End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
ELEMENTS OF AERONAUTICAL ENGINEERING (AE-301)  

Time: 3 hrs  
Max Marks: 100  

No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) What do you understand by a flying wing aircraft and a blended-body aircraft? Explain with the help of suitable illustrations.  
   b) Explain with the help of proper sketches various types of wing plan forms.  
   c) Draw the axis system typically used in the study of aircraft stability and control. Show the occurrence of various forces and moments.  
   d) Plot typical pressure distribution on an airfoil in a subsonic flow at low angle of attack. Show the changes that can take place when the angle of attack is increased.  
   e) What do you understand by cryogenic propellants? Give example of any ISRO designed rocket engine which uses cryogenic propellants.  
   f) What do you understand by after burning? What purpose is served if an after burner is provided in a jet engine? Give example of a jet engine where an after burner is used.  
   g) What advantages does a by-pass engine offer over a normal jet engine? Draw a configuration of a three-spool jet engine.  
   h) In an ILS, what roles are played by the localizer and the glide scope? What are their modulations ranges of operation?  
   i) Define the terms: Avionics, and Intelligence information.  
   j) List out advantages and disadvantages found by using air instead of hydraulic fluid to transmit power.  
   k) Name the parts of a filter assembly. To what extent does a Micronics filter prevent the passage of solid particles? In a filter assembly what is the purpose of a by-pass valve.

2x10

PART-A

Q.2 a) Define a flight vehicle. What is the difference between an aerostatic craft and an aerodynamic craft? Give examples of each type.

5
b) What do you understand by fixed wing aircraft, rotary wing aircraft and mixed-fixed-rotary wing aircraft? How do they function? Explain giving examples of each type.  

10

c) What is a surface effect craft? Explain with the help of a suitable sketch the operation of a surface effect craft.  

5

Q.3  
a) Explain how different types of moments occur on aircraft? Explain zero-lift angle and zero-lift line.  

8

b) Define absolute angle of attack. How is it related to the geometric angle of attack?  

4

c) Describe the moment coefficient curve for a stable aircraft. Discuss the criteria for longitudinal static stability of an aircraft.  

8

Q.4  
a) Compare the main functions performed by a piston engine with the similar functions performed by a turbine engine with the help of suitable sketches.  

8

b) What is the difference between a centrifugal flow type compressor and an axial flow type compressor? Elucidate with the help of suitable sketches of each.  

8

c) Distinguish between a turboprop engine and a turboshaft engine. What are their applications in the aviation field?  

4

PART-B

Q.5  
a) What are the foremost criteria for structural design of an aircraft?  

5

b) What structural materials are mainly used currently in the construction of aircraft?  

5

c) Define: (i) wing loading, (ii) stiffness  

5

d) Discuss the factors which influence the selection of materials for construction of aircraft.  

5
Q.6  a) What is the purpose of ILS? Explain the system and the function of its major components with the help of suitable diagrams.  

   b) Expand the following abbreviations:

(i) RNAV
(ii) TACAN
(iii) PPI
(iv) SHF
(v) SSR.

Q.7  a) What is a hydraulic actuator? Describe single action and double action actuators with the help of suitable diagrams.

   b) Explain the need and working of selector valve and sequence valve.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
AIRCRAFT ELECTRICAL INSTRUMENTS AND SYSTEMS (AE-302)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define thermal runway in batteries.
b) What is the function of carbon piling in retary inverter?
c) Differentiate between earthling and grounding.
d) What is the function of toggle switch?
e) In an aircraft warning and indicating lights are same. State whether true or false.
f) Define better coils.
g) Draw discharging curve for lead acid batteries.
h) Why cable termination is necessary?
i) Name any two instrument transformer.
j) Define electrical bonding.

2x10

PART-A

Q.2 a) Draw the block diagram of rectifier unit and explain it. 10
b) Write note on any one:
   i) Rotary converter. 10
   ii) Static inverter.

Q.3 a) Explain in detail wires and cables used in aircraft electrical system. 10
b) What is busbar system? Explain split busbar. 10

Q.4 a) What is the function of circuit breaker? Explain any one type of circuit breaker used in aircraft electrical system. 10
b) Explain:
   i) Over voltage protection. 10
   ii) Under voltage protection.
PART-B

Q.5 Write notes on any two:
   a) Frequency meter.
   b) Control synchros.
   c) AC and DC synchronous systems.  

Q.6 Explain in detail central warning system along with different warning and indicating lights.

Q.7 a) Name different type of ignition system. Explain turbine engine ignition system in detail.

   b) Explain the working of fire detection and extinguishing system with the help of neat diagram.
Q.1 Write short notes on any ten:
   a) Steady / unsteady flow.
   b) Compressible/incompressible flow.
   c) Viscous / in viscid flow.
   d) Irrotational flow.
   e) Vorticity.
   f) Circulation.
   g) Streamline.
   h) Streakline.
   i) Pathline.
   j) Stream function.
   k) Potential function.
   l) Pitot tube.
   m) Coefficient of pressure.
   n) Uniform flow.
   o) Source and sink flow.
   p) Doublet flow.
   q) Vortex flow.

2x10

PART-A

Q.2 a) Using Buckingham’s Pi theorems prove that \( C_R = f(Re, M_\infty) \), where \( C_R \) is Dimensionless force coefficient, \( Re \) is Reynolds number and \( M_\infty \) is Mach number. Explain the concept of flow similarity and significance of Reynolds and Mach numbers.

10

b) Consider two different flows over geometrically similar airfoil shapes, one airfoil being four times the size of the other. The flow over smaller airfoil has free stream properties given by \( T_\infty = 180 \, K \), \( \rho_\infty = 1.23 \, kg/m^3 \) and \( V_\infty = 125 \, m/s \). The flow over the larger airfoil is described by \( T_\infty = 800 \, K \), \( \rho_\infty = 1.7 \, kg/m^3 \) and
\[ V_o = 200 \text{m/s}. \] Assume that \( \mu \) and \( a \), speed of sound are proportional to \( T^{1/2} \). Are the two flows dynamically similar?

10

Q.3 Consider velocity field where \( x \) and \( y \) components of velocity are given by
\[
u = \frac{cy}{x^2 + y^2} \quad \text{and} \quad v = \frac{-cx}{x^2 + y^2},
\]
onobtain:

a) Stream function.

b) Potential function.

c) Equation of streamlines.

d) The vorticity.

5x4

Q.4 a) Obtain stream and velocity potential functions for the doublet also discuss the characteristics of the doublet.

10

b) Synthesize non lifting flow over cylinder from elementary flows. Write stream function. Discuss how lifting flow over a cylinder can be synthesized and importance of this method in aerodynamics.

10

PART-B

Q.5 Write short notes on the following; also give the mathematical significance of the following:

a) Vortex sheet.

b) Starting circulation theorem

c) Kelvin’s circulation theorem.

d) Kutta conditions.

5x4

Q.6 a) What is a boundary layer?

10

b) With the help of diagrams, explain the phenomenon of flow separation on a typical airfoil. In the process, explain the adverse effects of flow separation on airflow. Also discuss the methods to control flow separation.

10

Q.7 Explain the following:

a) Prandtl’s classical lifting-line theory.

b) Non-linear lifting line method.

c) Vortex lattice numerical method.

20
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
AIRCRAFT STRUCTURES-I (AE-402)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are the differences between trusses and frames?
    b) Discuss the constructional features of the fuselage.
    c) State and explain the reciprocal relation.
    d) Differentiate between strain energy and complimentary energy.
    e) Explain plane strain condition with necessary equations.
    f) State and explain St.Venant’s principle.
    g) Define factor of safety and load factor and discuss their importance.
    h) Explain centre of twist and flexural centre.
    i) Draw an S-N curve and explain.
    j) What are Neuber beams?

2x10

PART-A

Q.2  a) Write short note on different type of Fuselage constructions.
      5
    b) Check the determinancy and find force in members of the following truss shown in the figure.

![Truss Diagram]

15
Q.3 Direct stresses of 160 N/mm² (tension) and 120 N/mm² (compression) are applied at a particular point in an elastic material on two mutually perpendicular planes. The principal stress in the material is limited to 200 N/mm² (tension). Calculate the allowable value of shear stress at the point on the given planes. Determine also the value of the other principal stress and the maximum value of shear stress at the point. Verify your answer using Mohr’s circle.

Q.4

a) Derive the equations of equilibrium for a 3-Dimensional force system. 

b) A rectangular element in a linearly elastic isotropic material is subjected to tensile stresses of 83 and 65 N/mm² on mutually perpendicular planes. Determine the strain in the direction of each stress and in direction perpendicular to both stresses. Find also the principal strains, the maximum shear stress, the maximum shear strain and their direction at the point. Take E=200 KN/mm² and poisson’s ratio (µ) = 0.

PART-B

Q.5

a) Derive the equations for 2-D problems in respect of structural analysis. 

b) Determine the rate of twist and the stress distribution in a circular section bar of radius R which is subjected to equal and opposite torque T at each of its free ends.

Q.6 Determine the deflection of the free end of tip-loaded cantilever beam shown below by using complementary energy method; the bending stiffness of the beam is EI.
Q.7  a) For the beam section shown, determine the location of shear center from the point 4.

b) For the beam loaded as shown, determine the deflection equation. Also determine the point of maximum deflection and the magnitude of the same. The beam cross-section is doubly symmetrical.
Q.1 Explain any ten of the following:
   a) What do you mean by a redundant structure? Give its conditions.
   b) What do you mean by limit load and ultimate load of any structure? How are they related?
   c) How many strain factors parameters are there for a 3-D body analysis? List them all.
   d) Explain the role of Longerons and stressed skin structure in fuselage design.
   e) What do you mean by shear flow? How the shear flow is related to shear stress?
   f) What do you mean by load factor? How does it vary when the aircraft moves from level flight to an accelerated flight?
   g) What do you mean by unsymmetrical bending? How is it different from symmetrical bending?
   h) Explain the concept of unit load method for truss analysis. When is it actually used?
   i) Write down the equation of equilibrium for a 3-D body under stress.
   j) Explain the importance of gust analysis for an aircraft.
   k) State the importance of V-n diagram.
   l) Find the expression of normal stress in X and Y direction and a shear stress for the stress function of:

\[ \phi = A_{xy} + \frac{B_{xy}^3}{6} \]

2x10

PART-A

Q.2 a) What are the most common types of loads usually encountered by an aircraft? Explain any five load bearing members of an aircraft along with the nature of loads supported by each of them.

b) Briefly describe the ‘sharp edge’ and ‘graded’ gust analysis technique and show that for ‘sharp-edge’ gust analysis the change in load factor is given by:
Q.3  

a) Derive the compatibility equation for a 3-D body undergoing deformation under the action of normal and shear loads. In the derivation, the relation between normal and shear strain with displacement terms ‘u’, ‘v’ and ‘w’ can be directly used.

b) An aircraft having a total weight of 45 kN lands on the deck of an aircraft carrier and is brought to rest by means of a cable engaged by an arrester hook, as shown below. If the retardation induced by the cable is 3g, determine the tension T in the cable, the load on an undercarriage strut and the shear and axial loads in the fuselage at the section AA; the weight of the aircraft aft of AA is 4.5 kN. Calculate the length of deck covered by the aircraft before it is brought to rest if the touchdown speed is 25 m/s.

Q.4  

Find the internal loads acting on each member of the structure shown in figure below:
Q.5  
a) In the unsymmetrical bending moment on a beam cross section, write down the essential sign conventions that are followed for bending moment around X-axis and Y-axis. Show that:
\[ \sigma_z = \frac{M_x (I_{yy} y - I_{xy} x)}{I_{xy} I_{yy} - I_{xy}^2} + \frac{M_y (I_{xx} x - I_{xy} y)}{I_{xx} I_{yy} - I_{xy}^2} \]

b) The beam is subjected to a negative bending moment of 100 kN-m, applied in a vertical plane determine the distribution of direct stress through the depth of the section. Now if the same bending moment is applied on the horizontal plane and in a clock wise sense about C_Y, when viewed in the direction Y_C. Dimensions of the beam are given in the figure below.

![Beam Diagram](image)

Q.6  
a) State the principle of superposition and the Maxwell’s reciprocal theorem. A cantilever 800 mm long with a prop 500 mm from the wall deflects in accordance with the following observations when a point load of 40 N applied to its end.

<table>
<thead>
<tr>
<th>Distance</th>
<th>0</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflection (mm)</td>
<td>0</td>
<td>-0.4</td>
<td>-1.5</td>
<td>-2.4</td>
<td>-1.8</td>
<td>0</td>
<td>2.4</td>
<td>4.8</td>
<td>10.5</td>
</tr>
</tbody>
</table>

What is the angular rotation of the beam at the prop due to a 30 N load applied 200 mm from the wall, together with a 10 N load applied 350 mm from the wall?

i) Deflected shape of propped cantilever  
ii) Determination of deflection at C
b) Calculate the vertical displacement of the quarter and mid span points B and C of the simply supported beam of length \( L \) and flexure rigidity \( EI \) as shown in figure below:

![Beam Diagram](image)

Q.7 Calculate the shear flows in the web panels and the axial loads in the flanges of the wing rib shown in the figure below. Assume that the web of the rib is effective only in shear while the resistance of the wing to bending moment is provided entirely by the three flanges 1, 2, and 3.

![Wing Rib Diagram](image)
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
AIRCRAFT STRUCTURES-I (AE-402A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain principle of superposition.
   b) Define redundancy.
   c) Explain the role of longerons and stressed skin structure in fuselage design.
   d) Explain the concept of unit load method for truss analysis.
   e) Explain the importance of gust analysis for an aircraft.
   f) Define strain energy.
   g) What do you mean by limit load and Ultimate load of any structure?
   h) What do you mean by shear flow?
   i) Explain briefly, the stress-strain relationship.
   j) State the importance of V-n diagram.

2x10

PART-A

Q.2 State the Maxwell’s reciprocal theorem.
A cantilever 800mm long with a prop 500mm from the wall deflects in accordance with the following observations when a point load of 40N applied to its end,

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What is the angular rotation of the beam at the prop due to a 30N load applied 200mm from the wall, together with a 10N load applied 350mm from the wall? The initial deflected shape of the cantilever is shown below:
Q.3 Direct stresses of $160\text{N/mm}^2$ (tension) and $120\text{N/mm}^2$ (compression) are applied at a particular point in an elastic material on two mutually perpendicular planes. The principal stress in the material is limited to $200\text{N/mm}^2$ (tension). Calculate the allowable value of shear stress at the point on the given planes. Determine also the value of the other principal stress and the maximum value of shear stress at the point. Verify your answer using Mohr’s circle.

Q.4 For the truss shown below, Calculate the forces in all bars using method of joints.

**PART-B**

Q.5 An aircraft having a total weight of $250\text{kN}$ and a tricycle undercarriage lands at a vertical velocity of $3.7\text{m/s}$, such that the vertical and horizontal reactions on the main wheels are $1200\text{kN}$ and $400\text{kN}$ respectively; at this instant the nose wheel is $1.0\text{m}$ from the ground, as shown in figure. If the moment of inertia of the aircraft about its CG is $5.65 \times 10^8 \text{Ns}^2 \text{mm}$ determine the inertia forces on the aircraft, the time taken for its vertical velocity to become zero and its angular velocity at this instant.
Q.6 Determine the deflection of the free end of tip-loaded cantilever beam shown below by using complementary energy method; the bending stiffness of the beam is $EI$.

Q.7 Calculate shear flows in the web panels and the axial loads in the flanges of the wing rib shown in the figure below. Assume that the web of the rib is effective only in shear while the resistance of the wing to bending moment is provided entirely by the three flanges 1, 2 & 3.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
AIRCRAFT PROPULSION-I (AE-403)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on any ten:
   a) Geometric pitch of a propeller.
   b) Inflow Factor.
   c) Advance Ratio.
   d) Internal Combustion Engine.
   e) External Combustion Engine.
   f) Specific Fuel consumption of an IC Engine.
   g) Effects of altitude and velocity of an aircraft on Specific Fuel Consumption of IC Engine.
   h) Supercharging.
   i) Use of Heat Transfer in Aircraft Propulsion. Give a practical example.
   j) Specific Thrust.
   k) Specific Impulse.
   l) Design Parameters of Gas Turbine Engine.

   2x10

PART-A

Q.2 Explain the following Heat Transfer Processes, with help of governing equations:
   a) Conduction. b) Convection c) Radiation

   20

Q.3 a) Discuss the significance of Froude’s momentum theory and blade element theory in analyzing working of a propeller.

   10

   b) What are the parameters on which thrust of propeller depends? Using Buckingham Pi theorem obtain the equation of coefficient of thrust of a propeller.

   10

Q.4 At the beginning of the compression process of an air standard Otto cycle, $P_1=1$ bar,
   $T_1 =290 \text{ K}$, $V_1= 400 \text{ cm}^3$. The maximum temperature in the cycle is 2200 K and the compression ratio is 8. Determine:
a) The heat addition, in kJ.
b) The net work, in kJ.
c) The thermal efficiency.
d) The mean effective pressure, in bar.
e) If the engine has four cylinders and the cycle is repeated 1200 times per min in each cylinder, determine the net power output, in kW.

**PART-B**

Q.5  

a) Using governing equations of Fluid Mechanics obtain the equation of thrust produced by a propulsion device and its propulsive efficiency.

b) The Effective Jet Exit Velocity from a jet Engine is 2700 m/s. The forward velocity is 1300 m/s and air flow rate is 76 kg/s.  

Calculate:
   i) Thrust.
   ii) Propulsive Efficiency.

Q.6  

Describe the following:
   a) Describe the requirement of fuels used in an IC Engine.
   b) Advantages of Liquid fuel.
   c) Carburetor.

Q.7  

Air at 22 kPa, 220 K, and 250 m/s enters a turbojet engine in flight at an altitude of 10,000 m. The pressure ratio across the compressor is 12. The turbine inlet temperature is 1400 K, and the pressure at the nozzle exit is 22 kPa. The diffuser and nozzle processes are isentropic, the compressor and turbine have isentropic efficiencies of 85 and 88%, respectively, and there is no pressure drop for flow through the combustor. On the basis of an air-standard analysis, Determine:

a) The pressures and temperatures at each principal state, in kPa and K, respectively.
b) The velocity at the nozzle exit, in m/s.

Neglect kinetic energy except at the diffuser inlet and the nozzle exit.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
AIRCRAFT MATERIALS (AE-404)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define: Hardness, Brittleness, Malleability and Ductility.
b) Explain a binary phase diagram. Draw the same for aluminum-copper.
c) List types of nickel alloys with their composition.
d) What is hot short and cold short in steel?
e) Define a composite. Which composite is used in building bullet proof jackets and windows?
f) Explain Annealing, Normalizing.
g) Explain Quenching, Tempering.
h) What is an allotrope? Which are the allotropes of iron? Classify them.
i) Which heat treatment processes are used for Mg alloys? Define each.
j) What is isotropic and homogeneity? How is it maintained in composites?
2x10

PART-A

Q.2 a) Describe the corrosion resistant process used for stainless steels.
b) Explain sand casting, permanent mold casting and die casting for Mg alloys.
c) Discuss the various factors affecting selection of material in a/c manufacture.
d) Write a short note on inconel describing its composition, heat treatment process used and working properties.
e) Write a short note on Monel describing its composition, heat treatment process used and working properties.
4x5

Q.3 a) What are different types of corrosion resistant steels? Describe them. What are the different types of corrosion that act on such steels? What methods are used to increase corrosion resistance?
10
b) Explain sand casting, permanent mold casting and die casting for Al alloys. Which heat treatment processes are used on wrought Al alloys? Explain their uses and purposes with the classification of wrought Al alloys.
10
Q.4  a) Give and explain the manufacturing process of ceramics. Then explain manufacturing process for Mg. Give reason as to why Mg alloy will be a better metal to be used in a/c manufacturing.  

 10

b) Write the properties of Mg. Compare steel with magnesium alloys for a/c applications. What are the disadvantages of Mg alloys? Speak about the heat treatment processes done on Mg alloys.

 10

PART-B

Q.5  a) What are composite ceramics? State their types and write briefly on each type. Explain the stress strain curve for ceramics.

 10

b) Write the properties of Nickel. Compare it with steel an Al alloys. Explain the different grain structures in Ti alloys. What are the properties of Ti alloys? Where is it used in a/c and why?

 10

Q.6  a) Explain how various metals are used as alloys in steel? Describe the internal structure of steel.

 10

b) Define carburizing, cyaniding and nitriding process done for metals. Give the classification of surface hardening process. Explain the classification and also the processes mentioned above with required diagrams.

 10

Q.7  a) Describe K Monel, its properties, heat treatment done and working properties?

 5

b) Explain importance of strength/weight ratio importance in a/c materials with examples.

 5

c) Explain alloying theory and binary diagram in detail. Explain the heat treatment of alloy/carbon steels with the required diagram.

 10
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
AERODYNAMICS-II (AE-501)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) Define complex potential function and state its significance.
   b) What are conformal transformations?
   c) What are the different modes of vortex breakdown over a delta wing?
   d) Calculate $M_1$ if a pitot tube measure 1.638 $atm$ and the static pressure is 1 $atm$.
   e) What are expansion waves and how are they different from shock waves?
   f) When do we have detached shocks over wedges and cones?
   g) If air has static temperature of 300 $K$, the speed of sound works out to ________.
   h) Describe critical Mach number and its significance.
   i) What do you understand by supercritical airfoil?
   j) For Mach number 2 ________ is the minimum wave angle.
   k) Total pressure across a shock wave ________ whereas total temperature ________.
   l) State and explain Whitcomb’s area rule.

2x10

PART-A

Q.2 a) Define thickness chord ratio and percentage camber. If a circle of radius $c$ is displaced horizontally by distance ‘be’ and vertically by distance ‘$b\beta$’ from the origin of the $Oxy$ plane is transformed into a cambered airfoil profile given in the $\zeta$-plane by:
   $\zeta = 2b \cos \theta$ and
   $\eta = 2be (1 + \cos \theta) \sin \theta + 2b\beta \sin^2 \theta$,
   Determine the thickness chord ratio and percentage camber of the airfoil.

12

b) Define conformal transformation. For the transformation $\zeta = z + b^2 / z$, where $b$ is a constant, find out the length ratio.

8
Q.3  
\begin{itemize}
\item[a)] Describe with neat sketches, the subsonic flow characteristics over a delta wing.  
\item[b)] Discuss the salient features of Polhamus leading edge suction analogy.  
\item[c)] Discuss the effect of rounding the leading edge of a delta wing. 
\end{itemize}

Q.4  
\begin{itemize}
\item[a)] Derive the Prandtl relation for 1-dimensional, steady flow across a normal shock wave and state the important conclusion obtained from it. 
\item[b)] Air flows adiabatically through a duct. At point 1, the velocity is 240 m/s, with \( T_1 = 320 K \) and \( P_1 = 170 kPa \). Calculate (a) \( T_{01} \) (b) \( P_{01} \) (c) \( M_1 \) (d) \( \rho_{01} \). At point 2 further downstream \( V_2 = 290 m/s \) and \( P_2 = 135 kPa \), calculate (e) \( T_{02} \) and (f) \( P_{02} \).
\end{itemize}

**PART-B**

Q.5  
\begin{itemize}
\item[a)] For a uniform supersonic flow at Mach number \( M_1 \) along a surface having sudden deflection \( \theta \) resulting in generation of an oblique shock wave having wave angle \( \beta \), derive a relationship between \( \theta, \beta, \) and \( M_1 \). Discuss the plots between \( \theta \) and \( \beta \) for various values of \( M_1 \). 
\item[b)] A supersonic flow at \( M = 1.58 \) and \( p_1 = 1 atm \) expands around a sharp corner. If the pressure downstream of the corner is 0.13 atm, calculate the deflection angle of the corner.
\end{itemize}

Q.6  
\begin{itemize}
\item[a)] Derive the linearized velocity potential equation for a two-dimensional, irrotational, isentropic flow over a body immersed in a uniform flow and work out the perturbation velocity potential equation for small perturbations at subsonic and supersonic Mach numbers. 
\item[b)] Under low-speed incompressible flow conditions, the pressure coefficient at a given point on an airfoil is -0.54. Calculate \( C_p \) at this point when the free stream Mach number is 0.7, using the Prandtl-Glauert rule. 
\end{itemize}

Q.7  
List the various methods to model compressible flow using velocity potential equation. Explain the procedure to model this type of flow using method of
characteristics. Also give your opinion on different methods.
Q.1  a) What is a compressibility of a fluid? Write a few lines about control volume approach with the help of a diagram.
b) Determine the speed of sound in Argon (Ar) at 100°C \((MW = 40\, kg/kmol)\).
c) What are Mach wave or Mach front and Mach angle?
d) What are the advantages of turbofan engine over turbojet engine?
e) What is adiabatic process? What is a reversible process?
f) What is the primary requirement for use of intakes in a jet engine? What are propelling nozzles?
g) List the differences between normal shock and oblique shock.
h) What are the configurations of turbofan engine?
i) Write the dependency of slip factor on number of vanes.
j) What is liquid injection thrust augmentation system?

\[2 \times 10\]

\textbf{PART-A}

Q.2  The following data apply to a twin-spool turbofan engine, with the fan driven by the LP turbine and the compressor by the HP turbine. Separate cold and hot nozzles are used. 
Overall pressure ratio 25.0
Fan pressure ratio 1.65
Bypass ratio \(m_c/m_h\) 5.0
Turbine inlet temperature 1550 K
Fan, compressor and turbine polytropic efficiency 0.90
Isentropic efficiency of each propelling nozzle 0.95
Mechanical efficiency of each spool 0.99
Combustion pressure loss 1.50 bar
Total air mass flow 215 kg/s
It is required to find the thrust under sea level static conditions where the ambient pressure and temperature are 1.0 bar and 288 K.

\[20\]
Q.3  a) Write about working and parts of a centrifugal compressor. Also draw a labeled diagram.  

b) What are the two types of thrust augmentation methods? Explain.  

Q.4  a) What is Rayleigh flow and how does it differ from Fanno flow? Write assumptions for Rayleigh flow.  

b) Write the summary points of qualitative results of series of calculations for optimization of turbofan engine.  

PART-B

Q.5  The following data are suggested as a basis for the design of a single-sided centrifugal compressor:  

- Power input factor $ \psi = 1.04 $  
- Slip factor $ \sigma = 0.9 $  
- Rotational speed $ N = 290 \text{ rev/s} $  
- Overall diameter of impeller $ = 0.5 \text{ m} $  
- Eye tip diameter $ = 0.3 \text{ m} $  
- Eye root diameter $ = 0.15 \text{ m} $  
- Air mass flow $ m = 9 \text{ kg/s} $  
- Inlet stagnation temperature $ T_{01} = 295 \text{ K} $  
- Inlet stagnation pressure $ P_{01} = 1.1 \text{ bar} $  
- Isentropic efficiency $ \eta_c = 0.78 $  

Determine the pressure ratio of the compressor and the power required to drive it assuming that the velocity of the air at inlet is axial and calculate the inlet angle of the impeller vanes at the root and tip radii of the eye, assuming that the axial inlet velocity is constant across the eye annulus.  

Q.6  a) Draw and explain the typical components inside a turbojet engine.  

b) Differences between axial flow compressor and centrifugal compressor.  

c) What is Froude efficiency? Write its expression and what is SFC. Write its expression.
Q.7  a) Explain the working of turbofan engine along with a basic diagram.  
    10  
    b) Derive an expression for stagnation temperature rise in a stage of axial flow compressor.  
    10
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth Semester
AIRCRAFT STRUCTURES-II (AE-503 / AE-503A)

Time: 3 hrs
Max Marks: 100
No. of pages: 4

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define:
   i) Long columns  
   ii) Short columns
b) What is radius of gyration? How does it affect buckling of a column?
c) Define flexural rigidity. Calculate the flexural rigidity for a rectangular and circular column.
d) Define a thin plate. Which forces can a straight thin sheet and curved thin sheet withstand?
e) Which are the boundary conditions considered when analyzing thin airframe structures?
f) What is point of contraflexure? How does it affect column buckling?
g) Give the boundary conditions for:
   i) Fixed ended columns
   ii) One end fixed and one end hinged
h) Define stiffness matrix and flexibility matrix.
i) Explain welded joints and bolted joints?
j) Give the structural idealization for:
   i) Fuselage only
   ii) Fuselage and wing combined.

Q.2 a) Derive the bending equation of column using bending equation.

b) Derive the bending equation with their solutions for the following imperfections:
   i) Eccentric load
   ii) Initial displacement

c) Write a note on column end fixity.

d) A pin-ended column of length \( l \) and constant flexural stiffness \( EI \) is reinforced to give a flexural stiffness \( EI \) over its central half. Considering symmetric modes of buckling only, obtain the equation whose roots yield the flexural buckling loads and solve for the lowest buckling load.
Q.3  

a) Write notes on:
   i) Elastic shear buckling of flat plates
   ii) Buckling of curved sheet in compression.

b) For a thin flat plate having dimensions \((a \times b \times t)\) cm\(^3\), derive the equation for its buckling assuming that the buckling modes are harmonic.

c) For the stringer sheet shown in the figure below, compressive loading is done by rigid members. The sheet assumed to be simply supported at load ends, at rivet lines and free at sides. Each stringer has an area of 0.1 in\(^2\). Assume: \(E = 10.3 \times 10^6\) for the sheet and stringers. Find the total compressive load \(P\):
   i) When sheet first buckles
   ii) When the stringer stress is 10\(^4\) lb/in\(^2\)
   iii) When the stringer stress is 3\(\times\)10\(^4\) lb/in\(^2\)

Q.4  

a) Derive the matrix equations a single spring.
b) Derive the matrix equations for a space frame.

c) Use the stiffness method to find the ratio $H/P$ for which the displacement of node 4 of the plane pin-jointed frame shown loaded in the given figure is zero, and for that case give the displacements of nodes 2 and 3. All members have equal axial rigidity $EA$.

\[ \text{\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{frame.png}
\caption{Frame with Loading}
\end{figure}} \]

**PART-B**

Q.5 a) Derive the stiffness matrix for 2 and 3 springs attached in series?

b) Derive the stiffness matrix and matrix equation for a pin jointed member?

c) Determine the horizontal and vertical components of the deflection of node 2 and the forces in the members of the pin-jointed framework shown in the figure. The product $AE$ is constant for all members.

\[ \text{\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{pinJointed.png}
\caption{Pin Jointed Framework}
\end{figure}} \]

Q.6 a) Part of a wing section is in the form of the two-cell box shown in the figure, in which the vertical spars are connected to the wing skin through angle sections, all having a cross-sectional area of $300 \, \text{mm}^2$. Idealize the section
into an arrangement of direct stress-carrying booms and shear-stress-only-carrying panels suitable for resisting bending moments in a vertical plane. Position the booms at the spar/skin junctions.

b) The thin-walled single cell beam shown in fig. has been idealized into a combination of direct stress-carrying booms and shear-stress-only-carrying walls. If the section supports a vertical shear load of \(10 \text{kN}\) acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section.

Boom areas: \(B_1 = B_2 = 200 \text{ mm}^2\), \(B_3 = B_4 = 250 \text{ mm}^2\), \(B_5 = B_6 = 400 \text{ mm}^2\), \(B_7 = B_8 = 100 \text{ mm}^2\).

Q.7

a) What are riveted joints? Explain the modes for a rivet joint failure?

b) Write a note on how stress distribution takes place around a rivet joint.

c) For the fitting shown in the figure below, find the margins of safety for various failure types.
For bolt and bushing (made of steel):
\[ \sigma_{at} = 1.25 \times 10^6 \text{ lb/in}^2, \quad \sigma_{abr} = 1.75 \times 10^6 \text{ lb/in}^2, \quad \tau_a = 0.75 \times 10^6 \text{ lb/in}^2 \]

For fitting (made of aluminum):
\[ \sigma_{at} = 0.65 \times 10^6 \text{ lb/in}^2, \quad \sigma_{abr} = 0.98 \times 10^6 \text{ lb/in}^2, \quad \tau_a = 0.39 \times 10^6 \text{ lb/in}^2 \]

Resisting load of fitting in compression is \( 0.15 \times 10^6 \text{ lb} \) and \( 0.12 \times 10^6 \text{ lb} \) in tension. Fitting factor is 1.2 and bearing factor is 2.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
FLIGHT MECHANICS-I (AE-504)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1 Answer the following questions:
   a) What trends are shown by the atmospheric temperature variation with altitude?
   b) Airplanes A and B are flying at the same Mach number at 1000 m and 5000 m, respectively. Are their velocities also same? If not, which is flying faster?
   c) What are two consequences when we have a wing (three dimensional) instead of an airfoil (two dimensional)?
   d) Write an expression for shear stress in a flow. State how it compares between the laminar and the turbulent flows? Justify your answer.
   e) What is velocity profile in a boundary layer? How do the velocity profiles compare for laminar and the turbulent boundary layers?
   f) For what kind of span-wise lift distribution, the induced drag is minimum.
   g) Write the necessary condition for and how it leads to flow separation.
   h) Illustrate the devices used for reducing the induced drag.
   i) If the L/D max for a glider is 13.6, find the minimum glide angle.
   j) What is the condition (in terms of $C_L$ and $C_D$) for the maximum endurance for a propeller driven aircraft?

2x10

**PART-A**

Q.2 Calculate the standard atmosphere values of $T$, $p$ and $\rho$ at geopotential altitude of 14 km and 28 km. $p$, $\rho$ and $T$ at sea level can be taken as $1.01 \times 10^5 \, N/m^2$, $\rho_1 = 1.23 \, kg/m^3$ and $T$ as 216.66 K, $g = 9.81, R = 287 \, K$.

20

Q.3 a) What is the IAS and how it is measured?  

6

b) Define CAS, EAS, TAS.  

6
c) What is the headwind and crosswind component of the wind flying at a speed of $300 \text{ km/hr}$ at angle of $3^\circ$ from the direction of travel of airplanes?

Q.4  

a) Explain the mechanism of critical Mach number and drag-divergence Mach number.  

10  

b) Calculate: 

i) The boundary layer thickness at the trailing edge. 

ii) The drag force over a small flat plate $5\text{ cm}$ long and $1\text{ m}$ wide in laminar flow at a velocity of $120\text{ m/s}$ at standard sea level condition.  

10  

PART-B  

Q.5  

Illustrate the various leading and trailing edge high lift devices. Explain how these affect the max lift coefficient.  

20  

Q.6  

a) Derive an expression for power required in terms of aircraft design parameters and characteristics. What is the aerodynamic condition for the power required to be minimum?  

8  

b) A twin jet aircraft has a wing area of $47\text{ m}^2$, aspect ratio of 6.5, Oswald efficiency factor of 0.87 and weighs $103047\text{ N}$ and its zero lift drag coefficient is 0.032. It is equipped with two jet engines with $40298\text{ N}$ of static thrust each at sea-level. Do the following with this data: (1 atm. Density at 5-km is $0.73643\text{ kg/m}^3$) 

i) Calculate and plot the power required curve for S/L and 5 km altitude.

ii) Calculate the maximum velocity at sea-level and 5 km altitude.  

12  

Q.7  

a) Derive a relation for take-off distance for an aircraft.  

10  

b) High performance fighter aircraft operates at high load factor $n$. Derive expressions for turn radius $R$ and turn rate $\omega$ and maximum load factor $n_{\text{max}}$ in terms of wing loading, density, load factor and lift coefficient.  

10
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
AIRCRAFT SYSTEMS (AE-505)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain / describe the following:
a) Turnbuckles.
b) Stick shaker.
c) In-line hydraulic reservoir.
d) Integral fuel tanks.
e) Detonation and knocking.
f) Need of pressurization in aircraft.
g) Function of Gaspers in the cabin.
h) Control of tailpipe fire that occurs during shutdown or false start.
i) Wind screen ice protection.
j) Emergency escape system.

2x10

PART-A

Q.2 a) Explain the controls available to the pilot in the cockpit. 5
b) Explain the different types of control systems used in aircraft. 15

Q.3 a) Explain the power driven hydraulic system along with its components and their function. 10
b) Explain the automatic pressure regulators or unloading valves. 10

Q.4 a) Explain the layout for a four engine manifold cross-feed fuel system. 10
b) Explain the refueling and defueling of an aircraft. 10

PART-B
Q.5  a) Explain the air cycle cooling system.  
     b) Explain the functioning of Water separator.

Q.6  a) Explain a typical pressure-demand oxygen system installed in aircraft. 
     b) Explain the oxygen system flow indicators and pressure gauges.

Q.7  a) Explain the Kidde and Fenwal type continuous – loop fire detection systems. 
     b) Explain the different types of ice formation and its effects on functioning of different systems of aircraft.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
FLIGHT MECHANICS-II (AE-603)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write notes on any five of the following:
   a) Limits of centre of gravity.
   b) Floating and restoring tendencies.
   c) Effect and application of acceleration on airplane balancing.
   d) Dorsal fin.
   e) Effect of sweep wing over lateral stability.
   f) Four modes of dynamic motion.

   4x5

PART-A

Q.2 a) Derive the fundamental equation of static longitudinal stability with the help of a suitable diagram. Derive and explain the tail contribution in it.

   10

b) Derive the neutral point for the stick fixed static longitudinal stability with tail contribution.

   5

c) Draw and explain the typical pitching moment curve $C_M$ with $C_L$ for longitudinal stability.

   5

Q.3 a) Derive an expression for the control surface hinge moment with elevator and tab control. Explain it in detail with the help of graphs and diagrams.

   7

b) Evolve an expression for float angle for the mentioned control surfaces and explain its importance.

   5

c) What are the different types of tabs used on the airplanes?

   3

d) Write short notes on:
   i) Frise aileron.
   ii) Spoiler control.

   5
Q.4  a) Derive an expression for the stick force gradient in an unaccelerated flight. Explain with a suitable diagram.

b) Draw and explain the stick force build-up graph. Explain the importance of trim condition for the stick free longitudinal stability.

c) Derive an expression for stick force per g from the basic balancing equation for the accelerated flight making i) Pull up maneuvering flight ii) Horizontal turn maneuvering flight.

7

PART-B

Q.5  a) Derive an expression for stick-free directional stability condition. Calculate the pedal force required for the directional stability. Explain with a suitable diagram.

b) What do you understand by the rudder lock condition? Explain it with the help of a suitable diagram and graph.

c) Draw and explain the typical yawing moment curve $C_N$ with $\psi$ for directional stability.

10

Q.6  a) Derive an expression for aileron control force. Explain it with a suitable diagram and mention all the assumptions taken into consideration.

b) Define balancing the aileron. What are the different ways to balance the aileron? Explain it with a suitable diagram and graph.

c) Draw and explain the typical yawing moment curve $C_L$ with $\psi$ for dihedral stability.

10

Q.7  Explain and evaluate the solution of the equation of the motion for stick fixed case. Explain the phugoid mode and short period mode.
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
AIRCRAFT DESIGN (AE-604)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
\[ \text{a) Draw the flight envelope for a supersonic aircraft with proper labeling.} \]
\[ \text{b) Draw the } C_L \text{ vs } \alpha \text{ curve for positive and negative cambered a/c. Describe the difference in them, if any.} \]
\[ \text{c) What factors affect take-off weight? Derive its equation.} \]
\[ \text{d) Which factors define the operational criteria for building an aircraft?} \]
\[ \text{e) Which aspects a manufacturer should consider during spending of money for building an aircraft?} \]
\[ \text{f) How are the operating costs of building an aircraft categorized and define each?} \]
\[ \text{g) Name and define the airfield requirements to be considered in a/c design.} \]
\[ \text{h) Describe the various terms in airfoil geometry with diagrams.} \]
\[ \text{i) Define drag bucket. How change in camber affects drag bucket shape?} \]
\[ \text{j) Describe 4 tail designs with diagrams.} \]

2x10

PART-A

Q.2  
\[ \text{a) Explain the terms for each family of airfoils using examples.} \]
\[ \text{b) What is a design wheel? Explain the various phases of aircraft design with diagrams.} \]

4

\[ \text{c) Write brief notes on:} \]
\[ \text{i) Wing sweep.} \]
\[ \text{ii) Taper ratio.} \]
\[ \text{iii) Twist.} \]
\[ \text{iv) Dihedral.} \]

1x4

4

\[ \text{d) Which are different types of nozzle configurations? Explain with diagrams.} \]

4

\[ \text{e) Show the loads acting on an L1011 aircraft with diagrams.} \]

4

Q.3  
\[ \text{a) Calculate the weight fractions for a jet powered combat aircraft with the following input parameters:} \]
<table>
<thead>
<tr>
<th>Input parameter</th>
<th>Value (Units in F.P.S. unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruise Mach number</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. mach number</td>
<td>1.9</td>
</tr>
<tr>
<td>Cruise altitude</td>
<td>60,000 ft</td>
</tr>
<tr>
<td>Operating radius</td>
<td>300 nautical miles</td>
</tr>
<tr>
<td>Engine TSFC (min)</td>
<td>0.8</td>
</tr>
<tr>
<td>Engine TSFC (max)</td>
<td>1.8</td>
</tr>
<tr>
<td>Thrust</td>
<td>22,000 lbs</td>
</tr>
<tr>
<td>Aspect ratio</td>
<td>2.4</td>
</tr>
<tr>
<td>Combat time</td>
<td>8 min.</td>
</tr>
<tr>
<td>Combat altitude</td>
<td>20,000 ft</td>
</tr>
<tr>
<td>Loiter time</td>
<td>20 min</td>
</tr>
<tr>
<td>Loiter altitude</td>
<td>10,000 ft</td>
</tr>
<tr>
<td>Structural factor</td>
<td>0.5</td>
</tr>
<tr>
<td>Payload (non-expendable)</td>
<td>600 lbs</td>
</tr>
<tr>
<td>Payload (expendable)</td>
<td>500 lbs</td>
</tr>
</tbody>
</table>

b) Derive the equation of climb for an a/c. Compare best angle and rate of climb. Show variation of vertical velocity for a jet and prop based a/c.

Q.4 a) Briefly describe the different aft tail arrangements with figures and examples.

b) Which are the different high lift creating devices used on aircraft and describe them with diagrams? Show the variation in lift generated in the presence and absence of high lift generating devices.

PART-B

Q.5 a) Write notes on:
   i) Wing drag estimation.                ii) Plan form geometric relations. 5x2
b) Describe how fineness ratio affects fuselage shape. Briefly explain the various fuselage shapes. Derive an equation to calculate the drag over fuselage for a subsonic commercial aircraft.

Q.6 a) Explain the various conditions that need to be addressed during volume design consideration of a fuselage.

b) Design a fuselage for the supersonic business jet:
   i) Cruise Mach number = 2.1
ii) Cruise altitude=55000 ft.
iii) L/D=14
iv) Diameter=9 ft.
v) $\rho =0.01 \text{ b/ft}^3$
vii) $Q=1$
viiii) $\rho =0.001 \text{ b/(ft-s)}$

Use Sears Haack series for fuselage design?

Q.7
a) Explain vertical, horizontal and Canard tail sizing, respectively. Discuss how spin recovery is done using tail surfaces.

b) Discuss the various types of landing gear arrangements with diagrams. Compare bicycle and tail dragger arrangements in details.

c) Define centre of gravity. Derive the equations of CG position with an appropriate diagram. Explain CG position for an aircraft in trimmed flight with a diagram.

d) Derive the equation for stroke length of an Oleo shock absorber and show that the length is independent of aircraft weight.
Time: 3 hrs

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten questions form the following:
   a) Define energy thickness.
   b) Explain the physical interpretation of displacement thickness.
   c) Give an expression for Pohlausen dimensionless quantity \( \frac{\delta}{\lambda} \) and define it with its physical interpretation for two dimensional flows.
   d) Explain axially symmetrical boundary layers and mention the examples.
   e) Explain the physical significance with formula of:
      i) Grashof number.
      ii) Reynolds number.
   f) Explain the effect of high temperature over Eckert number.
   g) Explain the difference between laminar and turbulent velocity distribution in a pipe.
   h) Explain briefly the effect of transition over shape factor.
   i) Explain the characteristic effect in lift at high angle of attack on an airfoil with endless belt used over the upper surface.
   j) Explain briefly the effect of cooling of wall over boundary layer.
   k) What are Reynolds stresses?
   l) Write a short note on wind tunnel turbulence.

\[ 2 \times 10 \]

\section*{PART-A}

Q.2 a) Derive an expression for momentum thickness with the help of appropriate diagram.
   b) State all the assumptions and mention the physical interpretation briefly.
   c) Define boundary layer thickness and explain with the help of a diagram.
   d) Explain general properties of boundary layer equation.

\[ 5 \times 4 \]

Q.3 a) Using the approximate method, explain and the application of the momentum equation to the flow past a flat plate at zero incidence with the help of a diagram.
b) Derive an exact solution for the axially symmetrical boundary layers for the circular jet with help of a diagram and the theoretical explanation of the flow nature.

Q.4 a) Derive and explain the theory of similarity in heat transfer. Explain the dimensionless numbers obtained from it.
   b) Explain significance of Nusselt number with the help of expression. Explain the change in Nusselt number in forced and free flow.
   c) Explain theoretically the effect of Prandtl number over the two boundary layers i.e. velocity boundary layer and thermal boundary layer. Explain the general properties of thermal boundary layer over the adiabatic wall.
   d) Derive an expression for the temperature increase though an adiabatic compression with the help of a diagram.

\[ 5x4 \]

\[ \text{PART-B} \]

Q.5 Derive Orr-Sommerfeld equation with the help of the method of small distribution for the principle of the theory of stability of laminar flow. Further briefly explain the general properties of Orr-Sommerfeld equation.

\[ 20 \]

Q.6 a) Explain the following methods of boundary layer control:
   i) Acceleration of the boundary layer (blowing).
   ii) Injection of a different gas.
   iii) Prevention of transition to turbulent flow by the suitable shapes.

\[ 10 \]

b) Derive the fundamental equation of boundary layer suction with the help of a diagram and obtain a theoretical result using the exact solution method.

\[ 10 \]

Q.7 a) Derive the fundamental equation for the calculation of turbulent flow.
   b) Explain Prandtl’s mixing-length theory with all the assumptions and derive the Prandtl mixing length hypothesis.
   c) Explain and derive Von Karman’s similarity hypothesis with all the assumptions.
   d) Explain universal-distribution laws. Explain its application over Von Karman’s and Prandtl theory.

\[ 5x4 \]
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
ROCKET PROPULSION (AE-821)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) What is meant by pressure sensitivity of solid propellant?  
   b) What is the role of binders in solid propellant grains?  
   c) What do you mean by magneto plasma propulsion?  
   d) What do you mean by choked flow in a nozzle?  
   e) Explain the importance of multi-staging in rocket propulsion.  
   f) What do you mean by Sliver?  
   g) What is the role of ablatives in solid rocket motors?  
   h) Explain the effect of boundary layer on the exhaust jet stream through a nozzle.  
   i) Explain briefly the cone and bell shaped nozzle.  
   j) State any two complexities related to turbo pump feed system.

2x10

PART-A

Q.2  
   a) As a rocket scientist you have been asked to design a nozzle for optimum operation condition and you observed that exit Mach number is 2. Now give some logical answer for the following conditions:  
      (Only logical explanation to be written, can use the suitable formula wherever required but no calculations are required to be shown)  
      i) Can we have the subsonic Mach of 0.6 at the nozzle exit even when the sonic condition exists at the throat?  
      ii) Due to some purpose you have been asked to cut down the nozzle length by 1/4th its original length. How will you modify the nozzle geometry to obtain same exit Mach of 2?  
      iii) If the diameter of the convergent section of the nozzle is doubled. How will it affect the nozzle exit condition?  
      iv) In what condition will the shock enters inside the nozzle divergent section?  
      v) If for a specific mass flow rate of M kg/s we are getting a sonic flow at the throat, what will happen if we increase and decrease the mass flow rate.

2x5
b) List down some of the propellant factors and combustion factor for solid rocket motor which can augment the burning rate of composite propellants.  

Q.3  

a) With the help of schematic diagram, differentiate between cartridge loaded and case bonded grains.  

b) With the help of a diagram explain the different grain geometry along with their effects on burning rate.  

c) State the effect of combustion chamber pressure on the burning rate of the grain. Write the formula and mention its parameters.  

Q.4  

a) Describe different types of the injector for liquid propellant engines.  

b) Explain any five solid propellant combination along with their desirable properties.  

c) Explain the concept of electro thermal rocket propulsion.  

PART-B  

Q.5  

a) Design the nozzle for an ideal rocket that has to operate at 30 km altitude and give 4000 N thrust at a chamber pressure of 2.1 MPa and a chamber temperature of 2000 K. Assume specific heat coefficient as $y=1.3$ and $R=300 \text{ J/kg-K}$, determine the throat area, exit area, throat velocity and exit temperature and thrust coefficient.  

(At 30 km assume atmospheric pressure to be 0.0025 Pa)  

b) What do you mean by thrust vector control (TVC) in rocket? Explain the four categories of TVC and the different schemes used with a single nozzle.  

Q.6  

Write short notes on the following:  

i) Application and storability issues related to cryogenic propellants.  

ii) Hybrid rocket motor.  

iii) Ignition process in solid rocket motor.  

iv) Resistojets.  

Q.7  

a) Explain the different types of electric propulsion system.
b) State any five general design criteria desirable for electrostatic thruster.

c) What are the different engine cycles based on which turbo-pump feed liquid propellant engine works? Explain with a diagram.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
INTRODUCTION TO WIND ENERGY (AE-825)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following / fill in the blanks:
   a) What is the source of wind energy and its estimated global limit?
   b) What were the major causes of failure of initial 100 kW HAWT?
   c) Ancient use of wind power in India was for ___________.
   d) Wind energy can be used in textile processing for:
      i) Spinning.
      ii) Curing and finishing of both yarns and textiles.
   e) Wind power can be used in centralized utility applications to drive ______ ac ______ generators.
   f) Use of wind generators for pumped storage of water.
   g) Terrain modification for the purpose of augmenting average wind speeds.
   h) Wind surveys and requirement of items for data recording.
   i) Extraneous loadings that occur in the operation of any wind machine.
   j) System design objectives.


2x10

PART-A

Q.2 a) How winds are generated on earth? 8
   b) What is the US and Indian experience of WECS program? 6
   c) What are the factors in favour of wind energy? 6

Q.3 a) What are the types of wind energy collectors? 6
   b) Explain the various Savonius and Darrieus type of rotors. 8
   c) Explain the Magnus effect rotors. 6
Q.4  a) Describe ERDA-NASA Experimental 100 kW units along with the gearbox for this experimental unit.

b) Explain the objectives of the development and demonstration program for this unit.

8

PART-B

Q.5  a) Describe wind energy farms.

b) Describe their integration with hydroelectric power.

7

c) Explain the relation between available power in freely flowing wind stream with the subtended area of the wind stream at various wind speeds with the help of a graph.

6

Q.6  a) Explain the features for selection of suitable site for installation of a WECS.

b) What is power co-efficient for a WECS? What is Betz coefficient? Prove that its value is = 0.593.

7

c) Explain variation of an ideal wind machine rotor with the ratio of blade tip speed to free-flow wind stream speed for various types of rotors.

6

Q.7  a) Explain how ducted turbine interconnected with vortex generators can be designed with power outputs that are 100 to 1000 times those of conventional wind turbines.

8

b) Discuss the factors affecting the cost of energy delivered and WECS viability.

6

c) Describe the wind-system design synthesis.

6
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
BASICS OF COMPUTATIONAL FLUID DYNAMICS (AE-827)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q. 1 Answer any five of the following:
   a) What is the physical significance of substantial derivative, and divergence of velocity vector?
   b) Explain briefly the meaning of first order finite differences and second order central differences.
   c) What do you understand by primitive and flux variables?
   d) Differentiate between time marching and space marching.
   e) What are the first order and second order metric terms in generic transformation equations?
   f) What is Boussinesq approximation? Define the terms:
      i) Stress tensor.
      ii) Eddy viscosity.
   g) How do you define the time averaging of flow property $\phi$ and $\text{div}(\mu\phi\partial \mu)$, where $\partial \mu$ is the velocity vector in a turbulent flow?

   4x5

PART-A

Q. 2 a) Name the models of flow that can be used for deriving the governing equations of flow. Write the continuity equation in case of each flow model and comment on the features of these equations.

   10

   b) Discuss briefly the general behavior of hyperbolic, parabolic and elliptic equations.

   10

Q. 3 a) Explain the polynomial approach to construct the finite difference quotients of flow parameters at boundary points.

   15

   b) Differentiate between the discretisation and round-off errors.

   5
Q.4 What is the form of flow governing equation which is particularly suited for CFD? How can we transform such equation from physical plane to computational plane so as to apply finite difference methods technique for obtaining the solution?

20

**PART-B**

Q.5 Explain the concept on which the relaxation technique is based. What type of equations is particularly suited for this technique? Explain the technique for inviscid, incompressible, two-dimensional flow.

20

Q.6 a) Derive the discretised equation for a one-dimensional convection-diffusion problem using central differencing in finite volume method.

10

b) Explain the three properties of discretisation schemes, namely, conservativeness, boundedness and transportiveness.

10

Q.7 a) Explain the Reynolds averaged Navier-Stokes equations for incompressible flow.

5

b) Express the one equation models of turbulence due to Spallart-Allmaras.

10

c) How does the approach followed in LES differ from that followed in DNS?

5
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
BASICS OF AUTOMOBILE ENGINEERING (AU-405)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following:
   a) Coupe
   b) Transfer box
   c) D.T.S.S.I system
   d) Thermostat value
   e) Multiplate clutch
   f) Automatic transmission
   g) Toe out
   h) Scrub radius
   i) Leading shoe
   j) Aspect ratio

2x10

PART A

Q.2 a) Explain the function and importance of the following parts of an automobile:
   i) Differential
   ii) U joints
   iii) Suspension
   iv) Tyres

2 \frac{1}{2}x4

b) On a hilly track performance of a rear wheel drive vehicle is superior as compared to the front wheel drive type vehicles. Explain the reason for the same.

10

Q.3 a) With the help of a neat sketch, explain the working of battery ignition system.

10

b) Explain multi-point fuel injection (MPFI) system. Differentiate between D-MPFI and L-MPFI systems.

10
Q.4  
a) What is the necessity of transmission in a vehicle? Explain with the help of total resistance tractive effort curve.  
10
b) With the help of a neat sketch, explain the construction and working of diaphragm spring clutch.  
10

PART-B

Q.5  
a) What type of steering gear is used in Maruti Alto car? Explain its construction and working with the help of a neat sketch.  
10
b) Why is it necessary to employ a suspension system in an automobile? What are the advantages of independent suspension over rigid axle suspension?  
10

Q.6  
a) Explain the construction and working of hydraulic braking system of Maruti Alto car.  
10
b) i) With the help of a neat sketch explain working of parking brakes.  
ii) How does anti-lock braking system function?  
5x2

Q.7  
a) Draw cross section of an automobile tyre and show its various constructional features.  
10
b) What is wheel balancing? Why wheel balancing is necessary in a vehicle?  
10
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
BASIC OF AUTOMOBILE ENGINEERING (AU-405)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Short answer type questions:
   a) What are the salient features of saloon car?
   b) State the advantages of frameless construction.
   c) What is the function of cut out relay?
   d) Define stroke length and top dead centre.
   e) What is the function of torsional spring in friction plate?
   f) What do you understand by pitching and rolling of a vehicle?
   g) What is scrub radius?
   h) Why skidding take place in a vehicle?
   i) What is aspect ratio of a tyre?
   j) What do you mean by bleeding of hydraulic brake?

2x10

PART-A

Q.2 a) How do you classify automobile? Explain in details giving examples.

10

b) What is the function of frame? What are the different loads taken by the frame? Explain.

10

Q.3 a) What are the function of the following:
   i) Condenser
   ii) Distributor
   iii) Ignition coil

3

b) Differentiate between:
   i) Fuel feed pump and fuel injection pump.
   ii) Air cleaner and fuel strainer.

5x2
Q.4  a) With the help of suitable diagram, describe the constructional features of a diaphragm spring type of clutch. Discuss its advantages and disadvantages in relation to the clutch employing helical spring.  
10
b) Explain the construction and working of synchromesh gear box.  
10

PART-B

Q.5  a) With the help of a neat sketch explain the working and functioning of rack and pinion type of steering gear.  
10
b) Write short note on characteristics of leaf spring.  
10

Q.6  a) With the help of neat sketch, describe the functioning of sliding caliper type of disc brakes.  
10
b) Write short notes on:
   i) Self energizing brakes.
   ii) Characteristics of brake fluid.  
5x2

Q.7  a) What are the different types of wheels used in an automobile? Explain with the help of neat sketch.  
10
b) Draw a neat sketch of tyre section and then explain the importance of each component?  
10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
FUEL AND LUBRICANTS (AU-406)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain if engines are designed for the specific type of fuel.
b) What are normal hydrocarbons with series $C_nH_{2n+2}$?
c) Explain the mechanism of combustion in IC engine.
d) Explain how biogas is produced in village and used.
e) What are fuel oils and what are their properties?

4x5

PART-A

Q.2 a) With the help of a neat sketch, explain the crude oil refining process. In the sketch show at what temperature different products are obtained?

10

b) Write short notes on:
   i) Alkylation
   ii) Isomerisation

5x2

Q.3 a) What is a viscosity of lubricant? With the help of a neat sketch, explain how Redwood viscometer is used for finding the viscosity.

10

b) Write the BIS specification of diesel.

10

Q.4 What is LPG? Can it be used in CI engine as fuel? Explain its advantages and disadvantages with petrol.

20

PART-B

Q.5 a) Explain the merits and demerits of hydrogen as a fuel in automobiles.

10

b) Write short notes on:
   i) Fuel cell
ii) LNG

Q.6  
  a) Classify lubricating oils. Explain their properties and various tests performed to find their actual usage.  
  b) Write a short note on synthetic lubricants.

Q.7  
  a) Explain with a sketch the friction effects on engine variables.  
  b) Explain hydrodynamic lubrication.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
FUELS AND LUBRICANTS (AU-406A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain briefly:
   a) Octane number
   b) Cetane number
   c) Aniline point
   d) Viscosity index
   e) Factors influencing the flame speed
   f) Knocking
   g) Acetone as a fuel
   h) Fuel cell
   i) Synthetic lubricants
   j) Hydrostatic lubrication

2x10

PART-A

Q.2 a) Explain the different important qualities of C.I. engine fuel.  
   10
   b) With the help of a neat sketch, explain the refining process of petroleum.  
   10

Q.3 a) Explain the method of measurement of:
   i) Flash and fire point
   ii) Cloud point and pour point
   5x2
   b) What is penetrometer? With the help of a neat sketch, explain the construction and working of penetrometer.  
   10

Q.4 a) With the help of a neat sketch, explain different stages of combustion in a C.I. engine.  
   10
b) Discuss different factors affecting the delay period in C.I. engines.  
10

PART-B

Q.5  a) Explain the two methods by which hydrogen can be used in C.I. engines.  
10  
b) Explain the possibility of using dual-fuel system in engines.  
10

Q.6  a) What do you mean by lubricant emulsions? Explain.  
10  
b) Explain the requirements of automotive lubricants.  
10

Q.7  Write short notes on:  
a) Hydrodynamic lubrication.  
b) Boundary lubrication.  
c) Lubrication of engine components.  
d) Conradson apparatus.  
5x4
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
DESIGN OF AUTOMOBILE COMPONENTS-I (AU-502)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are two types of tolerances?
b) What is meant by a detailed design?
c) What are self locking screws?
d) What is the function of brakes in an automobile?
e) What is creep?
f) What is malleability?
g) Why leaf springs are preferred over helical springs?
h) Why a propeller shaft is employed in an automobile?
i) What is the function of an axle?
j) Why bearings are used in the rotating components?

2x10

PART-A

Q.2  a) Explain the concept of interchangeability.

b) Explain the various types of fits. Also prepare a flow chart connecting all the parameters of design process.

25

Q.3  Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa is shear, 150 MPa in compression. Also prepare a neat diagram of knuckle joint showing all parameters.

20

Q.4  A simple band brake operates on a drum of 600 mm in diameter that is running at 200 rpm. The coefficient of friction is 0.25. The brake band has a contact of 270°, one end is fastened to a fixed pin and the other end to the brake drum 125 mm from fixed pin. The straight brake arm is 750 mm long and placed perpendicular to the diameter that bisects the angle of contact.

Find out what is the pull necessary on the end of brake arm to stop the wheel if 35 kW is being absorbed.

20
PART-B

Q.5 Explain the electronic power steering system in detail.  

Q.6 a) Explain with the help of a diagram full floating rear axle.  

b) A solid circular shaft is subjected to a bending moment of 3000 Nm and a torque of 10,000 Nm. The shaft is made of 45C8 steel having ultimate tensile stress of 700 MPa and shear stress of 500 MPa. Take factor of safety as 6. Find the diameter of shaft.  

Q.7 a) Explain in detail various materials used for the construction of any automobile structure. Also mention the specific design details of different materials.  

b) A compression oil spring made up of an alloy steel is of following specifications: Mean diameter of coil=50 mm; wire diameter= 5 mm; No. of active coil=20. If spring is subjected to 500 N, calculate the maximum shear stress to which the spring material is subjected.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
AUTO ELECTRICALS AND ELECTRONICS (AU-503)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is function of an alternator and a cranking motor?
    b) Describe advantages of positive earthing system.
    c) Define battery ratings and its types.
    d) Write down five causes for cranking motor failure.
    e) What is the function of a commutator in a DC generator?
    f) What do you mean by conductor, semiconductor and insulator?
    g) Explain a diode and a transistor.
    h) What is function of distributor? Enlist its important components.
    i) What is the function of good spark plug?
    j) Define bulb wattage.

    2x10

PART-A

Q.2 a) Explain earthed and insulated return system. Discuss advantages and disadvantages of earth return. 

    10

    b) What is the primary source of electrical energy in a vehicle? Discuss its principle and working. 

    10

Q.3 a) Define battery efficiency. Discuss effect of temperature on:
    i) Battery characteristics
    ii) Electrolyte specific gravity

    5x2

    b) Discuss specific gravity and high discharge test of lead acid battery. Draw a labeled neat sketch of hydrometer. 

    10

Q.4 a) Define and discuss principle of simple motor. 

    10
b) What is an alternator? How it differs from dynamo? Which one would you prefer and why?

PART-B

Q.5 a) Explain components of electronic ignition system with the help of a neat sketch.

10

b) Discuss a microprocessor and memory of Electronic Control Module (ECM).

10

Q.6 a) Draw a neat sketch of a battery coil ignition system of 4-cylinder, 4-stroke petrol engine. Identify and explain function of each component.

10

b) Compare battery ignition and magneto ignition system of a petrol engine.

10

Q.7 a) What do you understand by colour codes? Classify automobile cables.

10

b) What is wiring harness? How does it effect electrical connections in an automobile vehicle?

10
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
AUTOMOTIVE COMPONENT DESIGN (AU-506)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is endurance limit?
   b) Write the expression for the effect of surface factor under bending load.
   c) What are the properties of the material used for shafts?
   d) What is meant by spring rate and spring index?
   e) What are the different types of bearings? Describe any one.
   f) What is the usefulness of gears over the belt and chain drives?
   g) What is module of gear?
   h) Why cylinder liners are used?
   i) State the function of piston rings.
   j) What are the different forces acting on a connecting rod?

   2x10

   PART-A

Q.2 a) Derive the expression for Goodman criterion for combination of stresses under reversed axial loading for ductile materials.

   10

   b) Find the maximum stress concentration induced in a rectangular plate 60mm x 10mm with a hole of 12mm diameter and subjected to tensile load of 12kN. The value of theoretical stress concentration factor is 2.5.

   10

Q.3 a) Explain the nipping phenomena in leaf springs.

   10

   b) Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5.

   10

Q.4 A full journal bearing of 50mm diameter and 100mm long has a bearing pressure of 1.4 N/mm². The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil
whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m·s. The room temperature is 35°C. Find:
1. The amount of artificial cooling required, and
2. The mass of the lubricating oil required,
If the difference between the outlet and inlet temperature of the oil is 10°C.
Take specific heat of the oil as 1850 J/kg/°C.

**PART-B**

Q.5 A bronze spur pinion rotating at 600 r.p.m, drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for bronze pinion and C.I. gear are 84 MPa and 105 MPa, respectively. The pinion has 16 standard 20° full depth involute teeth of module 8mm. The face width of both gears is 90mm. Find the power that can be transmitted from the standpoint of strength.

Q.6 a) What are different design considerations for a piston?

b) A four-stroke diesel engine has the following specifications, brake power is 5 kW, speed is 1200 r.p.m., indicated mean effective pressure is 0.35 N/mm², mechanical efficiency is 80%.
Determine:
1) Bore and length of the cylinder
2) Thickness of the cylinder head

Q.7 Design the I-section shank, big end bearing, piston pin and small end bearing of the connecting rod of an I.C. engine running at 1800 r.p.m. and developing a maximum pressure of 3.15 N/mm². The diameter of the piston is 100mm, mass of the reciprocating parts per cylinder 2.25 kg, length of connecting rod 380mm, stroke of piston 190mm and compression ratio 6:1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10 N/mm² and 15 N/mm². The density of material of the rod may be taken as 8000 kg/m³ and the allowable stress in the bolts as 60 N/mm² and in cap as 80 N/mm². The rod is to be of I-section for which you can choose your own proportions. Use Rankine formula for which the numerator constant be taken as 320 N/mm² and the denominator constant 1/7500.
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth Semester
DESIGN OF AUTOMOBILE COMPONENTS-II (AU-601)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the significance of stress concentration?
   b) What are average and mean stresses?
   c) How the shafts are formed?
   d) What is surging in spring?
   e) Define the term: static equivalent load.
   f) What is reliability of a bearing?
   g) What is usefulness of gears over belt and chain drives?
   h) What are the various causes of gear tooth failure?
   i) What is splash lubrication system?
   j) What is the function of connecting rod in an I.C. engine?

2x10

PART-A

Q.2 a) Define load and explain its various types. 10
   b) Explain the procedure for designing a shaft. 10

Q.3 a) Derive an expression for the shafts subjected to combined twisting moment and bending moment. 15
   b) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain. 5

Q.4 Design a journal bearing for a centrifugal pump from the following data:
Load on the journal=20000 N; speed of the journal=900 r.p.m; type of oil is SAE 10, for which the absolute viscosity at 55° C=0.017 kg/ms ambient temperature of oil=15.5°C, maximum bearing pressure for the pump=1.5 N/mm². Also calculate the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10° C. Heat dissipation coefficient=1232 W/m²/°C.
Take \( ZN/P = 28 \) and \( \frac{c}{d} = 0.0013 \).

**PART-B**

Q.5 A pair of straight teeth spur gear is to transmit 12 kW at 300 rpm of the pinion. The speed ratio is 3:1. The allowable static stresses for gear of cast iron and pinion of steel are 60 MPa and 105 MPa respectively. Assume the following number of teeth of pinion=16, face width=14 m, velocity factor \( (e_v) = \frac{4.5}{4.5 + v} \)

and tooth form factor \( (y) = 0.154 - \frac{0.912}{No.\ of\ teeth} \).

Determine: a) Module b) Face width c) Pitch dia of gears.

Q.6 A four-stroke diesel engine has the following specifications; Brake power=5 kW; speed=1200 rpm; indicated mean effective pressure=0.35 N/mm²; mechanical efficiency=80%.

Determine: a) Bore and length of the cylinder 
b) Thickness of the cylinder head 
c) Size of studs for the cylinder head

Q.7 Derive the expression for the force acting on a vertical engine:

a) Due to gas pressure and inertia of the reciprocating parts.

b) Due to friction of piston rings and of the piston.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
AUTOMOTIVE POLLUTION AND ITS CONTROL (AU-610)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are the pollutants emitted by petrol engine?
b) What do you mean by A/F ratio in petrol engine?
c) What is crankcase emission?
d) What are the causes of formation of NO\textsubscript{x} in a petrol engine?
e) How knock emission is caused?
f) What do you understand by CI engine emission?
g) Enumerate different types of HC emissions.
h) Define crankcase blow by.
i) Define smoke.
j) What is the function of a smoke meter?

2x10

PART-A

Q.2
a) Describe air pollution, water pollution, soil pollution and thermal pollution.

10
b) How pollution affects human health?

10

Q.3
a) Define and discuss evaporative emission.

10
b) Describe with the help of neat sketch EVAP system used to control evaporative emission.

10

Q.4
Write short notes on:
a) Poly nuclear Hydro carbons

10
b) Aldehydes

5
c) Keytones

5
**PART-B**

Q.5  
   a) What do you understand by sound pollution? Discuss the effects of noise pollution on human beings.  
   
   b) Discuss smoke and its types.  

Q.6  
   Explain the following:  
   a) Exhaust Gas Recirculation (EGR)  
   b) Catalytic converter  

Q.7  
   Draw a neat diagram of Hertridge Smoke Meter and explain its working.
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
MECHANICAL VIBRATION (AU-801)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following:
   a) Fundamental mode of vibration.
   b) Vibration isolation.
   c) Hysteresis damping.
   d) Orthogonality principle.
   e) Influence co-efficients.
   f) Damping ratio.
   g) Beat phenomenon.
   h) Discrete system.
   i) Transient vibration.
   j) Logarithmic decrement.

2x10

PART-A

Q.2 a) Derive the governing equation of a single mass damped system under harmonic excitation using D’Alemberts principle.

10

b) Determine steady state response of the above described system of harmonic excitation with fixed amplitude.

10

Q.3 a) Writing the characteristic equation for an under damped system and its response, derive expression for logarithmic decrement.

12

b) In order to determine the structural damping (Viscous damping) a free vibration rap test was performed. The successive amplitudes measured are 0.69, 0.362, 0.190, 0.099 units respectively. Determine the damping ratio of the structure.

8

Q.4 a) Describe principle and working of centrifugal pendulum vibration absorber.

8
b) A reciprocating machine weighing 25N running at 6000 rpm after installation has natural frequency very close to the forcing frequency of vibrating system. Design a dynamic absorber. The nearest frequency of system is to be at least 20% from the excitation frequency.

**PART-B**

Q.5  
a) Prove that the natural modes are orthogonal and explain the physical significance of orthogonality.

b) Determine the natural frequencies of the system shown below:

![System Diagram]

Q.6  
a) Discuss the Duhamel’s integral method for solving transient vibration problems.

b) Derive frequency equation for a beam with both ends free and having transverse vibration.

Q.7  
a) Represent the following complex numbers in rectangular form:

i) $10e^{-1.1}$  
ii) $5e^{2.1}$

and, represent the following periodic motion by harmonic series.
b) Show that the Fourier series expansion for the function $x(t)$ defined in the finite interval $-\pi \leq t \leq \pi$ by:

$$x(t) = \begin{cases} 0 & -\pi \leq t \leq 0 \\ \sin t & 0 \leq t \leq \pi \end{cases}$$

is given by

$$x(t) = \frac{1}{\pi} - \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{\cos 2nt}{4n^2 - 1} + \frac{1}{2} \sin t$$
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
COMPUTER AIDED VEHICLE DESIGN (AU-802)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Describe four properties of a CI engine fuel.
b) What is meant by blind spot? Give two examples.
c) What is the importance of vehicle testing?
d) List three resistances faced by a vehicle. Explain gradient resistance.
e) Define the term: tractive effort.
f) What is the significance of mean effective pressure?
g) What is the necessity to paint the vehicle body?
h) What information is given by the flow visualization technique?
i) What are the different body trim items?
j) Name the safety equipments for a car.

2x10

PART-A

Q.2
a) Explain the following:
   a) Choice of cycle for an IC engine.
   b) Choice of fuel for an IC engine.
   c) Choice of cylinder arrangement for an IC engine.
   d) Materials selection for an IC engine.

5x4

Q.3
a) What are various initial tests performed on vehicles.
   10

b) Explain about the visibility considerations in vehicles. Discuss in detail w.r.t. driver’s seat.
   10

Q.4
a) Explain various flow visualization techniques.
   10

b) Explain about the wind tunnel testing.
   10

PART-B
Q.5  
a) Explain different curves w.r.t. vehicle performance. Also explain tell how to derive gear ratios from them.  
b) Explain various loads which affect vehicle motion.  

Q.6  
Discuss P-V. diagram of a CI engine cycle and derives its efficiency and mean effective pressure.  

Q.7  
a) What are the properties required for material of automobile bodies?  
b) Why is steel still used in automobile industry?  
c) What is benefit of composite over metals?  
d) How selection of materials affects performance of car?  

5x4
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
EMERGING AUTOMOTIVE TECHNOLOGIES (AU-817)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) List feature to be considered for car designed for aging population.
     b) What environmental challenges are created because of vehicle emission?
     c) Discuss briefly hydrogen fuel cell.
     d) What are the merits and demerits of fuel cells?
     e) Why there is need to switch to hybrid vehicles in today’s era?
     f) Define: homogenous charge compression ignition.
     g) How EGR affects the emission of a diesel engine?
     h) What are capacitors?
     i) How are ultra capacitors beneficial for electrical automobiles?
     j) What are X-by wire technologies?

2x10

PART-A

Q.2  a) Discuss the issues to considered for designing cars for future. 10
     b) What are the crucial issues faced by automobile industries? 10

Q.3  a) How production of electron in fuel cell is different from that of a battery? Explain with the chemical reaction. 10
     b) Explain the working of a fuel cell. Though it also produces electrical energy through chemical reaction, how is it working is different from battery. 10

Q.4  How today’s diesel engine is different from that used a decade before? Discuss it in terms of:
     a) Performance
     b) Emission

20

PART-B
Q.5 Discuss the need and suitability of hybrid, electric vehicle in terms of:
   a) Energy.
   b) Environment.
   c) Urban transportation.

Q.6
   a) How is integrated starter generator beneficial?
   b) Discuss the need of new energy storage media.

Q.7 Explain the following:
   a) Drive by wire
   b) Steer by wire
   c) Brake by wire
   d) Active and semi-active suspension
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF BIOTECHNOLOGY (BT-101 / BT-101A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:
   a) Enlist five differences between living and non-living things.
   b) Define a cell.
   c) Draw a well labeled diagram of Golgi bodies.
   d) Why are chromosomes called hereditary vehicles?
   e) Define bioethics.
   f) Enumerate application of gene bank.
   g) How genetic disorder occurs in human?
   h) What are the entrepreneurship potentials of biotechnology?
   i) What is cryopreservation?
   j) Enumerate the applications of stem cell.

2x10

PART-A

Q.2 a) Draw a well labeled diagram of a cell. 10
   b) How Mitosis is different from Meiosis? 10

Q.3 Discuss evolution of life. What are different theories and evidences? 20

Q.4 a) Describe various types of chromosomal aberrations. 10
   b) What are induced mutations? 10

PART-B

Q.5 a) Discuss DNA replication with a suitable diagram. 12
   b) Explain the difference between a saturated and an unsaturated fat. 8
Q.6  a) Describe the procedure for DNA fingerprinting.  
    b) How are the DNA fingerprints analyzed?

Q.7  a) Enlist the importance of biotechnology in human health and its commercial 
      and entrepreneurship potentials. 
    b) Elaborate the bio-safety risk classification and its significance. 

77/4
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
CELL BIOLOGY (BT-301A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:
   a) What is the significance of surface: volume ratio in determining the cell size?
   b) What is the role of Robert Hook in development of cell biology?
   c) Which cellular organelle is known as “storage bin” of the cell and why?
   d) What happens in metaphase of cell cycle?
   e) Define histones and mention their significance.
   f) What do you mean by semi-permeable nature of plasma membrane?
   g) What is sarcolemma?
   h) What are proto-onco genes?
   i) How is a motor neuron different from a sensory neuron?
   j) What is paracrine signaling?

2x10

PART-A

Q.2 a) Give a detailed account of mechanism of active transport across the cell membrane in an animal cell.
   15
   b) What do you know about “Fluid-Mosaic” model of cell membrane?
   5

Q.3 a) Draw a comparison between structure and functions of microtubules and microfilaments.
   10
   b) Explain in detail the role of ribosomes in protein synthesis.
   10

Q.4 a) Give a detailed account of structural aspects of chloroplast.
   10
   b) “Mitochondria is a semi-autonomous organelle”, justify the statement.
   5
c) What do you know about chiasmata formation and crossing-over in meiosis?  

5

**PART-B**

Q.5 Explain in detail structure and functions of various kinds of receptors involved in cell signaling.  

20

Q.6 a) Give a detailed account of molecular bases of the development of cancer?  

10  
b) What are carcinogens? Give an account of various kinds of important carcinogens.  

10

Q.7 Give a detailed account of mechanism of nerve impulse generation and transmission.  

20
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
MICROBIOLOGY (BT-302)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms:
   a) Mold
   b) Capsulated bacteria
   c) Actinomycetes
   d) Photoautotrophs
   e) Thermoacidophiles
   f) Pure culture
   g) Binary fission
   h) Synchronous growth
   i) Transformation
   j) Disinfectant

   2x10

PART-A

Q.2 a) Give a detailed account of Whittaker’s five kingdom classification.  
   10
   b) How did Louis Pasteur contribute towards development of microbiology?  
   6
   c) What are Voch’s postulates?  
   4

Q.3 a) Discuss in detail the life-cycle of a virus.  
   10
   b) Give the salient features of Archebacteria.  
   10

Q.4 a) What do you mean by pure culture preservation? Why is it significant?  
   4
   b) Discuss in detail the technique of lyophilization mentioning its merits and demerits.  
   12
c) How is an enrichment medium different from a selective medium? Explain with the help of an example.

PART-B

Q.5  a) Differentiate between the following:
   i) EMP pathway and PPP Pathway.
   ii) Anaerobic respiration and fermentation.
   iii) Oxygenic and anoxygenic photosynthesis.

   b) Give a detailed account of ATP generation through electron transport chain.

Q.6  a) Differentiate between the following:
   i) Generalized and specialized transduction.
   ii) $Hfr \times F^{-}$ and $F^{+} \times F^{-}$ conjugation
   iii) Conjugation mapping and transductional mapping

   b) What do you know about U-tube experiment?

Q.7  Give a detailed account of sterilization through high temperature.
End Semester Examination, Dec. 2014
B. Tech. - Third Semester
BIOCHEMISTRY (BT-303 / BT-303A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from PART A and TWO questions from PART B. Each question carries equal marks.

Q.1 Answer the following:
   a) Give two examples of hydroxy amino acids and sulphur containing amino acids.
   b) What is difference between D and L sugars?
   c) What is clinical significance of histamine?
   d) What is the pH of 0.1 m HCl?
   d) What is cause for death because of cyanide poisoning?
   e) Give two examples of hydrolases enzymes.
   f) What is daily requirement of vitamin D?
   g) What is hard water?
   i) What fatty acids are generally present in human fat?
   j) Which hormones enhance glycogenolysis?

2x10

PART-A

Q.2 a) Derive an expression that relates pH, pKa and buffer concentration.
5
b) What are the structural levels of organization of proteins? Explain structure of any one protein in detail.
15

Q.3 a) Discuss the physical, chemical and structural properties of monosaccharides.
10
b) What are sphingolipids? Explain structure and functions of compound lipids in detail.
10

Q.4 Write descriptive notes on any four:
   a) Structure and properties of purine bases
   b) Derivation of michaelis Menten equation
   c) Role of co-factors in enzyme catalysis.
   d) Biologically important nucleotides
e) Function of animal hormones
f) Diseases caused by deficiency of vitamins.

5x4

PART-B

Q.5  a) Define bioenergetics. What is ATP and explain its participation in metabolic network?

10

b) Discuss metabolic fate of amino group in detail.

10

Q.6  a) What is TCA cycle? Give its reactions and regulations.

10

b) Explain alpha and beta oxidation of fatty acids.

10

Q.7  a) Define ETC. Discuss mitochondrial electron transport chain in detail.

10

b) How purines synthesis take place by salvage and de-novo pathway?

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
BIOCHEMISTRY (BT-303B)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Give any two examples of sulphur containing amino acids.
b) Differentiate between D and L sugars.
c) How are triglycerides formed? Give reaction.
d) What is deamination?
e) Mention any two co-factors with their enzymes.
f) What are high energy-phosphate compound?
g) What is gluconeogenesis?
h) Name two inhibitors of oxidative phosphorylation.
i) How ketone bodies are formed?
j) What is salvage pathway?

2x10

PART-A

Q.2 a) Explain different levels of structural organization of proteins.

10

b) Discuss chemical interactions between water and biomolecules.

10

Q.3 Give structure, properties and functions of:
a) Disaccharides
b) Compound lipids

5x2

Q.4 Write explanatory notes on:
a) Types of nitrogenous bases
b) Enzyme inhibition

5x2

PART-B

Q.5 a) Explain first and second laws of thermodynamics.

10
b) Write the biochemical reactions occurring in ‘urea cycle’.  

10

Q.6 Describe the steps and reactions in TCA cycle. Discuss the mechanism of regulation and energy efficiency of this cycle.  

20

Q.7 a) How are pyrimidines synthesized by de-novo pathway?  

10

b) Describe the electron transport chain and its role in oxidative phosphorylation.  

10
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Third Semester
GENETICS (BT-304A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:
   a) Differentiate between genotype and phenotype.
   b) Define linkage.
   c) What is back cross?
   d) Define polygenic inheritance.
   e) Which types of histones are conserved?
   f) What is photoreactivation?
   g) Differentiate between euchromatin and heterochromatin.
   h) A man with blood group AB marries a woman with blood group B (heterozygous). What will be the blood group of the child?
   i) What is two point test cross?
   j) Name some genetic diseases that are caused by recessive genes.

2x10

PART-A

Q.2 a) Define epistasis. Explain dominant epistasis with an example.

10

b) In guinea pig rough coat “R” is dominant over smooth coat “Y” and black coat colour “B” over white “b”. Find the genotype and phenotype ratio of the following crosses:
   i) RRBb x rrb
   ii) rrBB x rrb

5x2

Q.3 a) Explain XX-XO type of sex determination with an example.

8

b) Discuss the chromosomal aberrations with suitable examples.

12

Q.4 a) Discuss the various levels of structural organization of chromosomes in eukaryotes.
b) Explain polytene chromosomes and chromosomal puffs.

**PART-B**

Q.5 Discuss the various repair mechanisms that a cell employs to repair its damaged DNA.

20

Q.6 a) What are quantitative traits? Discuss the inheritance of such traits citing a suitable example.

15

b) Explain multiple factor hypothesis.

5

Q.7 a) How DNA fingerprinting is done to solve disputed parentage?

6

b) How are genetic disease classified? Discuss any two of them.

14
End Semester Examination, Dec. 2014  
B. Tech. (Biotechnology) – Third Semester  
BIOANALYTICAL TECHNIQUES (BT-305 / BT-305A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:  
a) State the significance of reproducibility of experimental results.  
b) How is fluorescence different from phosphorescence?  
c) What is retention factor? Give its expression.  
d) What is meant by isoelectric focusing?  
e) Give one example each for emission of α and β particle.  

4x5

PART-A

Q.2 a) What is calibration? Explain methods used to calibrate analytical instruments.  

10  
b) What kind of errors can be eliminated by calibration?  

10

Q.3 a) Describe with ray diagram, image formation in a compound microscope.  

10  
b) Explain various kinds of centrifugation procedures.  

10

Q.4 a) Write an explanatory note on partition chromatography.  

10  
b) Write an explanatory note on affinity chromatography.  

10

PART-B

Q.5 Describe the technique of electrophoretic separation of nucleic acids. How are these visualized and analyzed?  

20
Q.6 How does infrared radiation interact with matter? Explain the functioning of an infrared spectrophotometer.

20

Q.7 What are proportional counters? Explain the working of Geiger Mueller counters.

20
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Third Semester
BIOANALYTICAL TECHNIQUES (BT-305B)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) State the significance of reproducibility of experimental results.
   b) Mention the role of thermoionic gun in electron microscopy.
   c) State the principle of molecular exclusion chromatography.
   d) What is isoelectric point? How is it utilized in electrophoresis?
   e) Explain the types of vibrations caused by infrared rays in matter.

4x5

PART-A

Q.2 a) Classify the errors in analytical instruments. Give suitable examples.

10

b) Explain various methods to eliminate different types of errors in experimental data.

10

Q.3 a) Give schematic representation of instrument. Describe the image formation in a fluorescence microscope.

10

b) Differentiate between differential and density gradient centrifugations.

10

Q.4 a) Describe the techniques of ion exchange chromatography.

10

b) Discuss the factors contributing to efficiency in a column chromatography.

10

PART-B

Q.5 Discuss in detail the following bionalytical techniques:
   a) Discontinuous gel electrophoresis.
   b) Immunoelectrophoresis

10x2
Q.6 a) Describe the instrumental set-up and functioning of a spectroflourimeter.  
 10
b) What is the role of fluorophores in florescence fluorimetry?  
 10

Q.7 Describe the methods of scintillation counting. What are the uses of two differential scintillators / floors in liquid scintillation?  
20
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
BIOCHEMICAL CALCULATIONS (BT-306 / BT-306A) 

Time: 3 hrs  
Max Marks: 100  

No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:  
a) What is the normality of 0.01\textit{M} of sulfuric acid?  
3  
b) A solution needs to be buffered at a pH of 7.5. Buffer, A has p\textit{K}a of 9 and Buffer B has p\textit{K}a 6.5. Which buffer would you choose and why?  
2  
c) Balance the following equation:  
\[ \text{2 Mn(NO}_2\text{)}_2 + \text{2 BeCl}_2 \rightarrow \text{Be(NO}_2\text{)}_2 + \text{MnCl}_2 \]  
2  
d) Consider that equimolar quantities of hydrogen and oxygen reacted to produce water. Which of the two reactants would be limiting?  
2  
e) Define: i) Standard heat of reaction ii) Heat of solution  
3  
f) How does specific heat differ in solids, liquids and gases?  
3  
g) List essential amino acids.  
2  
h) What are the factors that affect electrophoretic mobility?  
3  

\textit{PART-A}  

Q.2 a) The molecular weight of HCl is 36, calculate:  
i) The grams of HCl contained in 0.2 moles  
ii) The grams of HCl needed to prepare 500\textit{ml} of a solution 1 \textit{M}.  
6  
b) Explain the following terms:  
i) Mole percent  
ii) ppm  

iii) Avogadro number
iv) Buffer capacity

Q.3

a) How many grams of $\text{AuCl}_3$ can be made from 100.0 grams of chlorine by this reaction? $2\text{Au} + 3\text{Cl}_2 \rightarrow 2\text{AuCl}_3$ (Molar masses $\text{Cl}_2 = 70.9$, $\text{AuCl}_3 = 303.3$)

b) What is a calorimeter? Explain its working.

c) How much heat is lost when 0.10 kg of steam at 100°C condenses to water at 90°C? (Heat of fusion of water is $3.3 \times 10^3 \text{ J/kg}$)

Q.4

a) In a bioprocess industry, 100 $\text{h}^{-1}$ of culture medium is to be cooled from 90°C to 30°C by cooling it in a heat exchanger using chilled water. The water enters the heat exchanger at 5°C at a flow rate of 150 $\text{h}^{-1}$. Calculate the heat transferred and the outlet temperature of the water. (General Data: $1 \text{ m}^3 = 1000 \text{l}$, Heat capacity of water = $4.18 \text{ kJ kg}^{-1} \text{C}^{-1}$ Density of water = 1000 kg m$^{-3}$ or 1.00 kg l$^{-1}$) Heat capacity of medium = $3.8 \text{ kJ kg}^{-1} \text{C}^{-1}$ Density of medium = 1014 kg m$^{-3}$.

b) Calculate $\Delta H$ for the following reaction:

$8\text{Al}(s) + 3\text{Fe}_3\text{O}_4(s) \rightarrow 4\text{Al}_2\text{O}_3(s) + 9\text{Fe}(s) \Delta H_f \text{Al}_2\text{O}_3(s) = -1669.8 \text{kJ}$, $\Delta H_f \text{Fe}_3\text{O}_4(s) = -1120.9 \text{kJ}$

Q.5

a) Describe the kinetics of radioactive decay.

b) Write a note on structure of B-form of DNA. Draw a suitable diagram.

Q.6

a) Define:
   i) Reducing sugar
   ii) Glycosidic bond
   iii) Saponification value
   iv) Acid value

PART-B

Q.5

a) Describe the kinetics of radioactive decay.

b) Write a note on structure of B-form of DNA. Draw a suitable diagram.

Q.6

a) Define:
   i) Reducing sugar
   ii) Glycosidic bond
   iii) Saponification value
   iv) Acid value
b) Describe the working principle of spectrophotometer using a well-labeled diagram.

Q.7  a) Explain the mechanism of action of enzymes. Derive Michaelis-Menten equation. 10
b) Classify the different types of inhibitors of enzymes. Compare Lineweaver-Burk plots of each type with uninhibited enzyme. 10
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
BIOCHEMICAL CALCULATIONS (BT-306B)  

Time: 3 hrs  
Max Marks: 100  

No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Convert 25 Å into nm and µm.  
b) How many grams of NaOH would you need to make 2 litres of 0.5 M solution?  
c) Balance the following equation:  
\[
\text{C}_2\text{H}_4\text{O}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}
\]  
d) Compare theoretical and actual yields in bioprocessing.  
e) Define:  
i) Standard heat of reaction.  
ii) Shaft work.  
f) What is the need of energy balance calculations?  
g) Classify amino acids bases on their acidic or basic nature.  
h) Calculate the pI of Arginine that has pKa1 (carboxyl group) 1.8, pKa2 (amino group) 9.0 and pKa3 (side chain) 12.5.  
i) State the relationship between the wavelength, frequency and velocity of light.  
j) What is the significance of Michaelis Menten constant Km?

2x10

PART-A

Q.2  
a) What are the factors that affect choice of buffers?  
6  
b) Explain the preparation of buffers using a suitable example.  
8  
c) Calculate the molarity of a dye having molar mass 327 g/mol and a concentration of 2ppm.  
6

Q.3  
a) Define:  
i) Conversion.  
ii) Degree of completion.  
4
b) Consider the following reaction: If there are 35 grams of C₆H₁₀ and 45 grams of O₂, how many grams of the excess reactant will remain after the reaction stops.

\[ 6 \text{C}_6\text{H}_{10} + 17 \text{O}_2 \rightarrow 12 \text{CO}_2 + 10 \text{H}_2\text{O} \]

8

c) Acetylene can be brominated to form 1, 1, 2, 3, tetrabromoethane, CHBr₂CHBr₂, the equation for the bromination of acetylene follows:

\[ \text{C}_2\text{H}_2 + 2\text{Br}_2 \rightarrow \text{CHBr}_2\text{CHBr}_2 \]

If 72.0 g of C₂H₂ reacts with excess bromine and 729 g of the product is recovered, what is the percentage yield of the reaction.

8

Q.4  a) Define enthalpy and state its units. Enumerate the processes that bring about change in enthalpy. For a given process at constant pressure, \( \Delta H \) is negative. Is the process endothermic or exothermic?

6

b) Calculate the standard enthalpy for the oxidation of ammonia gas to produce nitrogen dioxide gas and water vapour; given the following standard enthalpies of formation: \( \text{NH}_3(g) \quad \Delta H_f^o = -46 \text{ kJ} \text{ mol}^{-1} \); \( \text{NO}_2(g) \quad \Delta H_f^o = +34 \text{kJ} \text{ mol}^{-1} \);

\[ \Delta H_f^o = -242 \text{ kJ} \text{ mol}^{-1} . \]

8

c) Describe the procedure to carry out energy balance of a bioprocess.

6

**PART-B**

Q.5  a) Draw and explain the titration curve for lysine (pKa₁, 2.2, pKa₂ 9.1 and pKa₃ 10.5).

10

b) In E.coli DNA, the AT/GC ratio is 0.93. if the number of moles of adenine in the DNA sample is 558,000, calculate the number of moles of guanine present.

4

c) The mass of a certain radioactive compound is found to decrease by 60 % in 10 days. Find its half-life.

6

Q.6  a) Explain the principle and working of a spectrophotometer. Draw a suitable diagram.

8

b) The sensitivity of an absorbance spectrophotometer was adjusted to give absorbance of 1.00 for a known concentration of 0.5 mmol dm⁻³. Calculate the concentration of a sample which then records and absorbance of 0.75.

6
c) Define sponification number. Calculate the sponification number of palmitodistearin. (Molar mass KOH=56; palmitodistearin=862).

Q.7 An enzyme was assayed at an initial substrate concentration of 2x10^{-5}M. In 6 min, half of the substrate had been used. The Km for the substrate is 5x10^{-5}M. Calculate:
   a) k.
   b) Vmax.
   c) Concentration of product formed at the end of 15 minutes.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
MOLECULAR BIOLOGY (BT-401 / BT-401A)

Time: 3 hrs
Max Marks: 100

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from Part A and **TWO** questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) What is the meaning of the term consensus sequence? Give an example.
   b) What is meant by the term self-splicing? What types of introns are self-splicing?
   c) What is the difference between a constitutive gene and a regulated gene?
   d) What is meant by the term: attenuation?
   e) Explain the functional roles of A and P sites during translation.
   f) Describe the components of eukaryotic ribosomal subunits.
   g) What is the function of poly A tail?
   h) What are ribozymes?
   i) What is glycosylation?
   j) What is the difference between an autonomous and a non-autonomous transposable element?

   2x10

**PART-A**

Q.2 a) How denaturation and renaturation studies of DNA are used to elicit the complexity of prokaryotes and eukaryotes?  
   10
   b) Discuss the packaging of a eukaryotic chromosome within a nucleus.  
   10

Q.3 a) Summarize the steps that occur in the process of chromosomal DNA replication in E. coli.  
   15
   b) How base excision repair differs from mismatch repair?  
   5

Q.4 Describe the processing events that occur during the production of mRNA in eukaryotes.  
   20
PART-B

Q.5  Represent diagrammatically the organization of the genes involved in tryptophan biosynthesis and discuss their transcriptional regulation.  

Q.6  a) Discuss the major pathways involved in the degradation of proteins.  

b) Discuss the differences in the events that occur during the initiation, elongation and termination stages of transcription in prokaryotes and eukaryotes.  

Q.7  What features distinguish a transposon from a retroelement? How are their sequences different and how are their mechanisms of transposition different?
Q.1 Briefly answer the following:
   a) Differentiate between eosinophils and basophils.
   b) How do natural killer cells recognize targets?
   c) On what cells are class I and class II MHC proteins present?
   d) What are allotypic determinants?
   e) What is the difference between radial immunodiffusion and double immunodiffusion?
   f) What are the differences between antigens presented by class I MHC and those presented by class II MHC?
   g) What classes of immunoglobulin fix complement?
   h) What is the composition of HAT medium?
   i) What is degranulation?
   j) How does precipitation differ from agglutination?

PART-A

Q.2 Briefly explain the following:
   a) Natural killer cells
   b) Adaptive immunity
   c) Structure and function of thymus
   d) Macrophages

Q.3 a) List and describe the characteristics and functions of the five classes of antibodies.

   15
   b) Define Ig allotypes and idiotypes.

   5
Q.4  a) Distinguish between the endogenous and exogenous pathways of antigen processing and presentation.  14
b) How light chain DNA undergo rearrangements?  6

**PART-B**

Q.5  Describe the technique involved in the formation of a monoclonal antibody. How monoclonal antibodies differ from polyclonal antibodies?  20

Q.6  Briefly explain the following:
   a) Sandwich ELISA  7
   b) Agglutination  6
c) RIA  7

Q.7  a) Compare Type I and Type IV hypersensitivity reactions.  12
b) Distinguish organ-specific and systemic autoimmune disease, giving an example of each.  8
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
IMMUNOLOGY (BT-402A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) What are haptens?
   b) What is an example of natural passive immunity?
   c) What antigen presenting cells (APCs) are involved in antigen presentation?
   d) What are the chief differences between B cells and T cells?
   e) Which type of hypersensitive reaction can be induced by pollens and certain foods in sensitive individuals?
   f) What are epitopes?
   g) What are isotypic determinants?
   h) What is ADCC?
   i) Differentiate between autograft and isograft.
   j) Give an example of delayed type of hypersensitivity.

2x10

PART-A

Q.2 a) Summarize the different defensive barriers that contribute to innate immunity. 12
   b) What are primary and secondary lymphoid organs? Discuss the structure and function of thymus. 8

Q.3 a) Explain the basic structure of an antibody molecule. Discuss its different types. 12
   b) What are cytokines? List down the properties of cytokines. 8

Q.4 a) Explain the antigen presentation by MHC class I and MHC class II molecules. 15
   b) Show diagrammatically the organization of genes in heavy chain DNA. 5

PART-B

102/4
Q.5 Describe the technique involved in the information of a monoclonal antibody. What are the differences between monoclonal and polyclonal antibodies?

20

Q.6 a) What is ELISA? Discuss the different variants of ELISA. 15
b) Explain the principle of radioimmunoassay. 5

Q.7 a) What do you understand by the term: hypersensitivity? Explain IgE mediated hypersensitivity. 15
b) Give clinical manifestations of type II hypersensitivity. 5
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
INDUSTRIAL MICROBIOLOGY (BT-403)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are primary metabolites? Give example.
    b) What do you mean by ‘Malo-lactic’ fermentation?
    c) Name the microbial strains used for production of proteases and vitamin B-12.
    d) Define parasexual cycle.
    e) What are hops? Give their significance?
    f) What do you mean by over-oxidation of vinegar?
    g) Define the term single cell proteins.
    h) Name some algal strains used as biofertilizers.
    i) What do you mean by downstream processing?
    j) What are antibiotics? Give examples.

    2x10

PART-A

Q.2 Discuss in detail the different components of a fermentation process.

    20

Q.3 a) Differentiate between the following:
    i) Feedback inhibition and feedback repression.
    ii) Auxotrophs and prototrophs.

    b) How does parasexual cycle contribute towards strain improvement process?
    4

    c) Discuss in detail the recombinant DNA approaches for strain improvement.
    10

Q.4 a) What do you know about secondary fermentation in wine manufacturing?
    5

    b) Discuss the process of vettel boil in brewing.
    5

    c) Briefly discuss the production of vinegar through various fermentation methods.
    10
PART-B

Q.5  
   a) What do you know about large scale production of vitamin B12?  
      10
   b) Give a detailed account of media used for penicillin production and also  
      discuss the purification of penicillin.  
      10

Q.6  
   Write short notes on any two:  
   a) Single cell protein.  
   b) Xanthan manufacturing.  
   c) Bt-Toxin: production and mode of action.  
      10x2

Q.7  
   a) Discuss the relationship between media design and fermentation economics.  
      5
   b) Give an account of critical parameters pertaining to fermentation economics.  
      15
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
BASICS OF CHEMICAL ENGINEERING (BT-404 / BT-404A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Briefly explain Arrhenius equation.  
3

b) Compare batch reactor and continuous stirred tank reactor.  
3

c) Define:
   i) Conversion.  
   ii) Batch time.  
   4

d) Differentiate between plastic and pseudoplastic fluids.  
3

e) Enlist the factors that affect heat transfer by convection.  
2

f) What is fractional distillation?  
2

g) What are resistance temperature detectors?  
3

PART-A

Q.2  
a) Consider the following reaction: 
Br₂(aq)+HCOOH(aq) → 2Br(aq)+2H⁺(aq)+CO₂(g)  
You measure the concentration of bromine with time and record the data:

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Br₂(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0120</td>
</tr>
<tr>
<td>50.0</td>
<td>0.0101</td>
</tr>
<tr>
<td>100.0</td>
<td>0.00846</td>
</tr>
<tr>
<td>150.0</td>
<td>0.00710</td>
</tr>
<tr>
<td>200.0</td>
<td>0.00596</td>
</tr>
<tr>
<td>250.0</td>
<td>0.00500</td>
</tr>
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<td>300.0</td>
<td>0.00420</td>
</tr>
<tr>
<td>350.0</td>
<td>0.00353</td>
</tr>
<tr>
<td>400.0</td>
<td>0.00296</td>
</tr>
</tbody>
</table>
Find out the average rate of reaction. Plot the data on a graph paper and find out the instantaneous rate at 100s and 300s.

b) Elaborate the reasons behind non-ideality of chemical reactors.

Q.3  
a) What is rheology? Classify fluids based on their rheological properties.

b) Give a detailed account of:
   i) Hagen-Poiseuille equation.
   ii) Reynolds number.

Q.4  
a) Describe different types of heat exchangers.

b) Explain the effect of fouling on heat transfer.

c) Define:
   i) Fourier’s law.
   ii) Overall heat transfer coefficient.

PART-B

Q.5  
a) Describe the variables that can be manipulated to improve convective mass transfer.

b) Give short notes on:
   i) Liquid-liquid mass transfer.
   ii) Diffusion.

Q.6  
Write short notes on:
   a) Liquid-liquid extraction.
   b) Mier’s theory of crystallization.
   c) Adsorption chromatography.
   d) Factors responsible for solid-solid de-mixing.

Q.7  
a) Describe the principle and working of a pH probe. Draw a neat well labeled diagram.

b) Describe the various types of errors in measurement. How would you minimize the errors in measurement?
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
THERMODYNAMICS OF BIOPROCESSES (BT-405)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write brief notes on:
   a) Thermodynamic equilibrium.
   b) Quasi-static process.
   c) Non-equilibrium systems.
   d) Henry’s law.
   e) Curie law.

   4x5

PART-A

Q.2 a) Explain first law of thermodynamics and also prove that the stored energy is a property of the system and does not depend on path of travel.

   10

   b) Explain steady flow energy equation.

   10

Q.3 Explain the following:
   a) Raoult's law.
   b) Activity co-efficient.
   c) Chemical reaction equilibrium.
   d) Phase equilibrium.

   5x4

Q.4 a) Explain the thermodynamics for an irreversible biological process.

   10

   b) Write about thermodynamic potentials and force.

   10

PART-B

Q.5 a) Explain the Prigogine’s principle and concept of coupling in biological processes.

   10
b) Give the detailed concept of minimum entropy production.

Q.6  a) Explain the thermodynamic model of a sodium pump.

b) Discuss the electric model of active transport.

Q.7  a) Explain the stability of no-equilibrium states in time and space.

b) Explain biological clocks.

c) Explain routes to chaos.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
THERMODYNAMICS OF BIOPROCESSES (BT-405A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write brief notes on:
   a) Difference between heat and work energy.
   b) Chemical potential and chemical coupling.
   c) Perpetual motion machine of second kind.
   d) Phase equilibrium.
   e) Onsager relations.

   4x5

PART-A

Q.2 a) Explain second law of thermodynamics and equivalence of Clausius and Kelvin-Planck statement.

   12

   b) What is a heat pump? Derive an expression for C.O.P. of a heat pump.

   8

Q.3 a) Explain the condition for thermal equilibrium.

   10

   b) What are thermodynamic potentials? Derive differential relations for potentials.

   10

Q.4 a) Write in detail about Gibbs relation in an open system.

   10

   b) Explain the discontinuous system production of entropy.

   10

   PART-B

Q.5 a) Write about Fick’s law for entropy production.

   10

   b) Explain Constitutive equations.

   10
Q.6 Give details on diffusion in a gravitational field.  

Q.7 a) Describe thermo-analysis of oxidative phosphorylation. 

b) Explain energy transfer by chemiosmosis.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
RECOMBINANT DNA TECHNOLOGY (BT-501)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are insertion sequences?
b) What is S1 nuclease?
c) What is the function of a DNA probe?
d) Define SNP.
e) How is a replacement vector different from an insertional vector?
f) Define ddNTP.
g) Why a wild type ‘Ti plasmid’ cannot be used as a vector?
h) What is the role of phosphatases and kinase?
i) What are neoschizomers?
j) What do you know about T-4 DNA polymerases?

2x10

PART-A

Q.2  Write short notes on any five:
   a) Restriction endonucleases
   b) Ligases
   c) Phosphatases
   d) DNA probes
   e) Kinases
   f) Methylases

4x5

Q.3  a) Give a detailed account of structural attributes of YAC 5
     b) What are the essential features of a plasmid cloning vector? 5
     c) Discuss in detail lambda phage as a cloning vector. 10

Q.4  Elaborate the ‘Maxam-Gilbert’ method of DNA sequencing. Also mention the demerits of the same.
PART-B

Q.5  a) Elaborate on transposon tagging.  
     b) Give a detailed account of ballistic method of DNA delivery. Also discuss its demerits. 
     c) What do you know about microinjection of DNA in eukaryotes?

Q.6  a) Give a detailed account of gene expression in *S.cerevisiae*. 
     b) What are the problems associated with expression of eukaryotic gene in *E.coli*?

Q.7  a) Draw a comparison among the following pairs:
     i) Southern and northern blotting. 
     ii) Nested PCR and RT-PCR. 
     b) Write short notes on *any two*:
        i) Microarrays 
        ii) Gene silencing 
        iii) Limitations of gene therapy

End Semester Examination, Dec 2014 
B. Tech. – Fifth Semester
BIOREACTOR AND BIOPROCESS ENGINEERING (BT-502)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define a bioprocess. Give an example. 
     b) Why does death phase occur in batch culture? 
     c) What type of impellers would you choose for mixing of solid-liquid suspensions?
d) Explain the function of baffles in a bioreactor. 2

e) What is catabolite repression? 3

f) How are heat sensitive substances sterilized? 3

g) How does agitation aid aeration in a bioreactor? 3

**PART-A**

Q.2 a) Discuss the scope of bioprocess engineering. How does downstream processing affect cost of the final product? 10

b) Explain with a help of a suitable diagram, the key steps in a typical bioprocess. 10

Q.3 a) Describe the phases of cell growth obtained in batch culture. 6

b) Define:  
   i) Specific growth rate
   ii) Saturation constant
   iii) Substrate limitation
   iv) Substrate inhibition 2x4

c) Explain kinetics of growth associated and non-growth associated product formation. 6

Q.4 a) Explain the design and application of packed bed bioreactors. 8

b) Define:  
   i) Short circuiting
   ii) Residence time distribution
   iii) Radial and axial flow
   iv) Dead pockets in bioreactors 3x4

**PART-B**

Q.5 a) Describe the formulation of typical microbial growth medium. 12

b) Explain the concept of statistical media design. 8

Q.6 a) Discuss the design of batch sterilization process. 8

b) Why is moist heat sterilization more effective than dry heat sterilization? 5
c) Explain the working and applications of HEPA filters.

Q.7 Write short notes on:
   a) Kla
   b) GMP
   c) Mechanisms of mass transfer
   d) Factors affecting diffusion coefficient.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
ENZYME BIOTECHNOLOGY (BT-503)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) What is role of dialysis in enzyme purification?
   b) Define feedback inhibition with an example.
   c) Discuss role of amylases in food industry.
   d) Describe the technique of encapsulation with an example.
   e) What is an enzyme deactivation?
   f) Differentiate between chemical catalyst and biocatalysts.
   g) Write the principle of colorimetric biosensor.
   h) What are objectives of enzyme reactions in organic medium?
   i) Define artificial enzymes. Give an example.
   j) Explain the objectives of biotransformation.

2x10

PART-A

Q.2 
   a) How do enzymes accelerate the rate of enzyme reaction? Discuss transition state theory for its mechanism.  
      10
   
   b) What is partial purified extract? Explain different strategies for enzyme purification.  
      10

Q.3 Describe the role of enzymes in the following: 
   a) Detergents.  
   b) Pharmaceutical industry.  
   c) Food industry.  
   d) Leather and Wool industry.  
      5x4

Q.4 Define enzyme immobilization. Describe different physical and chemical techniques to immobilize an enzyme.  
      20

PART-B
Q.5  
   a) What is effect of solute partition on kinetics of immobilized enzyme?  
      10  
   b) Compare packed bed reactor and fluidized reactor giving their merits and  
       demerits.  
       10  

Q.6  
   a) Discuss about the Indian and International market of enzymes.  
      15  
   b) What are advantages of using enzymes over fermentation methods for  
       biotransformation?  
       5  

Q.7  
   a) What are novel enzymes? How they are designed and constructed?  
      10  
   b) Write the principle of glucose biosensor. Explain the types and applications of  
       biosensors with an example.  
       10
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
BIOINFORMATICS (BT-504)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Enumerate the applications of recombinant DNA.
   b) What do you mean by WAN?
   c) How primary database is different from secondary database?
   d) Enlist two software for homology studies.
   e) What do you mean by secondary structure of protein?
   f) What is the role of PDB?
   g) Expand the Fasta format
   h) What are advantages of bioinformatics?
   i) What is extranet?
   j) Expand the given terms: EMBL, NCBI

2x10

PART-A

Q.2 a) How internet, intranet and extranet are different from each other?

10

b) Discuss history of computer generation.

10

Q.3 a) What do you mean by recombinant DNA?

6

b) Discuss any DNA sequencing method.

14

Q.4 a) Briefly explain NBRF/PIR format and PDB format.

10

b) What do you mean by an ER diagram? Discuss different symbols used in an ER diagram.

10

PART-B
Q.5 Align the given sequence using Smith-Waterman algorithm for the given sequences ACCGTT and AGCGGT upto trace back using +2, -1 and 0 for match, mismatch and gap penalty, respectively.

Q.6 a) When a global MSA is performed, what are observations one can make from these sequences?

b) Discuss different methods used for multiple sequence alignment.

Q.7 Explain the following:

a) Protein structure prediction method.

b) Challenges faced in integration of biological data.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
DOWNSTREAM PROCESSING (BT-505)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  Write short notes on:
    a) Bioproducts
    b) Filtration
    c) Sedimentation
    d) Enrichment Techniques
    e) Distribution coefficient
    f) Dialysis
    g) Precipitation
    h) Selectivity factor in chromatography
    i) Product polishing/finishing
    j) Flocculation

    2x10

    PART-A

Q.2  a) Differentiate between upstream and downstream processes.
     10
     b) Discuss applications of downstream processing in bioprocesses.
     10

Q.3  a) What are different steps in the downstream processing of biochemical products?
     10
     b) Enlist some physic-chemical basis of bioseparation.
     10

Q.4  a) Discuss mechanical, chemical and enzymatic methods of cell disruption?
     10
     b) Give an account on the working of a continuous rotary filter.
     10

    PART-B
Q.5  a) What is biphasic extraction system? Explain recovery and purification of penicillin antibiotic.

10

b) What is membrane based separation? Differentiate between microfiltration, ultrafiltration and reverse osmosis.

10

Q.6  a) Enlist the variables that affect column efficiency.

10

b) Explain the component assembly and functioning of high performance liquid chromatography.

10

Q.7  a) What is drying? Give its principle and application in product finishing.

10

b) Discuss the theory of crystallization in product finishing.

10
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Fifth Semester
ANIMAL BIOTECHNOLOGY (BT-506)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you understand by natural and defined media?
b) What is the role of minerals in cell culture media?
c) What are suspension cultures?
d) What are the differences between the cells found in the body and cultured cells?
e) Differentiate between finite cell lines and continuous cell lines.
f) What is the importance of pH while culturing animal cells? How it is maintained?
g) What are the limitations of gene therapy?
h) What is molecular farming?
i) Are adult (tissue-specific) stem cells as good as embryonic stem cells in treating diseases?
j) What drives cancer cells to grow and divide uncontrollably and to escape cell death?

2x10

PART-A

Q.2
a) Briefly enumerate the requirements for animal cell and tissue culture.
    15
b) Explain the need of serum free media?
    5

Q.3
Define primary cultures and cell lines. Briefly describe the origin, characteristics and maintenance of continuous cell lines.

20

Q.4
a) Briefly describe the various transfection techniques for animal cells and ova, and discuss their advantages and limitations.
    14
b) How detection of transgene integration and function is done?
    6
**PART-B**

Q.5  
  a) Discuss the various promoters and reporter genes used for the expression of a mammalian gene in a eukaryotic host.  
  b) What are the disadvantages of using a prokaryotic host for the expression of a mammalian gene?  

  15

Q.6  
 Briefly explain the following:  
  a) Tumor antigens  
  b) Cancer associated genes and their significance  
  c) Cancer therapy  

  6

  7

Q.7  
  a) What are stem cells? List down the various sources of stem cells.  
  b) Discuss the trends and opportunities regarding Indian stem cell banking market.  

  10

  10
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
PLANT BIOTECHNOLOGY (BT-601)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) How is rooting during micro-propagation?  
b) Differentiate between an embryo and a shoot bud.  
c) How does colchicine induce polyploidy?  
d) What are cryogenic haploids?  
e) How are cybrids different from somatic hybrids?  
f) What is molecular tagging?  
g) How are retrotransposons produced?  
h) Mention therapeutic role of flavonoids.

Q.2  a) Describe the process of shoot tip culture. What are the factors affecting in-vitro regeneration of plants?  
b) What is the use of chromosome doubling?

Q.3  a) Describe various methods of protoplast fusion.

Q.4  a) Explain the process of symbiotic nitrogen fixation in plants.

Q.5  a) Explain the Pyrosequencing method of genome sequencing.
b) Describe the mechanism of post transcriptional modification of a protein in general.  

Q.6  
a) Describe vector less DNA transfer methods in plant cells.  

b) Give the structure of a Ti plasmid.  

Q.7  
a) State with examples, how does genetic engineering improve, how does genetic engineering improves nutritional quality of food crops?  

b) What is metabolic engineering? Discuss the pharmaceutical role of secondary metabolites.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
ENVIRONMENT BIOTECHNOLOGY (BT-602)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Enumerate the various pollutants present in air and their harmful effect.
b) Enlist the current strategies to reduce water pollution.
c) Which chemical is responsible for acid rain?
d) How do we use aquatic plants for waste water treatment?
e) Compare composting with landfill.
f) Distinguish between i) Bioplastics and ii) Biopolymers.
g) What do you mean by sustainable development?
h) Enumerate the disadvantages of ozone hole.
i) What do you mean by incineration?
j) Define eutrophication.

2x10

PART-A

Q.2 What are the environmental perturbations? Discuss its effects, measurement treatment, monitoring and control.

20

Q.3 What are the various types of reactors which are used for biogas production? Discuss them with sketches.

20

Q.4 Write short notes on:
a) Effect of petroleum exposure on marine organisms.
b) Sanitary landfill.

10x2

PART-B

Q.5 a) Describe the methodology of bioremediation with flow charts and suitable examples.

10
b) Discuss how microbial populations can be promoted to degrade xenobiotic compounds.

Q.6  a) Give an account of integrated waste management.  
     b) Explain biomass production with suitable examples.

Q.7  a) Explain the recycling of organic wastes through earthworm cultivation.  
     b) Write a note on water resource manement.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
HUMAN GENOMICS (BT-621B)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Aims and objectives of HGP. 4
   b) Differentiate between proto-oncogenes and onco genes. 2
   c) PCR /OLA procedure. 3
   d) Advantages of DNA /RNA probes. 3
   e) Down syndrome. 2
   f) Genetic counseling. 4
   g) Microsatellite and SNPs. 2

   PART-A

Q.2   a) Explain Mendel’s laws of genetics with suitable examples. 10
   b) What are sex-linked traits and explain how they inherit in human with suitable examples? 10

Q.3   Write short notes on:
   a) Specific susceptibility resistance. 10
   b) Maternal-fetal incompatibility. 10x2

Q.4   a) Describe the medical procedure used in prenatal diagnosis of chromosomal abnormalities and fetal infection with its risk and advantages. 12
b) Differentiate between karyotype and RFLP analysis.

8

PART-B

Q.5 a) How pedigree analysis is helpful to determine the probability of occurrence of any trait or genetic disease?

10

b) How will you identify a person suffering from sickle cell anemia diabetes and malaria?

10

Q.6 Describe technique of DNA finger printing with its applications.

20

Q.7 a) What is gene therapy?

8

b) Discuss gene based therapy for disorders of nervous system.

12
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
VIROLOGY (BT-622B)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) “Virus lie on the border line of living and non-living world”. Comment.
   b) Name two retrovirus.
   c) What are interferons?
   d) What do you know about COEL?
   e) Give the principle of flowcytometry technique.
   f) What do you mean by Immunomodulators?
   g) Define containment.
   h) What is capsid?
   i) Define plasmid incompatibility.
   j) Give some features of adenovirus.

   2x10

   PART-A

Q.2 Discuss in detail the morphology and biophysical properties of virus.

   20

Q.3 Discuss in detail the replication process of any two of the following virus:
   a) Negative strand RNA virus.
   b) Positive strand RNA virus.
   d) Large ds DNA virus.

   10x2

Q.4 a) Discuss in detail the designing and screening of interferons as antivirals.

   15
   b) Briefly discuss the application of ribozymes.

   5

   PART-B

Q.5 a) Give a detailed account of any one microscopic technique for viral detection and diagnosis.
b) What do you know about density gradient centrifugation technique?

Q.6 Write detailed notes on any two of the following vectors:
   a) Cosmid vectors.
   b) M-13 vectors.
   c) SCP plasmids of streptomycetes.

Q.7 Give a detailed account of principles of biosafety and containment pertaining to a virology laboratory.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
DIAGNOSTIC TECHNIQUES (BT-623B)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the use of gram staining in bacterial identification?
b) What is the requirement of precipitin formation in an antigen-antibody reaction?
c) How are cells sorted in ‘FACS’?
d) What is the role of ‘HAT’ medium in hybridoma selection?
e) Give an example of a biosensor based on detection of polypeptide hormone.
f) Mention the principle of PCR/OLA technique.
g) How can we identify carrier of hereditary disorder?
h) What are sub unit vaccines?

Q.2 Discuss the diagnostic characteristics of pathogenic bacteria on the basis of:
   a) Nutritional requirements. 10
   c) Susceptibility to antimicrobial agents. 10

Q.3 Write notes on:
   a) Antibody conjugation techniques. 10
   b) HLA typing in humans. 10

Q.4 a) Describe the key features of an immunoassay development. 10
   b) Explain various formats of ELISA. 10

Q.5 a) Elaborate the method of monoclonal antibody production. 10
b) How are monoclonal antibodies used in prevention of transplanted organ rejections? Give an example. 10

Q.6  
a) Describe the process of nucleic acid hybridization for detection of diseases. 8  
b) How is sickle cell anemia diagnosed by this method? 12

Q.7  
a) Mention the direct DNA sequencing method and an electrophoretic method of detection of mutations. 10  
b) Discuss recent advances in development of vaccines using recombinant DNA technology. 10
End Semester Examination, Dec. 2014  
B. Tech. (Biotechnology) – Seventh / Eighth Semester  
DNA MICRO-ARRAY (BT-801)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:
   a) What are the advantages of using oligonucleotide in microarray experiment?
   b) For what purpose independent verification is done?
   c) How function analysis is done?
   d) How one can determine where the primer is binding in genome?
   e) What do you mean by data filtering in a microarray experiment?
   f) Name two anchoring and tagging enzymes used in SAGE analysis.
   g) The following are two 20mer probes. Are they good probes?
      i) CCCCCCAAAATTTTTTTTTT
      ii) TATATATATATACAAATAT
   h) What resources could one use to design his own custom array?
   i) What are the factors that affect heteroduplex formation in the process of hybridization?
   j) What do you mean by dye bias in a microarray experiment?

   2x10

### PART-A

Q.2 Clustering is a method that is used in phylogenetic research and has adopted to DNA microarray analysis. Discuss the algorithms for clustering in:
   a) Hierarchical clustering  
      8
   b) K-mean clustering  
      8
   c) Self organizing map  
      4

Q.3 Biochips are fabricated by spotted arrays or link mask technology to be used for DNA microarray experiment. Explain these methods.  
20

Q.4 a) How reduction and visualization of large data matrices are done?  
10
b) What are the steps followed in SAGE analysis?

**PART-B**

Q.5  
a) In order to run a microarray experiment how hypothesis driven experiment helps researcher in designing an experiment.  

b) How do we evaluate performance of software used in diagnostics and drug discovery?

Q.6  
a) What do you mean by molecular classifier?  
b) Describe the need of feature selection, validation and performance evaluation.

Q.7  
a) In gene regulatory network, how time series data and steady state data help in reverse engineer the regulatory network.  
b) Discuss the limitations of network modeling.
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Seventh / Eighth Semester
BIOSAFETY AND IPR (BT-802)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the threats to biodiversity?
b) What are biological weapons?
c) How do benefits outweigh risks in biotechnology?
d) What are living modified organisms (LMOs)?
e) How can one classify biocontainment?
f) What is a patent search?
g) Name any two inventions that can not be patented.
h) What is collaborative research?
i) What are foreign patents?
j) Can a disclosed invention be patented? Support your answer.

2x10

PART-A

Q.2 a) What is the public liability towards sustainable use of biodiversity?

10

b) Give some measures for sustainable management of biodiversity.

10

Q.3 a) How does technology transfer help in globalization of biotechnology?

10

b) Comment on business ethic vs bioethics.

10

Q.4 a) How are drugs and vaccines assessed for their biosafety?

10

b) Describe the tier of biosafety levels giving their rationale.

10

PART-B

Q.5 a) Discuss the controversies associated with genetically modified organisms.

12
b) Enlist the biosafety measure adopted in a biotechnology laboratory.

Q.6 a) Describe the procedure of filing a patent.
   b) What are the conditions for patentability?

Q.7 Mention the recent developments in:
   a) Patentability of biotechnological inventions.
   b) Discuss the patenting issues of Haldi and Neem.
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Seventh / Eighth Semester
MEDICAL MICROBIOLOGY (BT-821B)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt **FIVE** questions in all; Q.1 is **compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1 Answer briefly:
   a) Differentiate between acute and chronic infection.
   b) Differentiate between enterotoxin and neurotoxin.
   c) Differentiate between interferons and base analogues.
   d) List two components of microorganisms that are responsible for adherence to host tissue.
   e) What are opportunistic pathogens?
   f) What are retroviruses?
   g) What are the causal organisms of syphilis and influenza disease?
   h) Give name of some vehicles or reservoirs of infection.
   i) What are recombinant proteins?
   j) What do you understand by drug resistance?

   2x10

   **PART-A**

Q.2 a) Discuss the some important events in the history of medical microbiology.
   8
   b) Give the classification of medically important microorganisms.
   7
   c) Enlist the name of some normal microflora of human body.
   5

Q.3 a) Define pathogenecity? List the various means by which pathogenic microorganisms can become distributed within the human body.
   10
   b) Explain mechanism of drug resistance in microbes.
   10

Q.4 a) Give a detailed account on immunological methods and molecular methods for identification of infectious disease.
   10
Q.5 a) Explain the DNA replication in bacteria and virus.  
10

b) Write notes on:
   i) Retroviruses
   ii) Gene therapy
   5x2

PART-B

Q.6 What is the causal organism of tuberculosis? Explain epidemiology, pathogenecity, diagnosis, prevention and its control.  
20

Q.7 a) What are vaccines? Explain killed, live attenuated and recombinant vaccines.  
10

b) Write notes on prevention and control of microbial diseases.  
10
End Semester Examination, Dec. 2014
B. Tech. (Biotechnology) – Eighth Semester
BIOENERGY (BT-821C)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain / Answer briefly:
   a) Define bioenergy. 2
   b) Why do wind turbines need to be high in the sky? 2
   c) Advantages and disadvantages of biomass energy. 4
   d) Flash steam power plant. 4
   e) Fuels for motor vehicles in india. 4
   f) Thermal gasification. 2
   g) Biodiesel 2

   PART-A

Q.2 Discuss global issues and environmental impact of energy production and its use. 20

Q.3 Write short notes on:
   a) Wind energy
   b) Geothermal energy

   10x2

Q.4 “Hydrogen energy is the future of world”. Justify the statement. 20

   PART-B

Q.5 “Biogas can provide a clean, easily controlled source of renewable energy from organic waste materials for a small labour input, replacing firewood or fossil
fuels”. Justify the statement.

Q.6 Describe economic concept of energy. Explain principle and technologies for energy conservation and management.

Q.7 Discuss cellulose ethanol production from various feed stocks.
End Semester Examination, Dec. 2014
M. Tech. (Biotechnology) - First Semester
GENETIC ENGINEERING (BT-M-101 / BT-M-101A)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1 Briefly explain the following:
   a) How the activities of the three types of RNA polymerases can be distinguished?
   b) How RNA polymerase holoenzyme differs from core enzyme?
   c) Which enzyme is mainly responsible for DNA polymerization? What other activities does it possess?
   d) What is attenuation?
   e) What is the significance of protruding ends in a cloning experiment?
   f) How a blunt ended DNA molecule can be converted into sticky ended molecule?
   g) What is the role of CAMP in the regulation of lac operon?
   h) Give a basic architecture of an expression vector.
   i) How purity of DNA is estimated?
   j) What are probes? What probe is used in Western blotting experiment?

1½x10

PART-I

Q.2 a) Discuss the role of sigma factors in the regulation of heat shock response.

7

b) Discuss the promoters and transcription factors recognized by RNA polymerase involved in the transcription of protein coding genes.

8

Q.3 Write notes on:
   a) Polyadenylation of mRNA.
   b) Rho dependent termination.
   c) Organization of eukaryotic genome.

5x3

PART-II
Q.4  a) Discuss the molecular events that lead to lytic and lysogenic life cycle in lambda phage.  12
    b) What do you mean by biological containment? How it is ensured while working with recombinant phage vectors?  3

Q.5  a) How changes in chromatin structure affect gene expression in eukaryotes?  8
    b) Discuss the physical and chemical methods used to transfer the gene of interest in a particular host.  7

**PART-III**

Q.6  a) What are molecular markers? Discuss PCR based molecular markers in detail.  8
    b) Differentiate between cDNA library and genomic library.  7

Q.7  a) Discuss Sangers dideoxynucleotide chain termination method for DNA sequencing. How this can be automated?  8
    b) List down different steps used for the production of insulin in E.coli. Also discuss the drawbacks of using a prokaryotic host for the expression of a eukaryotic gene.  7

End Semester Examination, Dec. 2014
M. Tech. (Biotechnology) – First Semester
APPLIED BIOINFORMATICS (BT-M-102A)

Time: 3 hrs  Max Marks: 75

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.
d) Gene annotations.
e) Secondary structure of protein.

**PART-I**

Q.2  

a) Discuss the information retrieval from a databank.  
   **10**

b) How blast is different from Fasta?  
   **5**

Q.3  

a) Explain the biological databanks with the help of an example.  
   **9**

b) What are the applications of computers in the field of biotechnology?  
   **6**

**PART-II**

Q.4  

Align the given sequence using Smith-Waterman algorithm for the given sequences ACCGTT and AGCGAT upto trace back using +2, -1 and 0 for match, mismatch and gap penalty, respectively.  
   **15**

Q.5  

a) How hidden Markov model is associated with multiple sequence alignment?  
   Diagrammatically represent the model with the help of an example.  
   **9**

b) How multiple sequence alignment is related with phylogenetic prediction?  
   Explain with a suitable example.  
   **6**

**PART-III**

Q.6  

a) Discuss steps involved in genome prediction.  
   **8**

b) What are micro RNA identification strategies?  
   **7**

Q.7  

a) Briefly describe the steps followed in Cho-Fasman protein secondary structure predictions.  
   **8**

b) How homology modeling is different from ab initio structure predictions?  
   **7**
End Semester Examination, Dec. 2014  
M. Tech. (Biotechnology) - First Semester  
NANOBIOTECHNOLOGY (BT-M-103A)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1  
(a) State and explain briefly Schrödinger’s equation.  
(b) What is a quantum dot?  
(c) What are microbial nanoparticles?  
(d) Spell out SEM, STM, AFM, SPM, and FTIR.  
(e) State the uncertainty principle.

**PART-A**

Q.2 What are various analytical techniques for material characterization? Explain one of them.

15

Q.3 Discuss particle in a box problem and state the conclusions graphically.

15

Q.4 Write detailed notes on:  
(a) Raman spectroscopy  
(b) NEMS and MEMS

7½x2

**PART-B**

Q.5 Discuss various methods adopted for synthesis of nanomaterials.

15

Q.6 Explain in details biomimetic ferritins for high density data storage.

15
Q.7 Write detailed notes on:
   a) Nanodevices
   b) CNTs and their applications

7½x2
End Semester Examination, Dec. 2014
M. Tech. (Biotechnology) - First Semester
BIOSENSORS AND BIOCHIPS (BT-M-104A)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1 Briefly answer:
   a) What is exatech biosensor? For what purpose is it used?
   b) Differentiate between selectivity and sensitivity.
   c) ”Receptors can be used as molecular recognition agents“. Comment.
   d) What are implantable biosensors? Give examples.
   e) What do you mean by hysteresis? How it can be reduced?

3x5

PART-I

Q.2 Describe the principle, mode of operation, applications and limitations of potentiometric based transducers.

15

Q.3 a) Describe an overview of performance and applications of an ion-selective fields effect transistor.

8

b) Draw a MOSFET structure and explain its operations.

7

PART-II

Q.4 Write in detail about the immobilization of biocatalyst explaining its definition, objectives, techniques and advantages.

15

Q.5 a) Explain some biosensors based on plant and animal tissues. Write the sensing element also.

8

b) Describe the construction of Longmire Blodgett bilayers.

7

PART-III

147/4
Q.6  a) Explain the two types of photoresists. How do they work?  
      7 
   b) What is the role of PDMS in biosensors?  
      8 

Q.7  a) How biosensors can be used in drug discovery and detection?  
      8 
   b) Illustrate the method of estimating urea from blood sample by bioaffinity sensor.  
      7
End Semester Examination, Dec 2014
M. Tech. (Biotechnology) - First Semester
BIOSEPARATION TECHNOLOGY (BT-M-105A)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1
a) How does reverse osmosis differ from normal osmosis?
b) What is the utility of gradient centrifugation technique?
c) Differentiate between adsorption and absorption processes.
d) What is selectivity factor in column chromatography?
e) Enlist the physico-chemical basis of bioseparation.

3x5

PART-I

Q.2
a) Give a details account of forces acting on a sedimenting particle and deduce the ‘relative centrifugal force’ during centrifugation.
7
b) Explain various designs of industrial centrifuges.
8

Q.3
a) Describe any two mechanical methods of cellular disruption.
8
b) Explain the working of a continuous rotary filter.
7

PART-II

Q.4
a) Describe the functional aspects of high performance liquid chromatography.
10
b) Mention the factors to improve resolution in HPLC.
5

Q.5
Discuss in detail the principle, working and applications of gas chromatography.
15

PART-III

Q.6
Write short notes on:
a) Leaching
b) Lyophilization
c) Bioconversion of steroids.  

Q.7  

a) Discuss the steps of down-stream processing of an antibiotic.  

b) Give an account of identification and isolation of genetically modified organisms.
End Semester Examination, Dec. 2014
M. Tech. (Biotechnology) - Third Semester
ADVANCED ENVIRONMENTAL BIOTECHNOLOGY (BT-M-301)

Time: 3 hrs
Max Marks: 75

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1 a) Briefly explain the role of genetic engineering in improving bioremediation.
b) Give an account of classes and characteristics of waste water.
c) Explain the concept of bio-available fraction of heavy metals in soil with the help of an example.
d) What are GMOS? Discuss the risks associated with them.
e) What do you know about environmental site assessment?

3x5

PART-I

Q.2 a) What do you mean by biological treatment of waste water? Give a classification of bioreactors used for the same.

b) Discuss in detail the process of activated sludge treatment. Also mention its limitations and modifications.

PART-II


b) Discuss in detail the significance of phytoextraction and phytostabilization.

Q.5 a) Give a detailed account of mechanisms of metal resistance in microorganisms.
b) Discuss the adverse effects of microbial metal transformation.

5

PART-III

Q.6  a) Discuss in detail the concept of bioprospecting and biopiracy.

8

b) Enlist various problems arising from overexploitation of natural resources.

7

Q.7  a) Define biodiversity and explain its various levels.

7

b) “Convention of biodiversity promotes nature’s well-being”. Justify the statement. 8
End Semester Examination, Dec. 2014
M. Tech. (Biotechnology) - Third Semester
FOOD PACKAGING TECHNOLOGY (BT-M-322A)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1 Briefly answer:
   a) What do you understand by Packaging Science and Packaging Technology?
   b) What are the general requirements of packaging and labeling?
   c) Write significance of hot tack testing method of packaging materials.
   d) Define sustainable packaging and discuss its advantages.
   e) What do you mean by multi-piece package?

   3x5

   PART-I

Q.2 Why is food packaging crucial for safety and quality control? Explain briefly by highlighting the functions and types of packaging you will use to ensure food safety.

   15

Q.3 a) Describe primary and secondary level of food packaging.

   8
   b) Discuss the principle of protective packaging.

   7

   PART-II

Q.4 What considerations must be taken into account while choosing food packaging material?

   15

Q.5 a) What are different methods to determine shelf life of a packaged food?

   8
   b) What is retort packaging? Name two materials used for retort pouch and state two properties of each material.

   7

   PART-III
Q.6  
a) Describe different sealing equipments used in food packaging.  

b) Describe the aseptic packaging for perishable liquid foods. What are its merits and limitations?

Q.7  
Give a detailed account of disposal and recycling of packaging materials.
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – First Semester
CELL AND MOLECULAR BIOLOGY (BT-S-101A)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1 Briefly answer:
   a) What do you understand by fluidity of lipid bilayer?
   b) How do proteins enter endoplasmic reticulum?
   c) How is passive transport of nutrients driven across the plasma membrane?
   d) How does nitric oxide communicate information to the interior of the cell?
   e) What do you mean by attenuation?
   f) What are gratuitous inducers?

   2x6

UNIT-I

Q.2 a) What are the key features of plasma membrane? How lipid bilayer contributes towards the selectivity of the plasma membrane?
   b) “Animal cells use energy of ATP hydrolysis to pump out sodium ions”. Discuss.

   6

Q.3 a) What are G proteins? How do they bring about cell communication?

   12

UNIT- II

Q.4 a) Why is semiconservative mode of DNA replication best accepted model?
   b) Discuss the mechanism of DNA replication in prokaryotes stating the role of each protein player.

   4

Q.5 a) How do RNA polymerase finds its promoter on DNA?
   b) Discuss the key features of the promoters recognized by RNA polymerase I and II in eukaryotes.

   6
UNIT-III

Q.6 How initiation of translation unique in prokaryotes and different in eukaryotes?

12

Q.7 Discuss the salient features of operon system operative in the utilization of lactose.

12
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – First Semester
MICROBIAL PHYSIOLOGY AND GENETICS (BT-S-102A)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1 Briefly answer:
   a) State Koch’s postulates.
   b) How an algae is different from fungus?
   c) How do microorganisms in a chemostat differ from microorganisms in batch culture?
   d) What is a lysogen?
   e) How competent cells differ from non-competent cells?
   f) What is meant by broad spectrum antibiotic?

   2x6

   UNIT-I

Q.2 State the theory of spontaneous generation. Discuss how this theory was disproved by its opponents?

   12

Q.3 a) Describe the following kinds of media and their uses. Give an example of each:
   i) Complex media.
   ii) Enriched media.
   iii) Selective media.
   iv) Differential media.

   2x4

   b) How are spread plates, pour plates and streak plates prepared?

   4

   UNIT-II

Q.4 Compare and contrast the cell walls of gram positive and gram negative bacteria. What happens when bacterial cells are treated with penicillin and lysozyme?

   12

Q.5 Explain any three:
   a) General characteristics of Archaeabacteria.
   b) Economic importance of fungi.
   c) Differences between endospores and vegetative cells.
d) Mathematical expression of growth.

**UNIT-III**

Q.6 What are beta-lactam antibiotics? Discuss the structure and function of any one of them.

12

Q.7 a) How bacterial genome can be mapped through transduction?

8

b) How does a F plasmid differ from a regular F plasmid?

4
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – First Semester
BIOMOLECULES (BT-S-103A)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1
a) Why do we call ATP as energy currency of the cell?
b) What are flavanoids?
c) How are nucleosides different from nucleotides?
d) What do you know about alkalosis?
e) What are the symptoms and causes of hyper-uricemia gout?
f) What are coenzymes? Give examples.

2x6

UNIT-I

Q.2
a) Give an account of the ionic product of water and the concept of pH.
4
b) What do you know about the secondary structure of proteins?
4
c) Briefly discuss the application of thermodynamic principles to biomolecules.
4

Q.3 Give a detailed account of classification and properties of lipids.
12

UNIT-II

Q.4
a) Explain the concept of Ramachandran’s plot and also discuss its applications.
6
b) What do you mean by salting-out technique? Discuss its applications in protein purification.
6

Q.5
a) What do you know about Beer-Lambert’s law?
4
b) Give a detailed account of affinity chromatography for purification of biomolecules.
8
UNIT-III

Q.6 a) How is an isoenzyme different from a coenzyme?  
   b) What is the role of pepsin and rennin in protein metabolism?  
   c) Discuss in detail the process of deamination and transamination.  

Q.7 a) What do you know about urea cycle disorder?  
   b) Give a detailed account electron transport chain and its role in ATP generation.
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – First Semester
BIOANALYTICAL TECHNIQUES (BT-S-104A)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1 Briefly answer:
   a) How is contrast of a specimen enhanced in light microscopy?
   b) What is the relation of density of a particle to its sedimentation rate?
   c) What is the significance of theoretical plates in column chromatography?
   d) How do infrared radiations interact with matter?
   e) Why is agarose gel used in immune-electrophoresis?
   f) What is electron capture? Give an example.

   2x6

UNIT-I

Q.2 a) Explain the functioning of a compound microscope giving its ray diagram.

   6

   b) How do electrons interact with specimen to produce image in electron microscopy?

   6

Q.3 Describe the technique of differential centrifugation. How is the purity of sub-cellular fraction determined?

   12

UNIT-II

Q.4 a) Give a detailed description of the chromatographic techniques based on:
   i) Adsorption
   ii) Ion Exchange

   6x2

Q.5 Describe briefly the principle and process of:
   a) Isoelectric focusing of proteins
   b) Agarose gel electrophoresis of nucleic acids

   6x2

UNIT-III
Q.6  
   a) Explain the functioning of a UV-visible spectrophotometer. 6
   b) Give uses of UV-visible spectrophotometer in qualitative and quantitative analysis of compounds. 6

Q.7  
   a) Mention the properties of $\alpha$, $\beta$ and $\gamma$ rays and their interactions with matter. 6
   b) How do proportional counters help in measurement of radioactivity? 6

End Semester Examination, Dec. 2014  
M.Sc. (Biotechnology) – First Semester  
BIOSTATISTICS (BT-S-105A)  

Time: 3 hrs  
Max Marks: 60  

No. of pages: 1  

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1  
   a) Write two advantages and two disadvantages of nonparametric methods.  
   b) Define linear regression and write Karl Pearson’s coefficient of correlation. 4x3  
   c) Write a short note on kurtosis.

UNIT-I  

Q.2  
   a) The mean of 200 items was 50. Later on it was discovered that two items were misread as 92 and 8 instead of 192 and 88. Find out the correct mean. 8  
   b) Draw a pie chart to the following data:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of employee</td>
<td>64</td>
<td>10</td>
<td>150</td>
<td>18</td>
</tr>
</tbody>
</table>
Q.3  
(a) Calculate the quartile deviation of the marks of 39 students in Mathematics given below:

<table>
<thead>
<tr>
<th>Marks</th>
<th>0-5</th>
<th>5-10</th>
<th>10-15</th>
<th>15-20</th>
<th>20-25</th>
<th>25-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of students</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>

(b) Define mutually exclusive events with an example.

Q.4  
(a) Define following with an example of each:
   i) Sampling
   ii) Level of significance
   iii) Confidence limits
   iv) Standard error
   v) Critical region

(b) What are Type-I and Type-II errors in sampling? Explain briefly.

Q.5  
The life time of electric bulbs for a random sample of 10 from a large consignment gave the following data:

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life in hrs</td>
<td>4.2</td>
<td>4.6</td>
<td>3.9</td>
<td>4.1</td>
<td>5.2</td>
<td>3.8</td>
<td>3.9</td>
<td>4.3</td>
<td>4.4</td>
<td>5.6</td>
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Can we accept the hypothesis that the average life time of bulb is 4000 hrs? Given: \( t_{0.05} = 2.26 \) for 9 degree of freedom.

Q.6  
Find the coefficient of correlation for the following data:

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<th>( x )</th>
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<tbody>
<tr>
<td>( y )</td>
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<td>12</td>
<td>24</td>
<td>6</td>
<td>30</td>
<td>36</td>
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Q.7  
The marks secured by recruits in the selection test \((X)\) and in the proficiency test \((Y)\) are given below:

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163/4
Calculate the rank correlation coefficient.

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<th>12</th>
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<td>46</td>
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End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – Second Semester
GENETIC ENGINEERING AND APPLICATIONS (BT-S-201)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks

Q.1 Briefly answer:
   a) Why it is best to use a restriction enzyme that cuts the plasmid vector only once?
   b) Why disarming of pTi is done?
   c) What is Tac promoter and how is it regulated?
   d) What are the key requirements of an effective primer?
   e) Which technique is employed to determine the 5’ end of a transcript?
   f) What is the disadvantage of gene augmentation therapy?

   2x6

UNIT-I

Q.2 Elucidate the methods for creating recombinant DNA molecules. What are the various biological tools required for it?

   12

Q.3 What are the key steps of PCR technique? Give the various variants of this technique and mention their applications in genetic engineering.

   12

UNIT-II

Q.4 a) How phage replacement vectors differ from phage insertion vectors? How screening of recombinant phage vector is done?

   7

   b) How will you clone an eukaryotic gene into a prokaryotic host?

   5

Q.5 a) What is the significance of yeast two hybrid and yeast three hybrid systems?

   8

   b) State any two practical applications of protein engineering.

   4

UNIT-III

165/4
Q.6  
a) What are the various approaches to carry out gene expression in yeast?

b) What disadvantages does Ecoli offer for expression of a heterologous gene?

Q.7  
a) How the numbers of introns present in a gene can be determined? Which techniques will you use for estimating the size and abundance of particular transcript?

b) What do you understand by the term: gene therapy? List down the limitation of this therapy.
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – Second Semester
BIOPROCESS TECHNOLOGY (BT-S-202)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks

Q.1 a) Describe the interdisciplinary organization of field of bioprocess technology. Give any two examples of industrial products that can be obtained by chemical as well as biochemical process.

b) Define:
   i) Dilution rate.
   ii) Steady state.

c) What is the function of mechanical seal in a bioreactor?

d) Enlist any four sources of carbon in microbial media.

e) How is air sterilization carried out?

f) State Fick’s law of diffusion.

2x6

UNIT-I

Q.2 a) Describe the cell growth in batch culture.

b) Define:
   i) Specific growth rate.
   ii) Downtime.
   iii) Saturation constant.

2x3

Q.3 a) What are the similarities and differences between chemical engineering and biochemical engineering?

b) Discuss the feeding strategies in a fed batch culture.

6

UNIT-II

Q.4 a) Describe a typical stirred tank bioreactor. Draw a well-labeled diagram.

b) Discuss the common causes of non-idealities in bioreactors.

6
Q.5  
a) Compare fluidized bed and packed bed bioreactors.  

b) Prove that the steady state in a continuous bioreactor can be achieved when dilution rate equals specific growth rate.  

Q.6  
a) Describe the formulation of a typical microbial medium.  

b) Write a note on chemical sterilization.  

Q.7  
a) Give a detailed account of gas liquid mass transfer. 

b) Discuss the factors affecting cellular oxygen demand.
End Semester Examination, Dec. 2014
M.Sc. (Biotechnology) – Third Semester
ANIMAL BIOTECHNOLOGY (BT-S-301)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1 Briefly answer:
   a) What is the role of non-essential amino acids and vitamins in cell culture media?
   b) What is immobilized cell culture?
   c) Differentiate between finite cell lines and continuous cell lines.
   d) Enlist the features that are specific to animal cells and absent in plant cells.
   e) Name two important products obtained from animal cell culture technology. What are their functions?
   f) How do you evaluate the embryo quality and sex?

2x6

UNIT-I

Q.2 a) What are lysosomes and how they are synthesized? Discuss their relation with endocytosis process in a cell?
   b) What are some of the characteristics features of a animal cell culture? Differentiate between primary and secondary cell cultures.

6x2

Q.3 a) What are the advantages and disadvantages of adding serum in the animal culture medium?
   b) What is the difference between cold trypsinization and warm trypsinization?
   c) What is the importance of pH while culturing animal cells? How is the pH maintained in the culture media?

4x3

UNIT-II

Q.4 a) Discuss in detail different methods of disaggregation of an animal tissue.

5

b) Describe the different methods of gene delivery along with their advantages and disadvantages.

7
Q.5 a) Differentiate between roller bottles and spinner bottles.  
    b) What do you mean by synchronized cell culture? How synchronization can be achieved?

UNIT-III

Q.6 a) What are the public concerns regarding the use of genetically engineered products?  
    b) How embryonic stem cells differ from adult stem cells? Mention the significance of stem cells.

6x2

Q.7 Briefly explain the following:  
    a) Tissue engineering of liver.  
    b) Rationale for the use of spheroid monocultures in anti-tumor therapy testing.  

6x2
End Semester Examination, Dec. 2014  
M.Sc. (Biotechnology) – Third Semester  
PLANT BIOTECHNOLOGY (BT-S-302)

Time: 3 hrs  
Max Marks: 60

No. of pages: 1

Note: Attempt any FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1  Briefly answer:
   a) What do you mean by surface sterilization of explants?
   b) Differentiate between batch and continuous cell suspension cultures.
   c) What do you understand by molecular framing?
   d) What is the difference between somatic hybrids and cybrids?
   e) Describe the concept of coat-protein-mediated cross protection for generating virus resistant transgenic plants.
   f) What are the applications of AFLP markers?

   2x6

UNIT-I

Q.2  a) What is micro propagation? What are the different pathways of morphogenesis in vitro?

   6

   b) What are somaclonal variations? Discuss their applications with suitable examples.

   6

Q.3  a) What is haploid culture? Why do we use it in plant breeding? Describe with illustrations, anther and microspore culture.

   7

   b) Discuss the process of cryopreservation in detail and write about its implications in the germplasm conservation on plants.

   5

UNIT-II

Q.4  a) “The marker genes are used for monitoring and detection in plant transformation systems”. Illustrate with examples.

   8

   b) Write a short note on chloroplast transformation.

   4
Q.5  Describe the vectorless or direct DNA transfer technique in plant transformation.  

UNIT-III

Q.6  a) Give an account of applications of transgenics for improving the production and quality.  

   b) Describe how herbicide resistant transgenic plants can be developed using different mechanisms?  

Q.7  a) “Molecular marker assisted selection has become a potent approach for integrating biotechnology with conventional breeding”. Justify the statement.  

   b) What do you mean by SSR’s and microsatellite-primed PCR (MP-PCR)?
End Semester Examination, Dec. 2014  
M. Sc. (Biotechnology) - Third Semester  
ENVIRONMENT BIOTECHNOLOGY (BT-S-303)

Time: 3 hrs  
Max Marks: 60

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) Define phytostabilization.
   b) How is mycoremediation different from phytoremediation?
   c) What do you mean by bioprospecting and biopiracy?
   d) Name the two biodiversity hotspots in India.
   e) Give the significance of aeration and sedimentation in waste water treatment.
   f) Enumerate the advantages of anaerobic digestion of wastes over aerobic digestion.

2x6

UNIT-I

Q.2 a) Discuss the types and collection of waste water.

b) What is the purpose of tertiary waste water treatment?

Q.3 a) Differentiate between trickling filter and activated sludge treatment of waste water.

b) Draw a well labeled diagram of rotating biological contractor. Enlist its performance parameters.

UNIT-II

Q.4 a) Differentiate between in site and ex site technologies of bioremediation.

b) Why bioremediation is preferred over physical and chemical methods of environmental clean up?
Q.5  a) Explain the possible mechanism of metal resistance in microorganisms.  
    6  
  b) Discuss the adverse effects of metal microbe transformations.  
    6  

UNIT-III

Q.6  a) Discuss the problems arising from exploitation of natural resources.  
    8  
  b) Differentiate between green development and sustainable development.  
    4  

Q.7  a) Write an account on the role of biotechnology in the conservation of biodiversity.  
    6  
  b) What are the laws and policy options to conserve the biodiversity in India?  
    6  

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End Semester Examination, Dec. 2014  
M. Tech. (Biotechnology) - Third Semester  
ENVIRONMENTAL BIOTECHNOLOGY (BT-S-303)

Time: 3 hrs  
Max Marks: 60  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt FOUR more questions out of six, taking at least ONE question from each part. Each question carries equal marks.

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   2x6

PART-I

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   7
   b) What is the purpose of tertiary waste water treatment?

   5

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   7
   b) Draw a well labeled diagram of rotating biological contractor. Enlist its performance parameters.

   5

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   4
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     6  
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        6  

**PART-III**

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     6  
     b) What are the laws and policy options to conserve the biodiversity in India?  
        6
End Semester Examination, Dec. 2014
M. Sc. (Biotechnology) - Third Semester
FOOD AND ENZYME BIOTECHNOLOGY (BT-S-304)

Time: 3 hrs
Max Marks: 60

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1 Write notes on the following:
   a) Differentiate between exotoxin and endotoxin
   b) Mushrooms
   c) Feedback inhibition
   d) Inter-esterification of lipids

   3x4

UNIT-I

Q.2 a) How different types of bacteria play role in spoilage of food?
   b) Define food additives. Explain some methods of food preservation.

   6x2

Q.3 Discuss methods of production and significance of following foods:
   a) Bread
   b) SCP
   c) Flavanoids

   4x3

UNIT-II

Q.4 a) Define sonification. Discuss different strategies of enzyme purification.
   b) Give Michaelis-Menten equation to explain enzyme kinetics.

   6x2

Q.5 Explain the following:
   a) Reactions and stabilization of enzymes in biphasic aqueous-organic system.
   b) Enzymes and bioinformatics.

   6x2

UNIT-III

Q.6 Discuss the role of enzyme in following industry:
   a) Baking
   b) Brewing

   6x2
Q. 7   a) How glucose and maltose syrup are produced?
       b) How food waste can be utilized for production of valuable products.

       6x2
End Semester Examination, Dec. 2014  
M. Sc. (Biotechnology) - Third Semester  
STEM CELLS AND REGENERATIVE MEDICINE (BT-S-305B)

Time: 3 hrs  
Max Marks: 60  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Taking at least ONE question from each Unit. All questions carry equal marks.

Q.1  
a) What are the prime functions associated with fibroblast cells?  
b) How does progenitor cell differ from stem cell?  
c) What are the two lineages of Hematopoietic stem cells?  
d) What is Parkinson’s disease?  
e) Differentiate between embryonic and adult stem cells.  
f) All cells contain the same genetic information. Why cannot cells other than stem cells differentiate into various tissues?  

2x6  

UNIT-I  
Q.2  
a) Define stem cell niche. Explain the molecular mechanism of germ line stem cell (GSC) niche in drosophila ovary.  
b) Write a note on fate mapping of stem cells.  

6  

6  

Q.3  
a) On the basis of origin explain different types of pluripotent stem cells.  
b) Explain which molecular mechanism governs the pluripotency of embryonic stem cells.  

6  

6  

UNIT-II  
Q.4  
a) Define hemangioblast cells.  
b) Differentiate between hematopoiesis and lymphopoiesis.  
c) Explain molecular diversification of hematopoietic stem cells.  

3  

3  

6  

Q.5  
a) Enlist various sources of hematopoietic stem cells.  

6
b) Discuss the repopulating pattern of primitive hematopoietic stem cells.

UNIT-III

Q.6  a) What are the obstacles that must be overcome before the potential user of stem cell in cell therapy?

b) Give the cause, types and symptoms of diabetes disease. Explain how diabetes can be cured by stem cells?

Q.7  What do you understand by the concept of regenerative medicines? Give an example of curing any neurological disorder by stem cells.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
STRUCTURAL ANALYSIS-I (C-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt all parts.
   a) What is a sign conventions of shear force and bending moment?
   b) What is the relationship between shear force, bending moment and deflection?
   c) What is the rise at quarter points of a parabolic arch?
   d) What are the uses of arches?
   e) What is meant by perfect frame?
   f) Write the assumptions used in the analysis of a truss.
   g) Give the expression for ranking formula.
   h) Explain failure of column in short columns.
   i) What is the relationship between real beam and conjugate beam?
   j) What is lateral strain?

   2x10

PART-A

Q.2 a) Define:
    i) Poisson’s ratio
    ii) Factor of safety
    iii) Working stress
    iv) Principal stress

   10

   b) An element in plane stress is subject to stresses \( p_1 = 100 \, N/mm^2 \) and \( q = -45 \, N/mm^2 \). Determine the (i) principal stress (ii) maximum shear stress.

   10

Q.3 a) Calculate support reaction for the given in the figure:

   10

   b) Draw BMD and SFD for the given in the figure:
Q.4  A three hinged parabolic arch of span $40 \, m$ having supports at different levels carries udl of intensity $30 \, kN/m$ over the portion left of the crown. The supports A and B are below the crown hinge C by $5 \, m$ and $3 \, m$ respectively. Determine:
  
  a) The horizontal thrust developed.
  
  b) Bending moment at $15 \, m$ from the left support.
  
  c) Normal thrust at $15 \, m$ from left support.
  
  d) Radial shear at $15 \, m$ from left support.

**PART-B**

Q.5  A roof truss shown in the figure is loaded $60 \, kN$ at F, G and H joints. Calculate the forces in the members BC, BG and HG of the truss.

Q.6  A vertical column $6 \, m$ long hollow circular in section with external diameter $100 \, mm$ and internal diameter of $60 \, mm$ has pinned ends. It deflects by $50 \, mm$ when a central point load of $30 \, kN$ is applied on it in horizontal direction. Determine the crippling load on the column.

Q.7  Find out the deflection at the mid span of simple supported beam of length $5 \, m$ with $UDL = 20 \, kN/m$ on entire length using conjugate beam method.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fifth Semester
STRUCTURAL ANALYSIS-I (C-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define principle of transmissibility?
b) What do you understand by a determinate structure?
c) What is shear force?
d) Define slenderness ratio.
e) Distinguish between two hinged and three hinged arches.
f) Write equation of a three hinged parabolic arch.
g) What is a truss? Classify them.
h) Define effective length.
i) Explain mode of failure in long columns.
j) What are different methods for calculating deflection in beams?
2x10

PART-A

Q.2
a) Calculate support reaction for the given figure:

10

b) Draw BMD and SFD for the given figure:

10
Q.3  a) Draw stress – strain curve for mild steel and briefly explain its parts.  

Q.3  b) Define:  
      i) Poisson’s ratio.  
      ii) Factor of safety.  
      iii) Principle of superposition.  
      iv) Flexure formula.  

Q.4  An udl of 4 kN/m covers left half of the span of a three hinged arch, span 36 m and central rise of 9 m. Find:  

Q.4  a) Horizontal thrust.  

Q.4  b) Maximum bending moment in the arch.  

PART-B  

Q.5  Determine the nature and magnitude of forces in the truss members shown in the figure:  

Q.6  a) A vertical column of uniform section, 40 mm in diameter and 3 m long, has pinned ends. Take E=215 kN/mm². Calculate the crippling load by Euler’s formula.  

Q.6  b) Derive crippling load for columns fixed at both ends.  

Q.7  Find out the deflection at the free end of cantilever beam of span 5 m with 25 kN point load using double integration method.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
STRUCTURAL ANALYSIS-I (C-301A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is a dead load? Which IS code defines calculation of a dead load?  
b) Define principle of transmissibility?  
c) What are the different types of beams?  
d) How is bending moment, shear force and loading related?  
e) Draw any four types of trusses.  
f) What is the rise at Quarter Points of a Parabolic Arch?  
g) What are the various end conditions and equivalent length corresponding to different end conditions?  
h) Define column and classify columns on basis of slenderness ratio.  
i) What is a conjugate beam?  
j) What are the Mohr’s first and second theorem?  

2x10

PART-A

Q.2  
a) Two forces are acting at a point as shown in the figure. Determine the magnitude and direction of the resultant.  

8

b) A square block of wood of mass M is hinged at A and rest on a roller at B. It is pulled by means of a string attached at D and inclined at an angle of 30° with the horizontal. Determine the force P which should be applied to the string to just lift the block off the roller.  

12

Q.3  
Draw BMD and SFD for the given in the figure.
Q.4 A three hinged circular arch hinged at the crown and springing points has a span of 40 m and a central rise of 8 m. It carries a udl of 20 kN/m over the left half of the span together with a concentrated load of 100 kN at the right quarter span point.

a) Find the vertical reactions and horizontal thrust at the supports.

b) Find the normal thrust at a section 10 m from left support.

c) Find radial shear at a section 10 m from left support.

PART-B

Q.5 A roof truss shown in the figure is loaded 60 kN at F, G and H joints. Calculate the forces in the members BC, BG and HG of the truss using any method.

Q.6 a) Derive crippling load for column fixed at both ends.

b) A rectangular column size b x d is hinged at both the ends. Determine the limiting length of the column so that the critical stress is 5 N/mm². Use \( E = 2 \times 10^5 \text{ N/mm}^2 \).
Q.7  a) Find out the slope and deflection at the free end of cantilever beam with point load at free end using double integration method.  

b) Find out the deflection at the mid span of simply supported beam with UDL on entire length using moment area method.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
BUILDING CONSTRUCTION AND MATERIALS (C-302 / C-302A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between elasticity and plasticity.
     b) Define the terms:
        i) Perpends
        ii) Jambs
     c) Define partition walls.
     d) What is the minimum width of cavity walls?
     e) Which type of foundation is preferred for marine construction?
     f) Mention the chemical constituents of cement.
     g) Give four uses of lime.
     h) State two principles of damp proofing.
     i) Give basic difference between king–post truss and queen-post truss.
     j) What are the properties of good bricks?

2x10

PART-A

Q.2  a) Explain how the following test of stones are carried out?
     i) Attrition test
     ii) Water absorption test

10

b) Elaborate how stone masonry is classified.

5

c) Write a note on glass block masonry.

5

Q.3  a) Explain, with the help of sketches, the details of cavity walls at parapet level.

10

b) Explain the various forms of concrete partition walls.

5

c) What are clay block partition walls?

5
Q.4  
   a) Explain with the help of sketches various types of shallow foundations. 
      10  
   b) What do you understand by geophysical methods? Explain various methods used. 
      10  

**PART-B**

Q.5  
   a) Explain the general principle of damp proofing.  
      10  
   b) Which masonry requires more attention in case of damp proofing, stone or brick? Justify your choice. 
      10  

Q.6  
   a) Write in detail about the classification of bricks.  
      10  
   b) How is seasoning of timber done? Explain. 
      5  
   c) How is testing of lime done?  
      5  

Q.7  
   a) Differentiate between mud flooring and muram flooring.  
      10  
   b) Explain in detail single joist timber floor. Explain with the help of a sketch. 
      10
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
BUILDING CONSTRUCTION AND MATERIALS (C-302B)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
 a) Define perpend.  
b) What is the size and weight of standard brick?  
c) Describe disturbed and undisturbed samples.  
d) Briefly explain the seismic refraction method of site exploration.  
e) List any four tests performed on bricks.  
f) How is sand piling done?  
g) Describe open drive sampler and stationary piston sampler.  
h) Enlist the classification system of building based on their occupancy as per National Building Code 1970.  
i) Briefly explain the components of floor.  
j) List any four advantages of natural seasoning of timber.  

2x10

PART A

Q.2  
 a) Explain stone composite masonry with a neat sketch.  
b) What do you understand by rubble masonry?  
c) Describe raking bond with a neat sketch.  
d) List and explain the different types of loads to be considered for design of a building.  

5x4

Q.3  
 a) Explain load bearing and non-load bearing walls.  

4  
b) Enlist different types of partition walls and explain any two of them.  

6  
c) What precautions are to be taken for construction of cavity walls?  

10

Q.4  
 a) What are the essential requirements of a good foundation?  

5  
b) Describe raft foundation and under what circumstances are they used.  

5
c) Discuss the causes of failure of foundations and remedial measures.

**PART-B**

Q.5  
 a) What are the ill-effects of entry of dampness?  
 b) Explain pressure grouting in context of damp proofing. What is asphalt tanking?  
 c) What are the characteristics of good damp proofing material?

Q.6  
 a) What factors affect the choice of flooring materials?  
 b) Explain: i) Brick flooring ii) Cement-concrete flooring  
 c) What are the requirements of good roof?

Q.7  
 a) Explain the procedure of natural seasoning of timber with a neat sketch.  
 b) List various tests conducted on bricks and explain the procedure of any two tests.  
 c) What factors affect the quality of bricks?
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
FLUID MECHANICS-I (C-303)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write notes on:
   a) Newtonian and non-Newtonian fluids.
   b) Kinematics and dynamic viscosity of a fluid.
   c) Steady and non-steady flow.
   d) Centre of pressure and centre of buoyancy.
   e) State the properties of a stream function.
   f) State Bernoulli’s theorem.
   g) Orifice meter.
   h) Laminar and turbulent flow in pipes.
   i) Gauge and absolute pressure.
   j) Buckingham’s \( \pi \) theorem.

\[ 2 \times 10 \]

PART-A

Q.2 a) Explain the phenomena of capillary rise or fall in capillary tubes. Derive an expression for capillary fall due to surface tension in a capillary tube.

8

b) The pressure inside a droplet of water is \( 0.02 N/cm \) greater than the atmospheric pressure. Calculate the diameter of the droplet. Take surface tension \( \sigma \) (water with air) = 70.07 \( N/m \).

12

Q.3 a) Derive Darcy-Weisbach equation for friction head loss in case of pipe flow.

8

b) A U tube mercury manometer is used to measure the pressure of oil flowing through a pipe whose specific gravity is 0.85. The centre of the pipe is \( 15 cm \) below the level of mercury. The mercury level difference in the manometer is \( 25 cm \). Determine the absolute pressure of the oil flowing through the pipe. Atmospheric pressure = 750 \( mm \) of Hg.
Q.4  a) The given figure shows a gate of quadrant shape of 4m diameter supporting water.

If the gate is 3m long (perpendicular to paper), find the total resultant pressure force acting on the gate and its relative direction with horizontal. The height of the water above the lowest point of the gate is 5m.

b) Explain the stability of a floating body under different conditions of equilibrium.

PART-B

Q.5  a) State Bernoulli’s theorem and assumptions for steady flow of an incompressible fluid.

b) An orifice of diameter 10 cm is fitted in pipe of 20 cm diameter carrying oil (sp. Gr=0.85). The head causing the flow is measured with the help of mercury manometer which is 40 cm. Find the flow rate of the oil passing through the pipe taking $C_d = 0.6$. 

15
Q.6 a) Describe the different head losses through pipes carrying fluid.

4

b) A plate of $60 \times 50 \text{cm}$ is mounted in a horizontal plane in a wind tunnel. The air is moving with a velocity of $5 \text{m/s}$ parallel to $60 \text{cm}$ side. Find out the following:

i) Boundary layer thickness at the end of the plate.

ii) Drag force on both sides of the plate. Take $\rho = 1.25 \text{kg/m}$ and kinematic viscosity $\nu = 0.15 \text{ Stokes}$ ($1 \text{Stoke} = 10^{-4} \text{m}^2/\text{s}$) for air.

Assume the velocity distribution in the boundary follows the law.

$$\frac{u}{U} = 2 \left( \frac{y}{\delta} \right) - 2 \left( \frac{y}{\delta} \right)^3 + \left( \frac{y}{\delta} \right)^4.$$  

16

Q.7 a) What is meant by geometric kinematic and dynamic similarities?

10

b) What is the procedure adopted for finding non-dimensional $\pi$ terms as per Buckingham theorem?

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
SERVEYING-I (C-304 / C-304A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the objective of surveying?
b) How will you correct length of a line if it is measured with a wrong scale?
c) If the fore bearings of line AB and CD are 112°30' and 260°20', respectively, find their back bearings.
d) What is local attraction?
e) What do you understand by a benchmark?
f) Write any two characteristics of contours.
g) Explain radiation method in plane table.
h) What is theodolite? What are its two types?
i) What is a tachometer?
j) What is the necessity of providing a curve?

2x10

PART-A

Q.2 a) Discuss briefly different types and sources of error in surveying.
   5
b) What are various methods of direct linear distance measurement?
   5
c) A steel tape 20 m long standardized at 18°C with a pull of 10 kg was used for measuring a base line. Find the correction per tape length if the temperature at the time of measurement was 30°C and pull exerted was 16 kg. Weight of 1 cubic cm of steel = 0.00786 kg, cross sectional area of tape = 0.04 cm², coefficient of expansion of steel = 0.00012 per °C and modules of elasticity
   
   E = 2.1 \times 10^6 \text{ kg/cm}^2.
   
   10

Q.3 a) Differentiate between the following:
   i) Fore bearing and back bearing.
   ii) Quadrantal bearing and whole circle bearing.
iii) True bearing and magnetic bearing.

2x3

b) Convert the following Q.B. to W.C.B.:
   i) $N 6^\circ 20' E$
   ii) $S 17^\circ 25 E$
   iii) $N 17^\circ 25 W$
   iv) $N 11^\circ W$

1x4

c) The following bearings were found in traversing with a compass in a place where local attraction was suspected. Compute the correct bearings of the lines:

<table>
<thead>
<tr>
<th>Line</th>
<th>F.B.</th>
<th>B.B.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>38°30'</td>
<td>219°15'</td>
</tr>
<tr>
<td>BC</td>
<td>100°45'</td>
<td>278°30'</td>
</tr>
<tr>
<td>CD</td>
<td>25°45'</td>
<td>207°30'</td>
</tr>
<tr>
<td>DE</td>
<td>325°15'</td>
<td>145°15'</td>
</tr>
<tr>
<td>EA</td>
<td>190°30'</td>
<td>10°15'</td>
</tr>
</tbody>
</table>

10

Q.4 a) Explain various characteristics of contours.

10

b) The following staff readings were obtained successively with a dumpy level:
   2.375, 1.730, 0.615, 3.450, 2.835, 2.070, 1.835, 0.985, 0.435, 1.630
   The instrument was shifted after fourth and eighth reading. Calculate the R.L. of all the points.

10

PART-B

Q.5 a) Differentiate between following:
   i) Face left and face right observation.
   ii) Transit and swinging of theodolite.

5

b) What is balancing of traverse? State Bowditch and transit rule.

5

c) The table gives the length and bearings of the lines of a traverse ABCDE, the length and bearing of EA having been omitted. Calculate the bearing of the line EA.

<table>
<thead>
<tr>
<th>Line</th>
<th>Length</th>
<th>Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>204.0</td>
<td>87°30'</td>
</tr>
<tr>
<td>BC</td>
<td>226.0</td>
<td>20°20'</td>
</tr>
<tr>
<td>CD</td>
<td>187.0</td>
<td>280°0'</td>
</tr>
<tr>
<td>DE</td>
<td>192.0</td>
<td>210°3'</td>
</tr>
</tbody>
</table>

198/4
Q.6  a) Briefly explain various methods of plane table surveying with neat sketches.  

b) Determine the gradient of a point P to another point Q from the following observations made with a tachometer fitted with an anallactic lens. The constant of instrument were 100 and 0 and the staff was held vertical.

<table>
<thead>
<tr>
<th>Instrument Station</th>
<th>Staff Station</th>
<th>Bearing</th>
<th>Vertical Angle</th>
<th>Staff Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>P</td>
<td>130°</td>
<td>+10°32’</td>
<td>1.255, 1.810, 2.365</td>
</tr>
<tr>
<td></td>
<td>Q</td>
<td>220°</td>
<td>+5°06’</td>
<td>1.300, 2.120, 2.940</td>
</tr>
</tbody>
</table>

Q.7  a) Give a classification of curves along with neat sketches of each.  

b) What is the need of a transition curve?  

c) The chainage of the intersection of two straights having the deflection angle of 50° is 1680.50. If the radius of curve is 450 m, calculate the following:
   i) Tangent length
   ii) Length of curve
   iii) Chainage of point of commencement (P.C.) and point of tangency (P.T.)
   iv) Length of long chord.
   v) Apex distance and mid ordinate.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
CONCRETE TECHNOLOGY (C-305)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are the sources of sulphate attack in concrete?
b) When the cement is considered to be unsound?
c) Define characteristic strength of concrete.
d) Classify OPC on the basis of grade.
e) Give the classification of aggregate on the basis of unit weight of aggregate.
f) What is fineness modulus?
g) After how many days concrete attains its full strength.
h) Define workability.
i) Draw the graph between water cement ratio and strength of concrete.
j) What is a natural aggregate?

2x10

PART-A

Q.2  a) What are the advantages and disadvantages of concrete?

8
b) Differentiate between rapid hardening and quick setting cement.

6
c) Write the physical properties of cement and explain any one in detail.

6

Q.3  Write short notes on any five:
a) Ordinary Portland cement.
b) Rapid hardening cement.
c) Low heat cement.
d) Volume batching and mass batching.
e) Factors affecting mix design proportions.
f) Hydrophobic cement.

4x5

Q.4  a) What are the factors that promote alkali-aggregate reaction?

10
b) Explain the grading of aggregate.  

c) Draw the graph for affect of water content on bulking of sand. 

**PART-B**

Q.5 

a) Explain the terms: segregation and bleeding. Enlist the reasons why segregation is different from bleeding.  

10

b) Enlist the factors affecting workability of concrete.  

6

c) Give an explanation as to how workability affects strength of concrete.  

4

Q.6 

a) What are admixtures? Name four mineral admixtures.  

6

b) How chemical admixtures differ from mineral admixtures?  

6

c) Discuss the effect of flyash on hardened concrete.  

8

Q.7 

a) How do you construct a building in a place with outside temperature of +55°C?  

10

b) How do you construct a building in a place with outside temperature of -55°C?  

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
CONCRETE TECHNOLOGY (C-305A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) What are the ingredients of concrete?
   b) Which compound in cement is responsible for high strength of concrete?
   c) What are deleterious substances in aggregate?
   d) Define porosity of aggregates.
   e) What is water cement ratio?
   f) What do you understand by air-entraining admixtures?
   g) Define slump of concrete.
   h) Give two advantages of light weight concrete.
   i) Write any three types of special concretes.
   j) What do you understand by controlled concrete?


PART-A

Q.2 a) What are advantages and disadvantages of using concrete as a construction material?

   10

   b) Write the physical properties of cement and explain any two in details.

   10

Q.3 a) Give the classification of aggregates on the basis of i) origin ii) shape iii) size and texture.

   10

   b) What are the factors governing the maximum size of aggregates in concrete and RCC?

   10

Q.4 a) Explain workability of concrete and explain any two methods of measuring it.

   10

   b) In reference to concrete, explain in brief:
PART-B

Q.5  a) What are plasticizers? How do they affect the properties of concrete?  
      b) What are mineral admixtures? Give their specific uses.

Q.6  a) What precautions are taken during hot weather concreting? How does it affect the quality of structure?  
      b) What do you understand by self-compacting concrete? Give its applications and also discuss its performance.

Q.7  a) List and explain the steps for mix design as per IS guidelines.  
      b) In mix design, what adjustments will you make on site for i) Bulking of sand ii) Water absorption of aggregate iii) Workability.
End Semester Examination, Dec. 2014
B. Tech. – Third / Fifth Semester
STRENGTH OF MATERIALS (C-306 / 306A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is stress?
b) Explain Hooke’s law.
c) Differentiate between ductile and brittle materials.
d) What is Poisson’s ratio?
e) Define centre of gravity and centroid.
f) What is radius of gyration?
g) Write the formula for moment of inertia about centroid axis of semicircular shape.
h) Define principal plane.
i) What is angle between principal plane and maximum shear stress plane?
j) Write bending equation.

2x10

PART-A

Q.2
a) Draw stress-strain diagram and discuss the salient points of graph.
10
b) Find out the total elongation of following compound bar.

Given: → A Area of cross-section
       → E Modulus of elasticity

   take E is same for AB and BC part.

Q.3
a) An element in a stressed material has tensile stress of 500 \( MN/m^2 \) and a compressive stress of 350 \( MN/m^2 \) acting on two mutually perpendicular
planes and equal shear stress of \(100 \, MN/m^2\) on these plane. Find principal stresses and position of the principal planes. Find also maximum shearing stress.

b) Find out the change in volume of given cuboid under given loading shown in the figure below.

Q.4  

a) Find the centroid of given lamina.

b) Determine the moment of inertia about centroid axis of cross-section given in the figure.
Q.5  

a) A symmetrical section 200 mm deep has a moment of inertia $2.26 \times 10^{-5} \text{ m}^4$ about its neutral axis. Determine the longest span over which, when simply supported, the beam would carry a uniformly distributed load of 4 kN/m run without the stress due to bending exceeding 125 MN/m².

b) A timber beam 150 mm $\times$ 250 mm in cross-section is simply supported at its ends and has a span of 3.5 m. The maximum safe allowable stress in bending is 7500 kN/m². Find the maximum safe U.D.L. which the beam can carry. What is maximum shear in the beam for the U.D.L. calculated?

Q.6  

a) Derive an expression for stresses on cross-section due to eccentric loading on short column.

b) A circular rod of 20 mm diameter carries a pull along a line which is parallel to the centroidal axis, but is displaced from it. Determine the distance of the line of pull from the centroidal axis, if the maximum stress is 20% greater than the mean stress on a section normal to the axis.

Q.7  

a) Give the expression for torsion of circular bar or shafts. Also write assumptions made in the theory.

b) A solid shaft is subjected to a torque of 12000 Nm. Find the necessary diameter of the shaft if the allowable shear stress in 60 N/mm², and the allowable twist is 1° for every 20 diameters length of the shaft. Take $N = 0.8 \times 10^5 \text{ N/mm}^2$. 

206/4
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
STRENGTH OF MATERIALS (C-306B)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define Hooke’s law.
     b) Define modulus of rigidity.
     c) Give the formula for normal stress and tangential stress developed on a plane inclined at 0° with the axis for a uniaxial stress state.
     d) Define moment of inertia.
     e) Write down the formula for centroidal moment of inertia of a semicircular arc of radius ‘R’.
     f) Define neutral axis.
     g) Write down the formula for shear stress developed at a section and explain the terms involved.
     h) Define eccentric load.
     i) Define a short column.
     j) Write down the torsion equation and explain the terms.

   2x10

PART A

Q.2  A rectangular block 350 mm long, 100 mm wide and 80 mm thick is subjected to axial load as follows 50 kN tensile force in the direction of length, 100 kN compressive force in the direction of its thickness and 60 kN tensile force in the direction of its width. Determine: i) change in volume ii) bulk modulus and iii) modulus of rigidity. Take $E = 2 \times 10^5 \, N/mm^2$ and Poisson’s ratio = 0.25.

   20

Q.3  Determine the direction of principal planes, normal stress and tangential stress of the strained material. Given $P_x = 50 \, N/mm^2$ (tensile), $P_y = 30 \, N/mm^2$ (compressive) and $q = 20 \, N/mm^2$.

   20
Q.4 Find the moment of inertia about the centroidal axes of the unequal section given in the figure:

![Diagram of an unequal section](image)

**PART-B**

Q.5 A beam $500\text{mm}$ deep of a symmetrical section has $I = 1\times10^8 \text{mm}^4$ and is simply supported over a span of 10 m. Calculate:

a) The informally distributed load it may carry if the maximum bending stress is not to exceed $150 \text{N/mm}^2$.

b) The maximum bending stress if the beam carries a central point load of $25\text{kN}$.

10x2

Q.6 A rectangular section $200\text{mm} \times 300\text{mm}$ carries a load of $250\text{kN}$ at a point having coordinates $(50,100)$ with the centroid as the origin. Find the stresses at the four corners.

20

Q.7 a) A shaft $50\text{mm}$ diameter and $0.7\text{m}$ long is subjected to a torque of $1200\text{Nm}$. Calculate the shear stress and the angle of twist. Take modulus of rigidity $= 90\text{GPa}$.

10

b) A shaft is made from tube $25\text{mm}$ outer diameter and $20\text{mm}$ inner diameter. The shear stress must not exceed $150 \text{MPa}$. Calculate the torque that can be applied on it.

10
Q.1 Answer the following:
   a) When is a statically indeterminate beam? Give an example.
   b) Give an example of an externally unstable structure.
   c) State law of reciprocal deflections.
   d) Write advantages of fixed beams over simply supported beams.
   e) What is stiffness of a member?
   f) What is elastic centre?
   g) Write analogy between properties of the eccentrically loaded column and fixed beam.
   h) What is a linear arch?
   i) Check determinacy of a two hinged arch vs a three hinged arch.
   j) Write the formula to account for temperature stresses in the cable.

Q.2 Analyse the frame shown in the figure given below using strain energy method and draw its bending moment diagram. EI=constant
Q.3 A continuous beam ABC consists of two spans AB=4 m and BC=3 m, the end A being fixed. The span AB carries a point load of 80 kN at 1 m from A while the span BC carries a point load of 60 kN at 1 m from C. $I_{AB}:I_{BC}=2:1$. Find the support moments and draw the bending moment diagram by moment distribution method.

Q.4 A fixed beam of span L carries an udl of w/m over the whole span. Calculate the fixed end moments using column analogy method.

**PART-B**

Q.5 a) Determine the horizontal thrust development in a semi-circular arch of radius R subjected to a udl of w/unit length over the entire span. Assume EI to be constant.

b) A two hinged parabolic arch of span 40 m and rise 8 m is subjected to a rise of temperature of 30º C. Find the maximum bending stress at the crown due to temperature rise. The rib section is 1000 mm deep. Take $E=2\times10^5$ N/mm² and $\alpha =12\times10^{-6}$ per ºC.

Q.6 A beam of rectangular section, 80 mm wide and 120 mm deep is subjected to a bending moment of 12 kNm. The trace of the plane of loading is inclined at 45º to the Y-Y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section.

Q.7 A three-hinged stiffening girder of a suspension bridge of span 120 m is subjected to two point loads of 240 kN and 300 kN at distances 25 m and 80 m from the left end. Find the shear force and bending moment for the girder at a distance of 40 m from the left end. The supporting cable has a central dip of 12 m. Find also the maximum tension in the cable and draw the bending moment diagram for the girder.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
STRUCTURAL ANALYSIS-II (C-401A)  

Time: 3 hrs  
Max Marks: 100  

No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is degree of redundancy? Explain with one example.  
b) What is kinematic indeterminacy for a roller, hinged and fixed supports?  
c) Find expression for strain energy due to axial loading.  
d) State Castigliano’s 1st theorem.  
e) State Betti’s law.  
f) Write Clapeyron’s theorem of three moments assuming notations for a continuous for beam.  
g) Which conditions are to be satisfied for equilibrium of the column in column analogy?  
h) What is a linear arch?  
i) What is the total strain energy stored by the whole arch?  
j) What are a three-hinged and a two-hinged stiffening girders?  

2x10

PART-A

Q.2  
a) Draw influence line diagram for shear force at a given section for simply supported beam with overhang on both sides.  
b) A uniformly distributed live load of 60 kN/m of length 5 m moves on a girder of span 16 m. Find the maximum positive and negative shear force at a section 6 m from the left end. Also find the maximum bending moment which can occur at the same section.

14

Q.3  
The bend ABC shown in the figure carries a concentrated vertical load P at A. Find the vertical and horizontal deflection of A. Assume uniform flexural rigidity and use strain energy method.
Q.4 Analyse the portal frame in figure by slope deflection method.

Q.5 A fixed beam of span L carries a point load W at mid span. Determine the fixed end moments using column analogy method. The beam is of uniform section.

Q.6 a) State Eddy's theorem.

b) A two-hinged arch of span 20 m and rise 4 m carries a uniformly distributed load of 50 kN/m on the left half of the span. Find the reactions at the supports and the position and amount of maximum bending moment.

Q.7 a) Why do we have no bending moment for the pier in case of a cable clamped to saddle carried on smooth rollers on the top of the pier?

b) A cable carrying a load of 10 kN/m of horizontal span is stretched between supports 100 m apart. The supports are at the same level and the central dip is 8 m. Find the greatest and the least tensions in the cable.
Q.1 a) Define turbulent and laminar flows.
b) What are the major and minor losses?
c) Define the energy gradient line.
d) Define the uniform and non-uniform flow.
e) Define critical and sub-critical flows.
f) Define specific energy.
g) Define critical depth and critical velocity.
h) What is the function of a draft tube?
i) Differentiate between impulse and reaction turbines.
j) What is NPSH?

Q.2 a) Drive an expression for loss of head due to friction in pipes.

b) A smooth pipe of diameter 400 mm and length 800 mm carries water at the rate of 0.04 m³/s. Determine the head lost due to friction, wall shear stress, center-line velocity and thickness of laminar sub-layer. Take the kinematic viscosity of water as 0.018.

Q.3 a) Drive an expression for loss of head due to sudden contraction.
b) Three pipes of 400 mm, 200 mm and 300 mm diameters have lengths of 400 m, 200 m, and 300 m, respectively. They are connected in series to make a compound pipe. The ends of this compound pipe are connected with two tanks whose difference of water levels is 16 m. If the co-efficient of friction for these pipes is same and equal to 0.005, determine the discharge through the compound pipe neglecting first the minor losses and then including them.
Q.4  

a) Explain the Chezy’s formula for finding discharge through an open channel.

b) A rectangular channel carries water at the rate of 400 liters/s, when bed slope is 1 in 2000. Find the most economical dimensions of the channel if C=50.

c) Find the specific energy of flowing through a rectangular channel of width 5 m when the discharge is 10 m$^3$/s and depth of water is 3 m.

**PART-B**

Q.5  

a) Drive an expression for a gradually varied flow.

b) Explain various types of channel slopes.

c) Determine the length of the back water curve caused by an afflux of 2 m in a rectangular channel of width 40 m and depth 2.5 m. The slope of the bed is given as 1 in 11000. Take Manning’s N =0.03.

Q.6  

a) What is a reaction turbine? Discuss working and construction of a reaction turbine.

b) A Pelton wheel is to be designed for the following specifications: Shaft power=11772 kW, Head=380 m, Speed=750 rpm, overall efficiency=86%, Jet diameter is not to exceed one-sixth of the wheel diameter.

Determine:
   i) Wheel diameter.
   ii) Diameter of Jet.

Q.7  

a) What is a reciprocating pump? Explain main parts of a centrifugal pump.

b) What are specific speed and cavitation?

c) Discuss working and principle of centrifugal pump with a neat diagram.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
SURVEYING-II (C-403)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define the coefficient of refraction.
b) Write a short note on terrestrial refraction.
c) Define Laplace station in triangulation.
d) Define geodetic distance.
e) Define conditional quantity and independent quantity with examples.
f) Define probable error for single measurement and for mean.
g) Define relief displacement in photogrammetry on a vertical photograph.
h) Define perspective projection.
i) Define the hour angle.
j) Define GPS.

PART-A

Q.2
a) Derive an expression for axis signal correction in trigonometrical levelling. What is its nature for angle of elevation and depressions?

b) A theodolite was set up at P and the angle of elevation to a vane 4.5 m above the foot of the staff held at Q was 8º 25’. The horizontal distance between P and Q was known to be 2.5 km. Determine the R. L. of the staff station Q given that the R.L. of the instrument axis was 2560.38 m.

Q.3
a) Describe routine of triangulation operations in detail.

b) Compute the value of C, D for the two given nets. The heavy lines are base lines of known lengths. Directions are not observed where lines are dotted.
Q.4  
(a) What do you mean by principle of least square? Derive an expression for it.  
(b) Given the following equations  
\[ A = 42^\circ 35'27'', \quad wt = 2 \]
\[ B = 28^\circ 10'42'', \quad wt = 2 \]
\[ C = 65^\circ 25'16'', \quad wt = 1 \]
\[ A + B = 70^\circ 49'14'', \quad wt = 2 \]
\[ B + C = 93^\circ 37'55'', \quad wt = 1 \]

Find the most probable value of A, B, and C, if all readings are taken at a station Q.

10

Part-B

Q.5  
(a) The standard time meridian in India is 82\(^\circ\) 35' E of the standard time at any instant is 20 hours 24 minutes and 6 seconds. Find local mean time for two places having longitudes.  
   i) 25\(^\circ\) E.  
   ii) 21\(^\circ\) W  
(b) Write short notes on:  
   i) Celestial sphere.  
   ii) Hour circle.  
   iii) Probable error.  
   iv) Ecliptic.  

2\(\frac{1}{2}\)x4

Q.6  
(a) What do you mean by flight planning for aerial photography? Write down various reasons for its overlap.  
(b) The scale of an aerial photograph is 1 cm =100 m. The photograph size is 20 cm x 20 cm. Determine the number of photographs required to cover an area of 100 km\(^2\), if the longitudinal Lap is 60% and side Lap is 30%.

10

Q.7  
(a) Write down various applications of GIS in civil engineering.

10
b) Write down the applications of remote sensing in various field details.
Q.1  a) If total depth, effective depth and diameter of tensile reinforcement are 500 mm, 450 mm and 20 mm, respectively, what will be the clear cover? 
b) If effective depth and depth of neutral axis of a beam is 600 mm and 200 mm respectively, what will be the value of lever arm both by working stress method and limit state method? 
c) Define characteristic strength and characteristic load. 
d) Define limit state. 
e) Mention the factors on which proper bonding between concrete and steel reinforcement is dependent. 
f) A simply supported slab is 7 m x 5 m. The reinforcement along short span is 10 mm @ 150 c/c and along long span is 8 mm at 200 C/C. Show the reinforcement in cross section of slab. 
g) What is the criteria for a slab to be called one-way or two-way slab? 
h) Draw a freehand sketch of a cantilever retaining wall and show its important component. 
i) What are the reasons for clear cover for different RCC members to be different? 
j) Write down span/effective depth ratio for different types of beams.

Q.2  a) Explain with the help of a neat sketch the difference between under-reinforced, balanced and over-reinforced section. 

b) A single reinforced beam 300 mm wide has an effective depth of 500 mm with an effective span being 5 m. It is reinforced with 804 mm$^2$ of steel. If the beam carries a total load of 16 kN/m on the whole span, determine the stresses produced in concrete and steel. Use M20 concrete and Fe 415 steel. Use working stress method.
Q.3 a) What are the reasons for using a doubly reinforced beam? 

b) Mention different limit states and describe any one in detail.

c) A doubly reinforced beam is 250 mm wide with 450 mm effective depth. It is reinforced with 2 bars of 18 mm diameter as compression reinforcement and 4 bars of 25 mm diameter as tensile reinforcement. The effective cover on both sides is 40 mm. Find moment of resistance of beam by limit state method. Use M 20 concrete and Fe 415 steel.

Q.4 a) A RCC beam of span 5 m is 250 mm wide and 500 mm deep up to centre of tensile reinforcement which consists of 4 bars of 22 mm diameter. The beam carries a load of 30 kN/m inclusive of its own weight. Design the shear reinforcement in form of vertical stirrup. Use M 25 concrete and Fe 415 steel.

b) If in the above question, two bars at curtailed at supported, what will be the new spacing of stirrups?

c) Find the main and shear reinforcement of a beam with following details:
   i) Size of beam=300 mm x 600 mm.
   ii) Factored moment=115 kNm.
   iii) Factored torsion=45 kNm.
   Use M 25 concrete and Fe 415 steel.

PART-B

Q.5 a) Design a simply supported slab over a passage. The slab is supported on a 200 mm thick masonry walls with following requirements:
   i) Clean span=3 m
   ii) Line load=4000 N/ml.
   iii) Use M 20 concrete and Fe 250 steel.

b) Design a simply supported slab of size 6 m x 4 m to carry an imposed load of 3 kN/m². Corners of the slab is free to lift i.e. there is no provision for torsional reinforcement. Use M 25 concrete and Fe 415 steel.

Q.6 a) An RCC short column of size 400 mm x 400 mm carries an axial load of 1250 kN. Design the column. Use M 20 quadi concrete and Fe 250 grade steel.
b) Design a square footing for the above column. The safe bearing capacity of soil is 225 kN/m².

Q.7  a) What are the different manners by which a retaining wall can fail?
  5

b) An RCC cantilever type retaining wall has 5 m tall stem. The wall retains soil level with its top. The density of soil is 18000 N/m³ and has angle of repose =30°. Safe bearing capacity of soil is 200 kN/m². Show dimensions of various components of this retaining wall in a cross section of the retaining wall and design its stem.  15
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
DESIGN OF STEEL STRUCTURES-I (C-405)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1

a) Why is the flange of a plate girder curtailed?
b) What is the recommended value of minimum and maximum inclination of a lacing bar?
c) Write any two disadvantages of bolted connections.
d) Write the formula for computing thickness of square base of a solid round steel column.
e) What is the difference between gantry girder and plate girder?
f) Why do we prefer grillage footings?
g) What is the recommended value of effective length of a compression member if it is effectively held in position at both ends, but not restrained against rotation? The unsupported length is 5 m.
h) What do you understand by laterally unsupported beam?
i) Draw a neat sketch of web splice in plate girder?
j) Define lug angles and give its necessity in a tension member?

2x10

PART-A

Q.2

a) Two sections 10 mm and 18 mm thick are to be jointed by double cover butt joint. The joint is double riveted with cover plates each 8 mm thick. The load to be transferred by the joint is 500 kN. Design the joint. Also draw a neat sketch of the connection.

10

b) Explain the various types of failures of riveted joints with neat sketches.

10

Q.3

a) Write the procedure for designing an axially loaded compression member.

10

b) Axial compressive force in a member of a truss is 45 kN and the distance between its joints is 1.35 m. Design the member using equal angle section of $f_y = 250$ N/ mm$^2$. 
Q.4  a) Design a slab base for a column section I.S.H.B 350 @ 724 N/m subjected to an axial load of 1030 kN if the load is transferred to the base plate by welded connection. Allowable bearing pressure of concrete is 5 N/mm².

b) Write the steps for the design of a grillage footing.

PART-B

Q.5  a) Design a beam of 5 m effective span, carrying a uniform load of 20 kN/m if the compression flange is laterally supported. Assume the beam is equal flanged and \( f_Y = 250 \text{ N/ mm}^2 \).

b) Write short notes on \textit{any two:}
   
i) Web crippling.
   
ii) Diagonal buckling.
   
iii) Built-up beams.

Q.6  a) Explain briefly the various types of loads that act on a gantry girder.

b) Design only the cross-section of the gantry girder to be used in an industrial building carrying a travelling crane with the following data:
   
i) Crane capacity = 200 kN.
   
ii) Self weight of crane girder excluding trolley = 200 kN.
   
iii) Self weight of trolley, electric motor, hook etc = 40 kN.
   
iv) Approx minimum approach of the crane hook to gantry girder = 1.20 m.
   
v) Wheel base = 3.5 m.
   
vi) C/C distance between gantry rails = 16 m.
   
vii) C/C distance between columns = 8 m.
   
viii) Self weight of rail section = 300 N/m.
   
ix) Yield stress of steel = 250 N/ mm².

Q.7  a) Draw the longitudinal view of the plate girder showing its various elements.

b) Write short notes on \textit{any two:}
   
i) Web splices
   
ii) Curtailment of flange plates
   
iii) Bearing stiffeners
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
DESIGN OF STEEL STRUCTURES-I (C-405A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) What do you understand by structural steel?
   b) Define effective length of a column.
   c) What is web buckling?
   d) Define anchor bolts.
   e) List the checks applied for the safety of beams.
   f) Define economical depth of plate girder.
   g) What is the difference between a joist and a girder?
   h) What are permissible stresses in bending and shear?
   i) Give a comparison between riveted and welded plate girders.
   j) Define gantry girder.

   2x10

PART-A

Q.2 a) Design as a lap joint and a butt joint to connect two plates 14 mm thick. Power driven rivets may be used for making the connection.
   10  
   b) How do you design a fillet weld? Explain in detail.
   10

Q.3 a) An angle section I.S.A 80x80x10 mm is used as a tension member and is connected to a gusset plate by 16 mm dia rivets. Taking permissible stress of 150 N/mm² in axial tension, determine the allowable axial tension.
   10  
   b) Calculate the strength of a discontinuous strut of length 3.2 m. The strut consist of two unequal angles 100 mm x 75 m x 8 mm, with long legs connected and placed on opposite side of a gusset plate and also calculate strength if they are connected on same side of a gusset plate.
   10

Q.4 a) Explain gusset base and its design procedure with the help of a neat sketch.
   10
b) What are types of column bases and how would you determine the thickness of slab base?  

**PART-B**

Q.5  

a) A beam consisting of I.S.M.B 600 @ 1226 N/m is simply supported over a span of 8 m. Determine the safe load the beam can carry, assuming that the beam is laterally supported.  

b) Explain web buckling and web crippling in detail.  

Q.6  

a) Explain the components of gantry girder and draw a typical arrangement of crane girder.  

b) Write in detail the steps involved in design of a gantry girder.  

Q.7  

a) What is proportioning of web and derive an expression for economical depth of a plate girder?  

b) Explain the following:  
   i) Curtailment of flange plates.  
   ii) Stiffeners.  

   5x2
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
SOIL MECHANICS (C-406)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Write relation between void ratio and porosity.
b) What is relative density of sands?
c) Pretreatment of soil to remove the organic matter by oxidation is done with
   __________.
d) Quick sand is ________.
e) Difference between primary consolidation and secondary consolidation.
f) List important characteristics of Mohr circle.
g) Define zero air void line.
h) Soil compacted dry of the optimum as compared to that wet of the optimum
   ________.
i) Classify shear tests based on drainage conditions.
j) Define soil water.

PART-A

Q.2  a) With the usual notations show that \( r_d = \frac{r}{1 + w} \)

   10

b) What do you understand by liquid limit? How is it determined?

   10

Q.3  a) What is the use of classification of soils? Discuss Indian standard classification. 10

b) Discuss the main considerations while determining permeability of stratified soil deposits. Write the relation between average permeability for flow parallel and that perpendicular to the bedding plane.

   10

Q.4  a) A deposit of sand has a porosity of 40 % and specific gravity of particle 2.7. The ground water table is 2 m below the ground surface. Compute the effective stress at a depth of 6 m below ground surfaces, if capillary rise
above water table is 1 m.

10
b) List and explain the factors affecting compaction.

10

PART-B

Q.5  a) Discuss the basis of the construction of Newmarks influence chart. How is it used?

10
b) What do you mean by contact pressure? Draw the contact pressure distribution diagram for flexible and rigid footings on sand and clayey soils.

10

Q.6  a) Discuss Terzaghi’s theory of consolidation, stating the various assumption and their validity.

10
b) The Laboratory consolidation data for an undisturbed clay sample are as follows:

\[ e_1 = 1.00, \bar{\sigma}_1 = 85 \text{kN/m}^2 \] \[ e_2 = 0.80, \bar{\sigma}_2 = 465 \text{kN/m}^2 \]

Determine the void ratio for a pressure \( \bar{\sigma}_3 \) of \( 600 \text{kN/m}^2 \).

10

Q.7  a) What is Mohr’s circle? Discuss its important characteristics.

b) Discuss culmann’s method for the determination of active earth pressure.

10
End Semester Examination, Dec. 2014
B. Tech. – Fourth / Fifth Semester
SOIL MECHANICS (C-406)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Given \( D_{10} = 0.1 \text{mm} \), \( D_{30} = 0.41 \text{mm} \), \( D_{60} = 0.62 \text{mm} \), write down soil classification as per IS 1498-1970.

b) Define specific gravity.

c) Which type of roller is the most suitable for compacting subgrade with high plastic clays?

d) Distinguish between seepage and discharge velocity.

e) Name two laboratory tests performed in laboratory to calculate permeability of soil.

f) Define shear strength.

g) What is placement water content?

h) List various types of earth pressure.

i) List limitations of Darcy’s law.

j) Give complete names of GW, CL.

2x10

PART-A

Q.2 a) Explain salient features of plasticity chart.

b) What is purpose of soil classification? Explain how soil are classified according to Indian Standard Soil classification system.

12

Q.3 a) The coefficient of permeability of a soil at a void ratio of 0.7 is \( 4 \times 10^{-4} \text{ cm/s} \). Estimate its value at a void ratio of 0.50.

b) What is a flow net? Describe its properties and applications.

12

Q.4 a) Find the intensity of vertical pressure at a point 4m below a 20kN point load acting at a horizontal ground surface. What will be the vertical pressure and shear stress at a point 2m horizontally away from the axis of loading but at
the same depth of $4m$?  

b) Discuss the principle and use of Newmark’s influence chart.  

**PART-B**  

**Q.5**  

a) Explain the term: optimum moisture content and discuss the factors which affect compaction of soils.  

b) With the help of a neat sketch, explain the standard Proctor test.  

**Q.6**  

a) Explain the process of consolidation of clay, and differentiate between primary and secondary consolidation.  

b) With the help of neat sketch, explain any one method for estimation of preconsolidation pressure.  

**Q.7**  

a) Discuss Mohr’s theory for failure of soils and state Coulomb’s empirical law governing strength of soils.  

b) What is meant by direct shear test? What are its advantages and limitations? Explain.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
ENGINEERING GEOLOGY (C-407)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) List objectives of engineering geology.
   b) Define intensity of earthquake.
   c) Define river meandering.
   d) What is streak of minerals?
   e) Name important minerals according to Moh's scale.
   f) What do you mean by primary and secondary structures of rock?
   g) Define joints and outcrop.
   h) What is hydrogeology?
   i) Define water table.
   j) What are drainage galleries?

2x10

PART-A

Q.2 a) Discuss scope of geology. 10

b) Discuss about the sub-divisions of geological science and also elaborate about atmosphere of earth. 10

Q.3 a) What are volcanoes? Explain its types and effect on minerals formed from different types of rocks. 10

b) Explain geological work of wind. 10

Q.4 a) What is time scale? Mention its sub-divisions. 10

b) Explain igneous, sedimentary and metamorphic rocks according to characters, textures and structures. 10
PART-B

Q.5  
   a) Explain with a neat diagram “classifications of faults”.  
       10  
   b) Write short notes with neat diagrams:  
       i) Recumbent folds.  
       ii) Over-turned folds.  
       5x2  

Q.6  
   a) What is the difference between free ground water and artesian water?  
       10  
   b) What are the different sources of ground water?  
       10  

Q.7  
   a) Write about the suitability of foundation sites for abutments.  
       10  
   b) What are the geological problems after dam construction?  
       10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
FLUID MECHANICS (C-408)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following questions:
    a) Define hydraulic gradient line.
    b) Define critical velocity.
    c) What is a pitot tube?
    d) Define buoyancy.
    e) What are local and average friction coefficients?
    f) Define capillarity and surface tension.
    g) What is the difference between laminar and turbulent flows?
    h) Explain a flownet.
    i) What do you mean by hydraulic co-efficient?
    j) What is the purpose of venturimeter and orifice meter?

    2x10

PART-A

Q.2 a) Derive an expression for the continuity equation in three dimensions.
   10
   b) The velocity vector in a fluid flow is given by the equation:
      \[ V = 4x^3 \mathbf{i} - 10x^2 \mathbf{y}j + 2t \mathbf{k} \]
      Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time \( t = 1 \).
      10

Q.3 a) State Bernoulli’s theorem. What are the assumptions made in Bernoulli’s equations?
   10
   b) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20cm and throat diameter 10cm. The oil-mercury differential manometer shows a reading of 25cm. Calculate the discharge of oil through the horizontal venturimeter. Take \( C_d = 0.98 \).
   10
Q.4  
   a) Derive an expression to find the losses due to sudden expansion in pipes.  
      10  
   b) Explain the concept of equivalent length of pipe.  
      5  
   c) A pipe-line carrying water has average height of irregularities projecting from  
       the surface of the boundary of the pipe as 0.15mm. What type of boundary is  
       it? The shear stress developed is 4.9 N/m². The Kinematic viscosity of water  
       is 0.01 strokes.  
       5  

**PART-B**  

Q.5  
   a) A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the  
       slope of the bed is 1 in 1500. The area of the section is 40 m². Find the  
       dimensions of the section if it is most economical. Determine the discharge of  
       the most economical section if  C = 50.  
       10  
   b) What is a gradually varied flow? Derive an expression of gradually varied  
       flow.  
       10  

Q.6  
   a) State Buckingham’s π–theorem. What are dimensionless numbers?  
       10  
   b) Explain in brief boundary layer with the help of a sketch.  
       10  

Q.7  
   a) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water  
       flowing at the rate of 700 litres/s under a head of 30 m. The buckets deflect  
       the jet through an angle of 160°. Calculate the power given by water to the  
       runner and the hydraulic efficiency of the turbine. Assume co-efficient of  
       velocity as 0.98.  
       10  
   b) Explain in brief specific speed and unit quant
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
TRANSPORTATION ENGINEERING-I (C-501)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is Indian Road Congress? What are its functions?
b) Explain the term super-elevation.
c) Why do we provide transition curve?
d) Write down the name of different types of pavements.
e) Discuss various types of sleepers.
f) Write down the formula for extra-widening.
g) What is the classification of roads by Nagpur Road Plan?
h) What do you understand by re-alignment?
i) List the various traffic control devices.
j) What are the purpose of wind rose diagram?

2x10

PART-A

Q.2 a) Briefly explain the Macadam’s method of road construction. Why this method is considered scientific one?

10

b) List out the factors that affect road alignment. What points would you keep in mind while undertaking a workable geometric design?

10

Q.3 a) The following data were collected for planning the road development programme of a backward district:
i) Total area = 9600 km²
ii) Agricultural and developed area = 3200 km²
iii) Existing railway track length = 105 km
iv) Existing length of metalled road = 322 km
v) Existing length of unmetalled road = 450 km
vi) Number of towns or villages in different population ranges are as below:

<table>
<thead>
<tr>
<th>Population</th>
<th>&gt;5000</th>
<th>2001-5000</th>
<th>1001-2000</th>
<th>501-1000</th>
<th>&lt;500</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of villages and towns</td>
<td>8</td>
<td>40</td>
<td>130</td>
<td>280</td>
<td>590</td>
</tr>
</tbody>
</table>
Calculate the additional lengths of metalled and unmetalled roads for the road system based on Nagpur Road Plan.  

b) Name different types of surveys that are conducted for locating a new highway with their objectives.

Q.4  
a) Define the term: sight distance, State the factors on which sight distance depends. Also explain the term overtaking sight distance.  

b) Super-elevation is to be provided for a two lane road with mixed traffic for a design speed of $80 kmph$. It is situated on a horizontal curve of radius $474 m$. Calculate the rate of super-elevation.

PART-B

Q.5  
a) What do you understand by traffic studies? Briefly explain the objectives of traffic studies.

b) What are the objectives of road signs? List different types of road signs mandatory as per IRC-67.

Q.6  
a) Describe various methods of flexible pavement design. Briefly indicate the basis of design in each case.

b) Discuss Westergaard’s concept of temperature stresses in concrete pavements.

Q.7  
a) Explain the term Rail and explain different types of rails with diagrams.

b) Explain different types of joints in a rail with diagram.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
WATER SUPPLY AND TREATMENT PLANTS (C-502)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the causes of ‘dental caries’ and ‘fluorosis’ diseases?  
b) What is dechlorination?  
c) What is water conveyance system?  
d) State four fittings of CI and DI pipes.  
e) Write any two demerits of intermittent water supply system.  
f) What is the unit of turbidity?  
g) Define design period.  
h) What is an ideal distribution system?  
i) Write any two demerits of continuous water supply system.  
j) Write the main function of reflux valve.

2x10

PART-A

Q.2 a) Explain all the factors that affect the rate of water demand of a locality.  

b) Compute the fire demand for a city having population of 1,60,000 using all empirical formulas.

Q.3 a) Write a short note on hardness.

b) Find out the pH of the mixture of the following two solutions:
   Solution A: Volume=600 ml, pH=4  
   Solution B: Volume=400 ml, pH=8

   c) Explain the causes and effects of inorganic and organic impurities of water.

Q.4 a) Write short notes on:
   i) Spray aerator  
   ii) Cascade aerator.
b) Derive the equation of Stoke’s law for settling of discrete particles with free hand diagram.

**PART-B**

Q.5  
  a) Explain Indian Nalgunda process for defluoridation.  
     5  
  b) Chlorine usage in the treatment of 40,000 cubic metre per day is 10 kg/day. The residual chlorine after 10 minutes contact is 0.2 mg/l. Calculate the chlorine dosage and chlorine demand of the water.  
     5  
  c) At a water treatment plant, 12 million liters of water is treated daily, using alum dosage of 15 mg per litres. Find:  
     i) Total quantity of alum used daily  
     ii) Amount of carbon dioxide released.  
     5x2

Q.6  
  a) Make a comparison between single water supply system and dual water supply system.  
     5  
  b) Write a short note on ‘Sluice valve’.  
     5  
  c) From a clear water reservoir 3m deep and maximum water level (MWL) R.L. 30.00, water is to pumped to an elevated reservoir MWL at 75.00 at the constant rate of 900,000 litres/hour. The distance is 15000 m. Design the pump and the rising main.  
     10

Q.7  
  Write short notes on:  
  a) Deadend system  
  b) Radial system  
  c) Gravitational system  
  d) Direct pumping system  
  5x4
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
IRRIGATION ENGINEERING-I (C-503A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write notes on:
   a) Different types of canal falls.
   b) Components of canal head regulator.
   c) Advantages of canal lining.
   d) Location of cross regulator.
   e) Silt ejectors.
   f) Purpose of providing canal escapes.
   g) Canal outlets.
   h) Permeable foundation and failure of hydraulic structure.
   i) Selection of dam site.
   j) Name different types of spillways.

   2x10

PART-A

Q.2 a) Explain the situation with the help of clear diagrams when canal fall becomes necessary. Describe different types of falls and their suitability under specific situations.

   10

   b) List different components of diversion canal head works and explain their functions regarding regulation of canal flow.

   10

Q.3 a) Prove that in case of rectangular channel, the channel section is most economical when hydraulic radius is half of the depth of flow.

   10

   b) An irrigation channel has a discharge of 10 cumec. Mannings n for the non-erodible surface is 0.025. The side slope is to be taken as 2H:1V. Design the section for economic condition if the bed slope is 0.0016 and free board is 20% of the depth.

   10
Q.4  a) Explain Bligh creep theory with the help of a diagram. What are the limitations to the Bligh theory?

b) The following diagram shows the section of a weir on permeable foundation. Calculate the average hydraulic gradient, uplift pressure and required floor thickness at point A and B the specific gravity of the floor material is given as 2.65. Use Bligh creep theory and factor of safety 1.334.

![Diagram of weir on permeable foundation]

Q.5  a) Describe different types of cross drainage works with the help of clear illustrations.

b) Discuss the hydraulic design aspect of siphon aqueducts.

Q.6  a) Explain different types of investigations to be carried out for the selection of a dam site. How site investigations are helpful in deciding the type of dam to be constructed?

b) What are the basics of arch dams? Describe the site conditions where arch dam can be preferred over other types of dam.

Q.7  a) Describe different types of spillways and their suitability under specific situations with the help of neat diagrams.
b) Compute the discharge over an ogee shaped weir whose coefficient of discharge is equal to 2.5 at a head of 4m. The length of spill way is 40 m. The weir crust is 6m above the bottom of approach channel which has the same width as that of spill way.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
IRRIGATION ENGINEERING-I (C-503)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Describe briefly the following:
   a) Three characteristics of Sarda Fall.
   b) Seven uses of a storage dam.
   c) Necessity of roughening devices.
   d) Five forces acting on a concrete dam.
   e) Cavitation.
   f) Canal regulation.
   g) Two functions of a weir.
   h) Role of filter in earthen dams.
   i) Specific merits of rock-fill dams.
   j) Importance of clay core in a rock-fill dam.

   2x10

PART-A

Q.2 a) Design a 2.0m drop sloping glacis fall across a canal carrying a discharge of 45 cumecs with a bed width of 25.0 m. The depth of flow is 2.0 m. Flumed width at crest = 18.0 m, side slopes of channel=1:1, Bed level in canal before the fall = 100.0 m
   Calculate the following:
   i) Velocity in the channel
   ii) Velocity head
   iii) Head over the crest
   iv) Crest level of the fall
   v) Width of broad crested weir
   vi) Floor length
   if \( D_1 = 0.37 m \) \hfill 10

   b) Draw a complete sketch with above dimension of the sloping glacis fall.
   4

   c) Describe briefly with sketch three best alignments of an off-taking canal and parent channel.
   6
Q.3  

a) Define a cross-drainage work. Differentiate between an aqueduct and syphon aqueduct with a proper sketch. How can we substitute a syphon aqueduct with a simple aqueduct by changing the alignment?

b) Design a syphon aqueduct with following data:

**Drain:**
- Discharge = 850 cumecs, H.F.L = 231.250 m
- Bed level = 227.50 m, general ground level = 230.0 m
- Number of spans = 15

**Canal:**
- Discharge = 30 cumecs, Bed width = 24.0 m
- Flumed width of trough = 12.00 m, Depth of flow = 1.7 m
- Side slopes = 1:1
- Bed level of canal at the end of the aqueduct (section 4-4) = 230.00 m
- Slab thickness = 0.30 m

Calculate the following:

i) Clear water way and total waterway.
ii) Depth of barrel if velocity is $2.5\text{ m/sec}$.
iii) Afflux or head loss in the barrel.
iv) Velocity in the canal and the velocity head.
v) Slope in the trough
vi) Total energy level and bed levels at the two ends of the trough portion of the canal i.e. section 3-3, 2-2.

Q.4  

a) Draw the complete sketch of a canal headworks showing different components.

b) Write notes with design parameters and sketches:

i) Canal head regulator
ii) Divide wall
iii) Fish ladder
iv) Undersluices

**PART-B**

Q.5  

a) Give the relative merits and demerits /limitations of concrete dams, rock-fill dams and earthen dams.

b) Work out the co-ordinates of the base parabola for an earthen dam with following data.

i) Top width = 5.0 m
ii) Height of dam = 25 m
iii) Upstream slope = 3:1
iv) D/S slope = 2:1
v) Free board = 2.5m
vi) Depth of water with full reservoir level = 22.5 m.

vii) \[ \frac{\Delta a}{a + \Delta a} = \frac{180 - \alpha}{400} \]
where \( \alpha = 26^\circ - 54' \)

Draw a sketch with above dimensions showing base parabola and actual phreatic (top flow) line.

Q.6  

a) Describe the role of spillway in case of a storage dam. Derive the equation with sketch \( t_2 - t_1 = \int \frac{A_dH}{Q - kH}^{3/2} \).

b) Describe briefly with proper sketches the following spillways.
   i) Ogee spillway
   ii) Side channel spillway
   iii) Saddle spillway
   iv) Shaft spillway.

Q.7  

a) Describe with a neat sketch the necessity and utility of U.S.B.R. Stilling Basin with Froude Number (Fr)>4.5.

b) An overfall spillway crest is 75.0 m above the river bed. The design head for the spillway = 6.0 m. The tail water depth above river bed for design flood is 14.0 m. The river bed consists of boulders and gravel. Find the length of the U.S.B.R. basin given that:

\[ V = 0.9 \sqrt{2gh} \]

\[ \frac{L}{D_2} = 4.3 \text{ for } Fr = 10 \text{ or more} \]

Note:- Assume any other data if not given.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
BRIDGE ENGINEERING (C-504)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Suspension bridge
   b) Deck type bridge
   c) Scour
   d) IRC class AA loading (tracked vehicle)
   e) Impact effect
   f) Shapes of various open well foundations
   g) Steining
   h) Abutment
   i) Deck slab and span
   j) Component of plate girder bridge

2x10

PART-A

Q.2 a) Explain economical span of bridge.

   10

   b) The approximate costs of one super structure and one pier for a multi-span bridge are given below. Estimate the economic span:

<table>
<thead>
<tr>
<th>Span in m</th>
<th>12 m</th>
<th>18 m</th>
<th>21 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super structure cost in Rs.</td>
<td>34000</td>
<td>80000</td>
<td>150000</td>
</tr>
<tr>
<td>Sub structure cost in Rs.</td>
<td>50000</td>
<td>54000</td>
<td>48000</td>
</tr>
</tbody>
</table>

   10

Q.3 a) Write short notes on any four:
   i) Wind loading
   ii) Longitudinal forces
   iii) Centrifugal forces
   iv) Buoyancy forces
   v) Water current forces
   vi) Seismic forces

   2½x4

243/4
b) Explain any two:
   i) IRC class B loading
   ii) Impact effect
   iii) IRC Class AA and 70 R loading

Q.4  a) Explain any one for analysis of a T bridge:
   i) Rankine grash off method
   ii) Pigeauds method

b) A T-beam bridge has to be provided across a channel having the following data design the bridge deck:
   Flood discharge = 30 m$^3$/s
   Side width = 12 m
   Side slope = 1:1
   Sed Level = 50 m
   HFL = 51.25 m

**PART-B**

Q.5  a) Briefly describe the component of plate girder with neat sketches. Explain why the plate girder bridges are economical for the construction of long span? Describe the design criteria of web and end bearing stiffener.

b) Design a welded plate girder bridge for a broad gauge railway line (single track) with splayed type wing walls across a stream having the following cross sectional detail:
<table>
<thead>
<tr>
<th>Distance in m</th>
<th>0</th>
<th>7.5</th>
<th>15</th>
<th>22.5</th>
<th>30</th>
<th>37.5</th>
<th>45</th>
<th>52.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground level in m</td>
<td>188.7</td>
<td>188.5</td>
<td>181.5</td>
<td>180.5</td>
<td>180</td>
<td>181</td>
<td>182.5</td>
<td>188.5</td>
</tr>
<tr>
<td>Hard rock level in m</td>
<td>181.2</td>
<td>181</td>
<td>179</td>
<td>178.5</td>
<td>177</td>
<td>178</td>
<td>179</td>
<td>180</td>
</tr>
</tbody>
</table>

Formation level of embankment = 189.5
Discharge in the stream = 140 m$^3$/s
Maximum flood level = 186.0 m
Permissible efflux = 15 cm
Permissible bending stress in steel = 165 N/mm$^2$
Permissible shear stress in steel = 100 N/mm$^2$
Permissible bearing stresses = 187.5 N/mm$^2$
Permissible shear stress in weld = 102.5 N/mm$^2

10
Q.6  
a) What do you understand by a bearing? Explain different types of bearings with neat sketches and components.  

10

b) Design a mild rocker bearing transmitting the superstructure reactive load of 1200 kN. Allowable pressure on bearing block = 3.8 MPa, permissible bending stress $f_y = 165$ MPa, Permissible bearing stress = 100 MPa, permissible shear stress = 100 MPa.  

10

Q.7  
a) What are the various components of the open well foundation?  

5

b) A well foundation is to be designed for an abutment of 10m X 5m base dimension. The well is founded on a sand and soil. The data available is as follows:  
Ht of the bearing above the maximum scour level = 28 m  
Permissible horizontal displacement of the bearing level = 50 m  
Ht of the abutment = 6.0 m  
Total vertical load including weight of the abutment and well = 2000 kN  
Total lateral load at the scour level = 400 kN  
Submerged unit weight of the soil = 9.5 kN/m$^3$  
Design the well and verify the stresses in the steining.  

15
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth Semester
DESIGN OF CONCRETE STRUCTURE-II (C-601)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define bending moment and shear force.
     b) What do you mean by column head?
     c) List various types of staircases used in different types of buildings.
     d) For what purpose a strap footing is used?
     e) Under what conditions pile foundations are used?
     f) List out the factors to be considered while designing a water tank.
     g) Mention four disadvantages of prestressed construction.
     h) What are various methods of analyzing portal frames?
     i) Intze type tanks are used for capacities ranging from _________.
     j) What are various types of losses of prestress?

2x10

PART-A

Q.2  a) Draw the shape of shear force and bending moment diagrams for a continuous beam of four equal spans of length ‘L’ and loaded with a UDL of w N/m.
     b) Design a 3-span continuous beam to carry a superimposed load of 25 kN/m excluding self weight of the beam. Each span is 6 m. The cross section of the beam may be taken as 250 mm x 750 mm. Use M25 concrete and HYSD (Fe 500) bars.

15

Q.3  a) Design a single flight staircase to cover a horizontal span of 4.5 m if the total vertical rise is 3.6 m. There are total 18 steps to rise. The tread is 250 mm. Take live load as 3000 N/m², M25 concrete and Fe 415.
     b) With the help of a neat sketch explain a flat slab. What are its advantages?

10

Q.4  a) What do you mean by combined footings? Under what circumstances they are provided.
b) It is desirable to drive a pile of 300 mm diameter in a sandy clay formation to support a load of 20 kN. Find the length of pile required allowing a factor of safety of 4. Take $\mu = 0.35$, $\phi = 30^\circ$ and $w = 18000 \text{ N/m}^2$.

c) Write a short note on main and rateral reinforcements in a concrete pile.

**PART-B**

Q.5 a) Distinguish between pre-tensioning and post tensioning of pre-stressed concrete.

b) State the assumptions made in prestress concrete design.

c) Explain the design of “end block” of a prestressed member by any one method.

Q.6 a) Design a circular tank to meet the following requirements:
i) Dia of tank = 6 m
ii) Depth of water = 3.75 m
iii) The tank rests on ground.
iv) The walls and base slab are not monolithic. Use M$_{20}$ concrete and Fe 415 steel.

b) Describe different types of water tanks.

Q.7 a) Determine the rotation factor and displacement factor for the given portal frame.
b) Write a short note on method of analysis of a building frame.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
DESIGN OF STEEL STRUCTURES-II (C-602)

Time: 3 hrs
Max Marks: 100

No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you understand by a mechanism?
   b) Define plastic hinge.
   c) Draw stress-strain curve for mild steel.
   d) What are the various components of an industrial building?
   e) Why are purlins provided in an industrial building?
   f) Write the expressions for thickness calculations in steel water tanks.
   g) Why is lining provided inside a steel stack?
   h) What are various types of towers?
   i) Define flat-width ratio in light gauge sections.
   j) Which is the Indian Standard Code for calculation of wind loads?
   2x10

PART-A

Q.2 a) Determine the collapse load for the beam shown in the figure. Here W=wL

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{beam.png}
\caption{Beam diagram}
\end{figure}

10

b) Calculate the value of shape factor for the section shown in the figure.
Q.3  
a) Explain various components of an industrial building with a neat sketch.  

8

b) Design for a truss:
   i) I-section purlins
   ii) Angle purlins
   Spacing of truss = 4.0 m, centre to centre
   Spacing of purlins = 1.8 m, centre to centre
   Pitch of truss = 1 in 4
   Span of roof = 7.5 m
   The vertical load from roof sheets is equal to 180 N/m² while the wind load on roof surface normal to the roof is equal to 1200 N/m². Take $\sigma_{bt} = 165 \, N/mm^2$  

12

Q.4  
Design a circular elevated tank for a capacity of 1,20,000 litres. Also, design the circular. The tank is supported over eight columns. Take $M=-0.00827 \, WR$.  

20

**PART-B**

Q.5  
Design a self supporting chimney for Delhi
   i) Ht of chimney=48 m,
   ii) Dia of cylindrical part=2.5 m
   iii) Brick lining=100 mm; flat topography [Terrain category 2].  

20

Q.6  
a) Define lattice tower and explain various types of bracings used in it with a neat sketch.  

10
b) What are the various loads considered in the design of lattice towers? Explain the calculations of wind load.

Q.7  a) Explain stiffened and unstiffened compression members with the help of neat sketches.

b) Determine the allowable load for the tubular column section shown in figure. Take effective length of the column as 4.5 m and \( f_y = 25 N/mm^2 \)

---

Table for the value of \( K_2 \)-factor is given below:
### TABLE 28. VALUES OF FACTOR \(k\):

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Terrain Category 1</th>
<th></th>
<th>Terrain Category 2</th>
<th></th>
<th>Terrain Category 3</th>
<th></th>
<th>Terrain Category 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class A</td>
<td>B</td>
<td>C</td>
<td>Class A</td>
<td>B</td>
<td>C</td>
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<td>B</td>
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<td>1.03</td>
<td>0.99</td>
<td>1.00</td>
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<td>1.06</td>
<td>1.03</td>
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<td>1.17</td>
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<td>1.31</td>
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<td>1.29</td>
<td>1.26</td>
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<td>1.30</td>
<td>1.34</td>
<td>1.32</td>
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</tr>
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<td>1.35</td>
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<td>1.34</td>
<td>1.39</td>
<td>1.37</td>
<td>1.32</td>
<td>1.36</td>
<td>1.33</td>
</tr>
</tbody>
</table>

**Note:** Intermediate values may be obtained by linear interpolation. It is permissible to assume constant wind speed between two heights, for simplicity.

**Structure size:** Buildings or structures are classified into the following three different classes depending upon their size (i.e., greater horizontal or vertical dimension).
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
IRRIGATION ENGINEERING-II (C-603)

Time: 3 hrs
Max Marks: 100

No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Describe briefly the following:
   a) Khosla curves
   b) Preference of barrage over a weir.
   c) Utility of cistern in Sarda type fall.
   d) Role of undersluices in a weir.
   e) Syphon aqueduct with a sketch.
   f) Definition of flood routing and channel storage.
   g) Conditions for adopting saddle spillway.
   h) Necessity of earthen dam.
   i) Froud number and its relevance.
   j) Seven uses of a storage dam.

2x10

PART-A

Q.2 a) What is a weir? When and where it is to be provided? Draw a simple lay-out plan showing different components.

b) A weir is to be designed across a river with following data:
   i) High flood discharge=2200 m³/s
   ii) Afflux=0.70 m
   iii) Silt factor=0.9
   iv) Average bed level=256.00 m
   v) High flood level=260.60 m
   vi) Pond level=259.70 m
   vii) Regression=0.30 m; Two spans are to be provided for undersluices

Design the following parameters:
   i) Lacy’s clear waterway
   ii) Total length of the weir including spans
   iii) Velocity of flow
   iv) T.Energy levels on u/s and d/s
   v) Crest level of the weir
   vi) Scour depth
vii) Bed levels of cut-off walls
viii) Critical depth

Draw a complete sketch of the cross-section of the weir showing protection units i.e. inverted filter and launching apron indicating all dimensions and levels.

Q.3 a) Describe with a sketch the reasons to provide guide banks in a river.

b) Design all the parameters of a guide bank for a river with following data:
   i) Maximum discharge=7000 m³/s
   ii) H.F.L=105.00 m
   iii) Bed level=100.00 m
   iv) Size of bed material =0.10 mm

c) Draw all important sketches at different cross-sections of the guide bank (showing the length of launching apron) along with a lay-out plan.

Q.4 a) What is a cross-drainage work? Enumerate four types of cross-drainage works with sketches only.

b) Design a siphon aqueduct with following data:
   Canal: Discharge=30 cumsec,
   Bed width= 23.0 m
   Depth of flow=1.7 m
   Bed level of the canal after the cross-drainage work=230.0 m
   Tributary: High flood discharge=850m³/s.
   High flood level=231.30 m
   Bed level=227.60 m
   General ground level=230.00 m
   Flumed width of the channel=12 m

   Calculate or design the following:
   i) Lacy's clear waterway.
   ii) Total waterway length assuming pier thickness of 1.5 m.
   iii) Depth of barrel assuming velocity of 2.5 m/s.
   iv) Total head loss at the entry and in the barrel length.
   iv) Uplift pressure in the bottom of the stale.

c) Design of u/s transition curve.
d) Complete sketch of the cross-sectional view of the aqueduct showing levels and dimensions and plan.

**PART-B**

Q.5  

a) Describe adequately the necessity of U.S.B.R. stilling basin along with its design parameter. Give a well dimensioned sketch. When \( \rho_r > 4.5 \)?  

b) An overfall spillway crest is 76.0 m above river bed. The design head of spillway is 6.0 m. The tail water depth above river bed is 14.0 m. The river bed consists of boulders and gravels. Suggest and find the main dimensions of the suitable energy dissipating stilling U.S.B.R. basin.

Q.6  

a) Describe with a sketch the necessity of a fall. Name the four types of important falls. What is a hydel channel?

b) Design a 2.0 m sloping glacis type fall on a channel with following data:

i) Discharge=50 m\(^3\)/s

ii) Bed width of channel=28.0 m

iii) Depth of flow=2.0 m

iv) Bed-level of canal u/s=100.0 m

v) Depth of cut-off wall=2.0 m, Floor length=8.5 m

vi) Slope of glacis=2:1.

_Assume any other suitable data. Calculate:_

i) Mean velocity in channel and velocity head.

ii) Crest level of weir if flumed width is 18.0 m,

iii) Width of crest (2H)

iv) \(E_f\), depth and length of eistern

v) Total length of structure

vi) Exit gradient

**Q.7**

a) Describe briefly the necessity of earthen dam and the clay core.

b) An earthen dam is provided with following dimensions:

i) Height of dam=22.0 m

ii) Top width=5m

iii) Height of water column=19.0 m

iv) Free-board=3.0 m

v) u/s slope 3:1, d/s=2:1
vi) Length of base = 115 m.
Develop the equation of phreatic line or theoretical parabola and draw the actual top seepage line. Calculate the ordinates at \( x = 0, 15, 30, 45, 60 \text{ and } 75.0 \text{ m} \). Calculate the value of “a” and draw a proper sketch.

15
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
TRANSPORTATION ENGINEERING-II (C-604)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) List components of rigid pavements.
b) What do you mean by GI index?
c) What is function of tie bars?
d) For which purpose contraction joints are provided in a pavement.
e) What is function of hoe and shovel?
f) Compare hot mix and cold mix.
g) Write the equation to find out radius of relative stiffness.
h) List various critical load positions in rigid pavements.
i) What is recommended value of camber for gravel and W.B.M surface in hill roads?
j) Define a pilot tunnel.

2x10

PART-A

Q.2
a) Explain the C.B.R. method of pavement design. Discuss the advantages and limitations of C.B.R method of design.

10

b) Discuss the various factors affecting design of pavements.

10

Q.3
a) Calculate the stresses at interior, edge and corner of a cement concrete pavement by Westergaard’s stress equation:
Modulus of elasticity of concrete=3.0x10^5 kg/cm^2
Poisson’s ratio of concrete=0.15
Thickness of concrete pavement=18 cm
Modulus of subgrade reaction=8.5 kg/cm^2
Wheel load=5100 kg
Radius of loaded area=15 cm.

10

b) Explain the effect due to expansion and contraction of cement concrete slab and discuss the types of stresses induced.

10
Q.4  a) Write down construction steps of gravel roads.  

b) Write short notes on:
   i) Use of geo synthetics
   ii) Prestress concrete pavements

PART-B

Q.5  a) What are the materials required and construction steps for built up spray grout?

b) What are the functions of:
   i) Prime coat
   ii) Bituminous surface dressing
   iii) Seal coat
   iv) Tack coat

Q.6  a) Discuss the importance of highway drainage.

b) What are the special points to be considered in the alignment of a hill road? Discuss.

Q.7  a) With the help of a neat sketch, explain different shape and size of tunnels.

b) What are methods of soft ground tunneling? Explain any one in detail.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
ENVIRONMENTAL ENGINEERING (C-605)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is a dystrophic?
b) What is the purpose of aeration of polluted water?
c) What is the full form of RPM and EDA?
d) What is a tri-cycle?
e) Differentiate between sullage and sewage.
f) What is BOD$_5$ at 20°C?
g) What is strong sewage and what is stale sewage?
h) What is TOD?
i) What is an intermittent filter?
j) Why is a skimming tank used?

2x10

PART-A

Q.2
a) Explain major sources of air pollution. Write in details about various effects of air pollution to our environment with an example.

10

b) A factory uses 1.6 ML of fuel oil per month. The exhaust gases from the factory contain the following qualities of pollutants per ML per year:

i) Particulate matter=3.5 t/year
ii) $SO_2 = 20.5t/\text{year}$
iii) $NO_x = 5t/\text{year}$
iv) $HC, CO$ and others $= 3.5t/\text{year}$

Determine the safe height of the chimney required for the safe dispersion of the pollutant.

5

c) What do you mean by particulate matter? Give three examples of particulate matter.

5
Q.3  

a) Discuss about the classification of solid wastes according to sources of waste, nature of chemical and biological characteristics of wastes as well as handling facilities of solid waste management. 

10 

b) In a solid waste management system, per capita solid waste under community bin collection system is 350 gm/day. Given the density of solid waste is 550 kg/m$^3$ and the population of that municipality is 1,00,000. Design the size and number of community bins required for the ward. Consider 6 persons per family and 1bin is to be provided for 25 families. 

10 

Q.4  

a) Calculate the diameter and discharge of a circular sewer laid at a slope of 1 in 500 when running half full and with a velocity of 2.5 m/s. Take $N=0.012$ in Manning's formula. 

5 

b) What are the sources of sanitary sewage? What are the factors that influence DWF? 

5 

c) A 60 cm diameter sewer is required to flow at 0.4 depth on a grade ensuring a degree of self cleansing equivalent to that obtained at full depth at a velocity of 85 cm/s. Find the required grade, associated velocities and rates of discharge at full depth and 0.4 depth. Take $N=0.015$ at all depth of flow. 

10 

PART-B 

Q.5  

a) Explain carbon cycle and sulphur cycle with proper diagrams and steps involved in details. 

10 

b) Differentiate between BOD, COD and TOD. 

5 

c) A 2% solution of a sewage sample is incubated for 5 days at 20$^\circ$C. The depletion of oxygen was found to be $5mg/l$. Determine the BOD of the sewage. 

5 

Q.6  

a) What do you understand by grit chambers? Why is it necessary to provide a grit chamber? Explain the configuration of a grit chamber with help of neat sketches. 

10
b) Write a short note on racks and screens.  

c) Write a note on comminutor and barminutors.  

Q.7  
a) What are the causes of water pollution? What are prevention measures that need to be taken to control water pollution?  

b) Give an about line about effluent standards as per BIS standards. Give an outline about drinking water standards as per BIS standard.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
ESTIMATING AND COSTING (C-801)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Describe the principle of estimation.
     b) What do you understand by schedule of rate?
     c) Describe the need of security money.
     d) Why is rate analysis important?
     e) Explain measurement book.
     f) What do you understand by administrative sanction?
     g) Explain the difference between salvage and scrap value.
     h) What do you understand by PWD works?
     i) Muster roll is an important field document. Explain it.
     j) What do you understand by retention money?

2x10

PART-A

Q.2  From the sketch given in figure (given on the overleaf) calculate the quantities and prepare an abstract of quantities for the following items of works:
    a) PCC in foundation.
    b) DPC 40 mm thick.
    c) Brickwork in superstructure.
    d) Flooring.

20

Q.3  a) Specification has an important bearing on quality of civil engineering works. Discuss importance of detailed specifications.

6


14

Q.4  a) Write down a short note on analysis of rates, discussing in detail the factors which affect it.

7
b) Find out rate analysis for excavation in a trench for foundation.  

13

PART-B

Q.5  
a) Describe in detail the various terms and conditions of contract which are to be formulated while inviting tender for a civil engineering works.  

10
b) Describe any one method of approximate estimation in brief.  

5
c) What are different type of bills and describe any one briefly?  

5

Q.6  
a) Write a short note on final payment.  

8
b) What all important points are to be kept in mind while maintaining a muster roll?  

6
c) Classify at least any five items of work in a load bearing building. Write down their method of measurements and their units.  

6

Q.7  
a) Explain in detail the various purposes of valuation.  

10
b) A first class type building is situated in sector-16 Gurgaon on a land of 500 sqm. Built up portion is 25 m x 15 m. The building is complete with water supply, sanitary and electrical fitting and is 30 years old. Work out the valuation of the property. Assume suitable land rate.  

10
NOTES:
1. All dimensions are in MM.
2. All Brick Work shall be 230 Th.
3. Door DI: 0.90 M x 2.10 M
4. Window WI: 1.00 M x 1.35 M
End Semester Examination, Dec. 2014  
B. Tech. – Seventh / Eighth Semester  
TENDERING AND VALUATION (C-802)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  

a) How many corrigendums can be issued against a tender?  
b) Who can participate in a closed tender?  
c) Define costing of a tender.  
d) What is a Lump-Sum tender?  
e) What do you understand by a award of work without call of tenders?  
f) Define earnest money.  
g) What is re-invitation of tenders?  
h) What is the work of evaluation panel?  
i) Indian Contract Act was passed by_________.  
j) When Arbitration Act is introduced in India.  

2x10

PART-A

Q.2  

a) What are the various types of tenders and why these are published in the newspapers?  

10  

b) What is the importance of tender writing? Also write down the instructions given to the tenderers.  

10

Q.3  

a) Draw Generic tender cost model.  

10  

b) Explain the various types of forms used for tenders.  

10

Q.4  

a) Define earnest money. Also explain in details about refund of earnest money.  

10  

b) Explain in details the tendering process. Also draw a flow chart for the same.  

10

PART-B
Q.5 a) How the recommendation report of the tenders is prepared? Explain.  
10

b) Define the following:
   i) Tender validity period. ii) Financial capacity.
   iii) Project risks. iv) Non-confirming tenders.
   v) Tender document.  
2x5

Q.6 Explain the following with respect to the Indian Contract Act:
   a) Essential elements of the wagers and their contingencies.  
10
   b) Discharge of a contract and its types.  
10

Q.7 a) What do you understand by arbitration? List the causes under which it becomes necessary.  
10

b) Explain the following terms:
   i) Arbitrator. ii) Prior to arbitration.
   iii) Pre hearing conference. iv) Selecting an arbitrator.
   v) Joint exhibits.  
2x5
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
HYDROLOGY (C-803)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms:
   a) Hydrologic cyclic.
   b) Precipitation.
   c) Transpiration.
   d) Evapo-transpiration.
   e) Infiltration indices.
   f) Natural flow.
   g) Staff-gauge.
   h) Synder’s synthetic UH.
   i) Effective rainfall.
   j) Aquitard and aquifuge.

   2x10

PART-A

Q.2 a) Describe the hydrologic cycle. Also discuss the hydrological water budget with the aid of examples.
   10

   b) An area is composed of square of side 10 km and an equilateral triangle placed on the left side. The annual precipitation recorded at four corners clockwise from the top corner is 460 mm, 650 mm, 760 mm and 800 mm, respectively. The apex of triangle has recorded 800 mm of the annual precipitation. Find the mean precipitation over the area by Thiessen polygon method.
   10

Q.3 a) Explain briefly the evaporation process and describe a commonly used evaporimeter.
   10

   b) A reservoir with the surface area of 250 hac as the value of saturated vapour pressure as 17.54 mm of hg and actual vapour pressure of 7.02 mm of Hg. Wind velocity at 1 m above ground is 16 kmph. Find the average daily evaporation from this law and volume of water evaporated from this lake in 1 week. Given K_m=0.36.
Q.4  
   a) Explain briefly the infiltration process and how the measurement of infiltration takes place.  
   b) A storm with 10 cm precipitation produces a direct run-off = 5.8 cm. The time distribution of rainfall is given below:  
      | Time from start (hrs) | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  |
      | Cummulative rainfall (cm) | 0.4 | 0.9 | 1.5 | 2.3 | 1.8 | 1.6 | 1.0 | 0.5 |
   Calculate the Ø index.

PART-B

Q.5  
   a) Discuss about the various catchment characteristics.  
   b) Discuss in details about the velocity measurement by horizontal and vertical current meter.

Q.6  
   a) List the factors affecting runoff hydrograph. Discuss the role of these factors.  
   b) Ordinates of 3 hr UH are given below. Find the ordinate of 6 hr UH using S-curve.  
      | Time (hrs) | 0  | 3  | 6  | 9  | 12 | 15 | 18 | 21 |
      | Ordinate of 3hr UH | 0  | 20 | 50 | 60 | 50 | 40 | 10 | 0  |

Q.7  
   a) Discuss the various type of aquifers. Illustrate the answer with suitable sketch.  
   b) Derive the basic differential equation of unsteady groundwater flow in a confined aquifer. State clearly the assumptions involved.
End Semester Examination, Dec. 2014  
B. Tech. – Seventh / Eighth Semester  
FOUNDATION ENGINEERING (C-804)  

Time: 3 hrs  

Max Marks: 100  

No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  

a) What do you mean by stability number?  
b) Define finite and infinite slopes.  
c) What is active earth pressure?  
d) Name different types of anchored sheet piles.  
e) Draw plan of a sheet pile wall.  
f) What is the difference between disturbed and undisturbed samples?  
g) Define the term net safe bearing capacity.  
h) What is the purpose of doing standard penetration test in soil?  
i) Explain the term transmissibility.  
j) If the circular frequency $\omega$ is 30 $\pi$ radians per second, the time period is ____________.  

2x10  

PART-A  

Q.2  

a) What do you mean by factor of safety? What are different factors of safety used in stability of slopes?  

5  
b) Discuss friction circle method for the stability of slopes. Can this method be used for purely cohesive soil?  

15  

Q.3  

a) What are different types of earth pressure? Give examples.  

5  
b) Determine the active pressure and passive pressure, using Coulomb’s theory, on the wall as shown in the figure:
Q.4  a) What are different types of sheet pile walls? Draw the sketches showing the pressure distribution for anchored sheet pile with free earth support.

10

b) What is arching effect and why struts are used in braced open cuts?

10

**PART-B**

Q.5  a) What are the factors which affect the depth of foundation? Discuss Rankine’s formula for the minimum depth.

10

b) What are the conditions where a pile foundation is more suitable than a shallow foundation? List various types of pile foundations.

10

Q.6  a) Describe plate load test. What are its limitation and use?

10

b) A circular foundation is of 2.4 m dia. If the depth of foundation is 1 m, determine the allowable load.

Take: \( \gamma = 19 \text{ kN/m}^3 \), \( C = 30 \text{ kN/m}^3 \), \( \phi = 15^\circ \) and factor of safety as 3.0. Use Terzaghi’s equation and assume general shear failure. Take \( N_c = 12.9 \), \( N_q = 4.4 \), \( N_r = 2.5 \).

10

Q.7  a) Determine the natural frequency of a machine foundation having a base area 2 m \( \times \) 2 m and a mass of 10 Mg, assuming that the soil mass participating in the vibration is:

i) Negligible.

ii) 20% of the mass.

Take: \( C_u = 3 \times 10^4 \text{ kN/m}^2 \).

10

b) Explain the following terms:

i) Natural frequency.

ii) Period.
iii) Damping.
iv) Forced vibrations.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
ELEMENTS OF EARTHQUAKE ENGINEERING (C-821A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Magnitude of earthquake.
   b) Seismic design philosophy.
   c) Irregular building.
   d) Imposed loads.
   e) Ductile failure.
   f) Ductility factor.
   g) Different types of tests conducted on structure.
   h) Prism strength of masonry.
   i) Vertical reinforcement at corner and jambs of masonry.
   j) Modes of vibration.

Q.2 a) Explain briefly characteristics of ground motion. 5
   b) Describe seismographs with a sketch. 5
   c) Define liquefaction. What are the factors that affect liquefaction? 10

Q.3 a) Discuss the effect of symmetry and elongated shape of the building on the earthquake resistance of the structure. 5
   b) How do you design earthquake resistant masonry building? 7
   c) Discuss lateral force resisting structural system. 8
Q.4 A four storeyed building is to be constructed in a seismic zone IV on a plot of 10 m x 10 m. The building is to be designed with special moment resisting frame. Determine the base shear of the building and sketch the same.

Live load = 3 kN/m²
Slab thickness = 150 mm
Size of column = 300 x 300
Size of beam = 250 x 350
Wall thickness = 230 mm
Soil of the area: medium hard
Height of each storey = 3.25 m

**PART-B**

Q.5 For the three storeyed building shown in the figure. The dynamic properties in the X direction have been obtained by carrying out a free vibration analysis as shown in the figure. Obtain in design seismic force in X direction by dynamic analysis method and distribute it along the building height. Assume zone IV and ordinary moment resisting frame.

Q.6 a) Explain weak beam and strong column concept.
Q.7  

a) Sketch special confining reinforcement for column, beam and foundation.  

6  

b) Explain the methods to determine the strength of existing structure.  

7  

c) How will you retrofit RCC beam and column?  

7
End Semester Examination, Dec. 2014  
B. Tech. – Seventh Semester  
GROUND WATER ENGINEERING (C-823)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write notes on:  
a) Primary porosity and secondary porosity.  
b) Unsaturated zone and saturated zone.  
c) Confined aquifer and unconfined aquifer.  
d) Vadose zone and capillary fringe.  
e) Percussion and rotary drilling rigs.  
f) Boundary conditions for ground water flow domain.  
g) Radius of influence for tubewell.  
h) Casing pipe, well pipe and strainer pipe.  
i) Role of gravel packing.  
j) Drilling fluid is used during tube well drilling.

2x10

PART-A

Q.2 a) Explain the Dupuit assumptions for ground water flow with phreatic surface.  
10  
b) Derive the basic continuity equation of flow based upon the Dupuit assumptions.  
10

Q.3 a) Derive the Thiem equation for steady-state flow in a confined aquifer; clearly indicating the assumptions.  
10  
b) Design a tubewell from the following data:  
Yield required 0.2 cumec. Thickness of the confined aquifer 40 m. Radius of influence 300 m. Permeability coefficient 80 m/ day. Drawdown 6 m.  
10

Q.4 Explain different types of tubewells with diagrams according to different criteria of classification.  
20

276/4
**PART-B**

Q.5 Describe the complete process of cavity tubewell installation including site selection and geological consideration, drilling, well log preparation, tubewell assembly and its lowering, development of cavity and commissioning of the tubewell in alluvial aquifer.

20

Q.6 a) What are the basic considerations for selecting a site for artificial ground water recharge?

5

b) Describe the different techniques adopted for artificial ground water recharge. 15

Q.7 a) Describe the set-up used for hydraulic testing of pumps and the testing procedure adopted for centrifugal pumps.

10

b) A centrifugal pump equipped with a variable speed drive running at 3500 rpm is discharging 1000 litre/s. corresponding with a head of 86 m. The horsepower is 35.5. If the pump’s speed is reduced to 2900 rpm, what will be the revised flow rate, head and power required? The impeller of the pump has not been changed.

10
Q.1 a) What do you understand by perception reaction time? Give the expression for braking distance.
b) What are the objectives of carrying out volume studies?
c) What is the PCU value of car, bike and bullock-cart?
d) Define basic capacity of road.
e) List the various types of traffic control devices in detail.
f) Express the various equations used in Webster’s method of designing signal time.
g) Mention at least four design factors for design of a rotary.
h) What do you understand by road pricing?
i) Mention at least four parts of a vehicle that contribute to the generation of noise.
j) Draw a neat sketch of full cloverleaf and show the traffic movement.

Q.2 a) Indicate the maximum dimensions and weight of vehicles allowed in India, as specified by IRC. Discuss the effect of wider vehicles on the road.

b) What is the significance of road user characteristics in traffic engineering? Discuss the various factors which affect the road user characteristics.

Q.3 a) Explain spot speed, running speed, space mean speed, time mean speed and average speed. How are spot speed studies carried out?

b) Indicate how the traffic volume data are presented and the results used in traffic engineering.

c) What are the various causes of traffic accidents? Discuss briefly.
Q.4  
   a) Discuss briefly the various factors affecting the practical capacity of road.  

   b) i) Explain the relationship between speed, travel time, volume density and capacity.

   ii) What are the factors on which PCU values depend.

   iii) Explain the level of service concept while deciding the design capacity of a road.

Q.5  
   a) Design the timing of an isolated signal to be installed at a right angled intersection when roads P and Q cross. The data available are:

   **Road P**
   - Width (meter): 14
   - Peak hour traffic volume per hour per lane: 128
   - Approach speed (kmph): 50

   **Road Q**
   - Width (meter): 10.6
   - Peak hour traffic volume per hour per lane: 200
   - Approach speed (kmph): 35

   b) What is a traffic rotary? Enumerate the various types of intersections and the basic principles involved. Also explain the factors to be considered in rotary intersection design.

Q.6  
   a) What are the various aspects considered in the regulation of vehicles?

   b) Write in brief the goals and objectives of traffic enforcement.

   c) What regulations concern the driver cover?

Q.7  
   a) Explain the various detrimental effects of traffic on our surroundings.

   b) What are the various fuel properties which affect the consumption of fuel? Also explain the factors which affect the fuel consumption.
End Semester Examination, Dec. 2014
B. Tech. (Integrated) – Second Semester
INDUSTRIAL CHEMISTRY (CH-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) If a water sample contains bicarbonate ions only, which indicator will determine its alkalinity.
   b) Which type of ions is responsible for alkalinity?
   c) How many types of hardness are present in water?
   d) Define phase rule.
   e) What is soil corrosion?
   f) What are flash point and fire point?
   g) Write a brief note on the application of liquid crystal polymer.
   h) What are the important applications of nanomaterials in applied field?
   i) Write application of composites in different fields.
   j) Write any three characteristics of good lubricating oil.

2x10

PART A

Q.2 a) 50 ml of water sample required 8 ml of N/50 H₂SO₄ for neutralization to phenolphthalein end point. After this methyl orange indicator was added and a further 9 ml of the same acid required for neutralization. Calculate the type and extent of alkalinity in the water sample.

6

b) Explain electro dialysis method for desalination of water along with a suitable diagram.

7

c) What do you mean by softening of water? Discuss ion exchange method for softening of water.

7

Q.3 a) Discuss the following:
   i) Galvanic corrosion.
   ii) Pitting corrosion.

3x2

b) Explain rusting of Fe with the help of a diagram and chemical reaction.

7
Q.4 a) Explain the following terms:
   i) Phase
   ii) Eutectic point.
   iii) Degree of freedom.
   iv) Reduced phase rule.

b) Describe the Pb-Ag phase diagram.

c) Write application of phase rule in various field.

Q.5 a) Write notes on the following:
   i) Aniline point
   ii) Saponification number.

b) What are the important function of lubricants? Discuss the mechanism of boundry lubrication.

c) What are the composite? Classify them on the basis of matrix.

Q.6 a) Discuss the important properties of speciality polymer.

b) Write a brief note on the biodegradable polymer.

c) Write preparation and applications of the following:
   i) Conducting polymers.
   ii) Fire retardant polymer.

Q.7 a) What do you mean by the term: nano? Discuss the significance of nanoscience and nanotechnology in engineering field.

b) Explain electrode position method with a suitable diagram.

c) Discuss the principle and application of SEM technique. Write advantages of AFM technique over SEM technique.
End Semester Examination, Dec. 2014  
B. Tech. – First Semester  
INDUSTRIAL CHEMISTRY (CH-101A)

Time: 3 hrs 
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the suspended colloidal impurities? How they can be removed from water?
   b) As per (WQS) Water Quality Standards, what is the limit of TDS in water.
   c) What is the role of bleaching powder in water?
   d) Write the structure of EDTA.
   e) Write the chemical formula of potash alum.
   f) Define alkalinity of water.
   g) How are exhausted ion exchange resins regenerated?
   h) Write any three applications of LCPs (liquid crystal polymers).
   i) What is the difference between dry and wet corrosion?
   j) Write a short note on future scope of nanotechnology.

2x10

PART-A

Q.2 a) Describe the Zeolite process used for the softening of water. What are the advantage at this method? 7

b) Describe the various steps used in domestic water treatment. 7

c) 100ml of water sample required 4ml of $\frac{N}{50} H_2SO_4$ for neutralization of phenolphthalein end point. Another 16ml of same acid was needed for further titration to methyl orange end point. Determine the type and amount of Alkalinity. 6

Q.3 a) Write the mechanism of electrochemical theory of corrosion with a suitable diagrame and chemical reactions. 8

b) Explain with diagrame and chemical reactions:
i) Galvanic corrosion
ii) Differential aeration corrosion

c) Explain sacrificial anodic protection.

Q.4 a) Draw a well labeled phase diagram of Pb-Ag system. Discuss the desilverization of Pb.

Q.4 b) What is mean by congruent M.P.? Explain with the help of a phase diagram.

Q.4 c) Explain following terms with examples:
   i) Triple point
   ii) Components

PART-B

Q.5 a) What are composites? Write the properties and applications of CMC and PMC.

Q.5 b) Write notes on:
   i) Viscosity index
   ii) Flash point and fire point

Q.5 c) Write a brief note on extreme pressure lubrication.

Q.6 a) What are conducting polymers? Write their important properties and application in engineering.

Q.6 b) What do you mean by smart batteries? Write their applications.

Q.6 c) Write difference between a dry and a wet cell.

Q.7 a) Discuss the principle and applications of SEM technique. Is AFM a better technique than SEM? Explain.

Q.7 b) Write the name of conventional techniques for the preparation of nanomaterials. Explain sol-gel technique.
c) What do you mean by the term nano? Discuss the significance of nano technology in engineering fields.
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
ENVIRONMENTAL SCIENCE AND GREEN CHEMISTRY (CH-201)

Time: 1 hrs
Max Marks: 50

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Fill in the blanks:
   a) Pollutants released directly into the air in harmful form are known as ______.
   b) PTC is also called ________.
   c) NO₂ and ________ cause acid rain.
   d) Claisen and Fries rearrangement are the examples of ________ reactions.
   e) Itai-itai is caused by the contamination of ________.
   f) ________ is the process when levels of non-biodegradable pollutants increase through the food chain.
   g) Biodiesel is an example of ________ principle of green chemistry.
   h) Lignin, switch grass and cellulose are all types of ________.
   i) ________ or VOCs have been replaced and banned in some paints.
   j) Glucose can be used as the starting material in place of benzene in the synthesis of ________.

1x10

PART-A

Q.2 a) What are green house gases? What is their contribution to the global warming?
   b) What roles does ozone play in the troposphere and stratosphere? Elucidate
   c) How would you broadly divide the major regions of the atmosphere?
2½x4

Q.3 a) Characterize the toxic effects of CO in the body. Is the effect reversible or irreversible?
   b) What are the environmental harms caused by mercury?
   c) What is the role of pharmaceuticals as emerging contaminants?
   d) Write a note on carcinogens.
2½x4

Q.4 a) Explain the mechanism of formation of acid rain.
   b) Give any two techniques used for sampling of gaseous pollutants.
   c) How is electrochemistry helpful in removing metals from the contaminated solutions?
d) Suggest any two methods to control NOx pollution.
   \[2\frac{1}{2}x4\]

**PART-B**

Q.5  
  a) Write a note on versatile bleaching agent indicating its advantages over traditional bleaching agent.

   \[3\]
  
  b) How can the formulations be modified to minimize or to avoid formation of hazardous chemicals?

   \[3\]
  
  c) Discuss any four principles of green chemistry.

   \[4\]

Q.6  
  a) What are the important points to be considered while designing a green synthesis? Discuss any three.

   \[3\]
  
  b) How do you differentiate between percentage yield and atom economy?

   \[3\]
  
  c) Explain the statement- “Microwave-assisted synthesis as a green technology”.

   \[4\]

Q.7  
  a) What is the role of catalysts in the development of a more economic and environmentally friendly chemical industry?

   \[3\]
  
  b) Write a note on green economy.

   \[3\]
  
  c) How can green chemistry provide green technology solutions for a sustainable future?

   \[4\]
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
ENVIRONMENTAL SCIENCE AND GREEN CHEMISTRY (CH-201A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Fill in the blanks:
a) ________ on inhalation dissolves in the blood hemoglobin more rapidly than oxygen.
b) Air pollution from automobiles can be controlled by fitting ________________.
c) Dissolved O₂ needed by microbes to decompose organic waste is known as ________________.
d) The main atmospheric layer near the surface of earth is ________________.
e) Minamata is caused by the contamination of ________________.
f) ________________ is the father of Green Chemistry.
g) The term used to measure a product on person’s environmental impact is ________________.
h) ________________ is fulfilling the needs of the present generation without compromising the ability of future generations to meet their needs.
i) RRR stands for ________________.
j) ________________ is an excellent green solvent as well as a greenhouse gas. 1×10

Explain the following questions:
k) Which event led to the birth of Green Chemistry initiatives?
l) What is the role of DMC?
m) What is Ultrasound Synthesis Method?
n) What are renewable and non-renewable resources?
o) How does exposure to benzene affect health?

2×5

PART-A

Q.2 a) What are various effects of thermal pollution? Give its control measures also. 6
b) Discuss ozone hole and its effects on human health.

6

c) How does the earth control its radiation balance so as to maintain its average surface temperature of $15^0\text{C}$?

4

d) What is population explosion? How does it affect a developing nation like India?

4

Q.3 a) Discuss the uses of cyanide. What are the symptoms of cyanide poisoning? Suggest initial treatment for the same.

6

b) Discuss the atomic absorption spectrometry in detail. What are its various applications?

6

c) What are the biochemical effects of lead? Why the children are at the greater risk due to its exposure?

4

d) Give the role of nanoparticles as emerging contaminants.

4

Q.4 a) How do you design the water quality monitoring programme? What precautions should be taken while collecting water samples?

6

b) What is toxicity assessment? Illustrate giving examples the different types of toxic effects?

6

c) How can we prevent and control air pollution?

4

d) What are the objectives of soil quality monitoring?

4

PART-B

Q.5 a) Explain the principles of:

i) Less hazardous chemical synthesis.

ii) Design for energy efficiency.

6

b) What are the benefits of Green Chemistry? How can you relate them to industries/business?

6

c) List some of the hazards associated with the chemical synthesis of adipic acid used to make nylon.

4
d) How will you calculate the atom economy (AE)? Explain giving an example. 4

Q.6 a) What is microwave synthesis? Give its benefits and different approaches. 6
   b) Write four examples of green synthesis with their reactions. 6
   c) Write a note on phase transfer catalysis. 4
   d) What is supercritical carbon dioxide? What are its advantages? 4

Q.7 a) What are the different principles of green engineering? Explain giving examples. 8
   b) How green chemistry can be helpful in improving the state of the environment? 4
   c) What are the future trends in green engineering? 4
   d) What is the significance of green engineering? 4
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Third Semester  
FLUID MECHANICS (C-I-301)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Newton’s law of viscosity.
   b) Differentiate between absolute and vacuum pressure.
   c) What do you mean by resultant pressure and centre of pressure?
   d) What do you mean by laminar and turbulent flow?
   e) Write the application of venturimeter.
   f) What is difference between notch and weir?
   g) Describe the velocity distribution in a pipe for laminar and turbulent flow.
   h) Explain the various parameter associated in the expression of head loss due to friction.
   i) Define hydraulic gradient line and total energy line.
   j) What do you mean by most economical channel section?

   2x10

PART-A

Q.2 a) Derive an expression for total pressure, centre of pressure and resultant pressure for a circular plate immersed in water body with the inclination of angle \( \theta \) with water surface.

   12

b) What is a piezometer tube? Explain the application of piezometer tube in fluid mechanics with suitable sketch.

   8

Q.3 a) Calculate the rate of discharge of the water flowing through a pipe of 12 cm and average velocity of flowing water is 8 \( m/s \)? Also determine the velocity at the other end, if the pipe dia is changed to 20 cm.

   12

b) State the difference between:
   i) Steady and unsteady flow
   ii) Uniform and non-uniform flow

   4x2
Q.4 Explain the following:
   a) Real flow and ideal flow with example.
   b) Cohesion, adhesion, viscosity and capillarity.
   c) Mass density, specific weight, specific gravity and compressibility.
   d) Fundamental units and international system of units.

5x4

PART-B

Q.5 a) A right angle V notch is used to measure the discharge of a flow with the depth of flow as 35 cm, calculate the discharge over the notch in litre per minutes.
   b) Write short notes on:
      i) Venturimeter and orificemeter
      ii) Notches and weir.
      iii) Mouthpiece and current meter.
      iv) Velocity of approach.

3x4

Q.6 a) Calculate the head loss due to friction in a pipe of 1.5 m diameter and 20 km long, for the water flowing with the velocity of 2 m/s. Take the coefficient of friction as 0.005. What will be loss if dia is decreased by 25% and velocity is increased by 25%.
   b) Draw the total energy gradient and hydraulic gradient line for a pipe flowing from reservoir A to B with length L and difference of elevation h. What will be change in H.G.L. and T.E.L. if pope suddenly contract at half dia at length of L/2.

12

Q.7 a) Calculate the discharge through a rectangular channel of 5 m wide and 4 m deep, with a slope of 1/1000. Use Manning’s formula. (n = 0.02)
   b) Derive an expression for most economical channel section for rectangular and trapezoidal channel section.

10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
GENERAL ENGINEERING (C-I-302)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Name different sources of power transmission.
b) What are applications of pulley?
c) Differentiate between refrigeration and air-conditioning.
d) What are different types of pumps?
e) Write the important characteristics of refrigerant.
f) Differentiate between AC and DC.
g) Define current and write its unit.
h) Name instrument used to measure current and voltage.
i) Convert on kW power into horsepower.
j) Write applications of single phase connection.
  2x10

PART-A

Q.2  a) How power is transmitted through belt.
     8
     b) Define the terms used in gear drive system.
     12

Q.3  a) Explain the principle of air conditioning system.
     10
     b) What type of refrigerant is used in centralized air conditioning system?
     10

Q.4  a) Write the function of pump.
     5
     b) Explain in detail, the working principle of any type of pump.
     15

PART-B
Q.5  a) What are the sources of electricity generation?  
      b) Why electrical energy is more important than other types of energy sources. 
          Write few applications of electricity.  

Q.6  a) How will you identify three phase wires, neutral wire and the earth wire on a 
      low voltage distribution system?  
      b) Distinguish between single phase and three phase power supply.  

Q.7  a) What do you mean by star delta starter? Write its application.  
      b) Differentiate between electric motors and electric pumps.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
CONCRETE TECHNOLOGY (C-I-401)

Time: 3 hrs 
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you mean by segregation?
b) What is silica fume concrete?
c) Define admixture.
d) List the precautions to be taken during placing of concrete.
e) What is hot weather concreting?
f) What is water cement ratio?
g) Write down the composition of cement.
h) Why silica fume is added to concrete?
i) What is hydration of cement?
j) What is the purpose of using air entraining admixtures?

2x10

PART-A

Q.2 a) Explain in brief the various types of cement.

10

b) Describe the classification of aggregate.

5

c) Why concrete is preferred over other building materials?

5

Q.3 a) Describe in brief the properties of concrete in hardened state.

8

b) How workability of concrete is determined?

6

c) What is Duff Abram’s water cement ratio law?

6

Q.4 a) Difference between normal and controlled concrete. Explain with suitable example.

10
b) Explain in brief the concept of mix design. 
10

**PART-B**

Q.5 Explain the following:
   a) Water reducers.
   b) Fly ash.
   c) Air entraining admixture.
   d) Difference between mineral and chemical admixture. 
5x4

Q.6 a) Explain silica fume concrete along with its application. 
10
   b) Describe briefly hot weather concreting along with example. 
10

Q.7 a) How storage of cement is done? What is the effect of storage on the strength of concrete? 
10
   b) How curing of concrete is done? What are the defects in concrete? 
10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
SOIL AND FOUNDATION ENGINEERING (C-I-403)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define relative density.
b) Write down relation between bulk density, dry density and water content.
c) List laboratory methods of permeability measurement.
d) What is neutral stress?
e) Name various types of rollers.
f) Define net safe bearing capacity.
g) What is use of geotextiles?
h) The group index of a soil sub grade is 7. The subgrade soil is rated as ______.
i) Classify pile foundation on the basis of material.
j) Define liquid limit.

2x10

PART-A

Q.2 a) A natural soil deposit has water content of 6% and bulk density of 1.7 gm/cc.
i) Calculate amount of water required to be added to 1 cum of soil to raise water content to 18%.

10

ii) The value of degree of saturation if void ratio remains constant. Take G=2.67.
b) Explain salient features of plasticity char.

10

Q.3 a) What is coefficient of permeability? Explain various factors affecting permeability.

10

b) What are the steps involved in performing constant hea permeability test in lab? Explain.

10
Q.4  a) What is effective stress principle? Explain its importance in engineering problems.

10

b) Define stresses which occur in sub soil. Give the relationship between them.

10

PART-B

Q.5  a) What is unconfined compression test? Sketch the apparatus used.

10

b) What is compaction? Discuss in brief the factors that affect compaction.

10

Q.6  a) Discuss standard penetration test. What is the importance of the test in geotechnical engineering?

10

b) Write short notes on:
   i) Sand drain method
   ii) Use of geotextiles

5x2

Q.7  a) What is difference between shallow foundation and deep foundation? Mention various types of shallow foundations with their suitability.

10

b) Discuss different methods for the installation of piles.

10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
SURVEYING-II (C-I-404)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is the objective of preparing a contour map?  
b) What is meant by contour interval and horizontal equivalent?  
c) Differentiate between transit and non-transit type of theodolite.  
d) What is face left and face right observation of theodolite?  
e) What are the instruments used in tacheometry?  
f) Explain the use of an anallactic lens in tacheometer.  
g) What is meant by a “degree of curve”?  
h) What is a tangent clinometer?  
i) What do you understand by GIS?  
j) What is the basic principle of EDM?

2x10

PART-A

Q.2  
a) Define a contour. State various characteristics of contour.  
10  
b) Explain different methods of interpolating contours; state the suitability of each one of them.  
10

Q.3  
a) Explain how would you measure with a theodolite:  
   i) Horizontal angle by repetition.  
   ii) Vertical angle.  
10  
b) Differentiate between the following:  
   i) Close and open traverse.  
   ii) Bowditch and transit rule.  
   iii) Consecutive and independent coordinate.  
10

Q.4  
a) Define tacheometry. What are the methods employed in tacheometric survey? Explain the method most commonly used.  
10
b) Determine the gradient from a point A to a point B from the following observations made with a tacheometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertically.

<table>
<thead>
<tr>
<th>Inst. Station</th>
<th>Staff point</th>
<th>Bearing</th>
<th>Vertical angle</th>
<th>Staff reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>P</td>
<td>134°</td>
<td>+10°32’</td>
<td>1.360, 1.915, 2.470</td>
</tr>
<tr>
<td>B</td>
<td>P</td>
<td>224°</td>
<td>+5°6’</td>
<td>1.065, 1.885, 2.705</td>
</tr>
</tbody>
</table>

**PART-B**

Q.5  
   a) List the various methods of sitting out a simple circular curve. Explain briefly the Rankine method of deflection angle.  
   b) A Circular curve has a 200 m radius and 65° deflection angles. What is its degree?  
      i) By are definitions.  
      ii) By chord definition.  
      Also calculate:  
      1) Length of curve.  
      2) Tangent length.  
      3) Length of long chord.  
      4) Mid ordinate.  

Q.6  
   a) Write short notes on Abney level and explain how to measure vertical angle and slope with it?  
   b) What is tangent clinometer? Describe the use of it with plane table.  

Q.7  
   a) Write short note on total station. Explain its working principle.  
   b) What are different applications of GIS?
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Fourth Semester  
STRUCTURAL MECHANICS (C-I-405)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define stress.  
b) What is principle of superposition?  
c) Define brittle material with suitable examples.  
d) What is poission’s ratio?  
e) Define beam.  
f) Write down the sign convention for shear force.  
g) What are the different assumptions in the theory of simple bending?  
h) Draw a neat sketch of propped cantilever beam.  
i) Define ultimate stress.  
j) What do you understand by column and street?

2x10

PART-A

Q.2 a) Classify the materials on the basis of their physical properties.  
10  
b) Explain with a neat diagram the tensile test curve for mild steel specimen.  
10

Q.3 A hollow cylinder 2 m long has an outside diameter of 50 mm and inside diameter of 30 mm. If the cylinder is carrying the load of 25 kN, find the stress in the cylinder. Also find the deformation of the cylinder, if the value of modulus of elasticity for the cylinder material is 100000 N/mm².

20

Q.4 Draw the shear force and bending moment diagram for the given simply supported beam.

20
**PART-B**

Q.5 Find the moment of inertia of a T-section with flange as 150 mm x 150 mm and web as 150 mm x 50 mm about x-x and y-y axes, through the centre of gravity of the section.

20

Q.6 Calculate the slope and deflection for the cantilever beam carrying a concentrated load at the free and.

20

Q.7 a) Explain with neat figure the different end conditions of column.

10

b) A steel rod 5 m long and of 40 mm diameter is used as a column with and end fixed and other free. Determine the crippling load by Euler’s formula. Take E=2x10^5 N/mm².

10

End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fifth Semester
QUANTITY SURVEYING (C-I-504)

Time: 3 hrs

Max Marks: 100

No. of pages: 3

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Define preliminary estimates.
   b) What do you understand by quantity survey?
   c) Write down rules of measurement.
   d) Define centre line method with the help of a housing project.
   e) What do you understand by abstract estimate of road?
   f) Item to be considered while preparing of detail and abstract estimate of water supply scheme.
   g) Components to be taken while analysis of Portland cements concrete.
h) Contractor profit and overhead during analysis of rates.
i) Materials cost in the rate analysis.
j) Components to be considered in rate analysis of cement plaster.

1x10

**PART-A**

Q.2 a) What do you understand by detail estimate? Explain mid section formula trapezoidal or end areas formula, Prismoidal formula volumes from spot levels used for calculation of quantity of earth works.

10

b) Write notes in **any two**:
   i) Cubic rate estimates.
   ii) Plinth area estimates.
   iii) Preliminary estimates.
   iv) Estimate per unit base.

2x5

Q.3 a) List out units of measurement for the various item of Civil engineering.

<table>
<thead>
<tr>
<th>SI. No.</th>
<th>Item</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site clearing and preparation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Earthwork</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>P.C.C. work</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Brick work</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stonework</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Woodwork</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Shuttering</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Reinforcement</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plastering</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>White washing</td>
<td></td>
</tr>
</tbody>
</table>

10

b) Estimate the quantity of a 1st storey residential building by long wall and short wall method: if.
   i) The plinth area of the building is 4.8 m x 4.2 m.
   ii) Ceiling and depth of foundation is 3.5 m and 1.7 m respectively.

10

Q.4 Estimate quantity of steel and concrete **any two** of:
Conventional beam, wide beam, T-beam, L-beam.

10
a) Conventional beam, 30 cm x 65 cm, longitudinal span = 6.0 m, main reinforcement 6 no of 32 mm dia, vertical stirrups 10 mm dia with stirrups @ 200 mm, Hanger bar 12 mm dia. As shown in figure. Use 1:1.5:3 and 320 kg/m$^3$ of cement.

b) Wide beam, 125 cm x 65 cm, longitudinal span = 6.0 m, Main reinforcement 5 no of 24 mm dia, vertical stirrups 6 mm dia with 2 legged @ 200 mm, Hanger bar 12 mm dia as shown in figure. Use 1:1.5:3 and 320 Kg/m$^3$ of cement.

c) T-beam 45 cm x 80 cm, main reinforcement 8 No of 25 mm diameter vertical stirrups 12 mm $\Phi$ @ 200 mm c/c hanger bar of 12 mm diameter slab 100 mm thick, span of 6 m x 6 m, main reinforcement 16 mm $\Phi$ c 200 mm c/c and distribution bar 6 mm diameter @ 250 mm $\Phi$ c/c as shown in figure. Use 1:1½:3 made of cement of 335 kg/m$^3$ of cement.

PART-B

Q.5 a) Estimate quantity of surface drains any two.
   i)  
   ii)
iii)
iv)

b) Explain with neat sketch mini water supply in City.  
10

Q.6 a) Find out the quantities of cement and sand, stone/aggregate course required for the construction of R.C.C. underground reservoir as shown in figure.

10

b) Calculate quantities of course aggregate, sand and cement to complete the retaining wall of a length 3.7 m as shown in figure. The proposition of concrete is 1:2:4.

Q.7 Rate analysis of the following:

a) Coursed rubble stone masonary in cement mortar (1:6) in super structure, ground floor.  
10

b) 7.5 cm thick cement concrete floor 1:4:8 with over burnt brick chips.  
10
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
FLUID MACHINES AND TURBOMACHINERY (M-402A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define the term: Jet propulsion.
b) A jet of water 5 cm in diameter issues with a velocity of 20 m/s and impinges on a stationary flat plate which destroys its forward motion. Find the work done.
c) Define the term: governing of a turbine.
d) What is meant by the speed ration of a Pelton turbine?
e) Differentiate between an inward and an outward flow reaction turbine.
f) What are unit quantities?
g) Define a centrifugal pump.
h) Define specific speed of a centrifugal pump.
i) Differentiate between a single-acting and double-acting reciprocation pump.
j) Define the term: hydraulic accumulator.

2x10

PART-A

Q.2
a) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.

10

b) A jet of water of diameter 75 mm moving with a velocity of 25 m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60°. Find the force exerted by the jet on the plate:
   i) In the direction normal to the plate.
   ii) In the direction of the jet.

10

Q.3
a) Describe briefly the function of various main components of Pelton turbine with neat sketches.

10

b) A 137 mm diameter jet of water issuing from a nozzle impinges on the buckets of a pelton wheel and the jet is deflected through an angle of 165° by the buckets. The head available at the nozzle is 400 m. Assuming
coefficient of velocity as 0.97, speed ratio as 0.46 and reduction in relative velocity while passing through buckets as 15%. Find:
   i) The force exerted by the jet on buckets in tangential direction.
   ii) The power developed.

Q.4  a) A kaplan turbine runner is to be designed to develop 7357.5 kW shaft power. The net available head is 5.50 m. Assume that the speed ratio is 2.09 and flow ratio is 0.68 and the overall efficiency is 60%. The diameter of the boss is 1/3rd of the diameter of the runner. Find the diameter of the runner, its speed and its specific speed.

10

b) What is a draft tube? Describe with neat sketches different types of draft tubes.10

PART-B

Q.5  a) Explain the following terms:
   i) Static head
   ii) Manometric head
   iii) Multistage pump
   iv) Manometric efficiency
   v) NPSH 2x5

b) The outer diameter of an impeller of a centrifugal pump is 400 mm and outlet width 50 mm. The pump is running at 800 rpm and is working against a total head of 15 m. The vanes angle at outlet is 40° and manometric efficiency is 75%. Determine:
   i) Velocity of flow at outlet.
   ii) Velocity of water leaving the vane.
   iii) Angle made by the absolute velocity at outlet with the direction of motion at outlet.
   iv) Discharge. 10

Q.6  a) What is a reciprocatory pump? Describe the principle and working of a reciprocatory pump with a neat sketch. 10

b) The cylinder bore diameter of a single acting reciprocatory pump is 150 mm and its stroke is 300 mm. The pump runs at 50 rpm and lifts water through a
height of 25m. The delivery pipe is 22m long and 100mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s, find the percentage slip. Also determine the acceleration head at the beginning and middle of the delivery stroke.

Q.7

a) Draw a neat sketch and explain the principle and working of a hydraulic press. 10

b) With the help of a neat sketch, explain the principle and working of a gear wheel pump. 10
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
STRENGTH OF MATERIALS (M-403)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Write an expression for maximum shear stress for a body subjected to biaxial stress conditions.
b) State the bending equation. Give the meaning of each term and a set of consistant units for the terms.
c) Why is hollow shaft preferred to a solid shaft?
d) Define the terms: strain energy, modulus of resilience, proof resilience and proof stress.
e) Which shell is more efficient in resisting pressure, the cylindrical or the spherical shell? Why?

Q.2  
a) In a two dimensional case the stresses at a point are \( \sigma_x = 100 \text{ MPa} \). If the principal stress is limited to 150 MPa, find the value of shear stress. Also find inclination of principal plane and magnitude of maximum shear stress.

Q.3  
a) Deduce an expression for maximum deflection of simply supported beam carrying uniformly distributed load.
b) A rectangular beam 6 cm x 4 cm is 2 m long and is simply supported at ends. It carries a load of 1 kN at mid span. Determine the maximum bending stress induced in the beam.

Q.4  
a) Compare the torque in solid and hollow shaft having same maximum shear stress and made of same amount of material.
b) A solid steel shaft 60 mm diameter is fixed rigidly and coaxially inside a bronze sleeve 90 mm external diameter. Calculate the angle of twist on a 2 m
length of composite shaft due to a torque of 1 kNm. Take G for steel = 80 GPa and G for bronze=42 GPa.

PART-B

Q.5  a) Derive an expression for stresses developed due to gradually applied load, suddenly applied load and impact load.

b) A bar 10 cm in length is subjected to an axial pull such that the maximum stress is equal to 150 MPa. Its area of cross section is 2 cm$^2$ over a length of 95 cm and for middle 5 cm length, it is only 1 Cm$^2$. Find the strain energy stored in the bar. Take E=200 GPa.

Q.6  a) A thick cylinder with internal radius of 10 cm and external radius of 20 cm is subjected to an internal fluid pressure of 100 MPa. Draw the variation of radial and hoop stresses in the cylinder wall.

b) A cylinder is 3 m long, 0.75 m in diameter and 12.5 mm thick at atmospheric pressure. Calculate the dimensions when subjected to an internal pressure of 1.5 MPa.

Q.7  a) Derive an expression for the stresses developed in closed coiled helical spring under the action of axial torque.

b) Derive the Euler’s crippling load for a column hinged at one end and fixed at other.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
STRENGTH OF MATERIALS (M-403A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is complimentary shear stress? What is its significance?
b) What are the boundary conditions that will be used for calculating the constants of integration obtained while using the double integration method to find slope and deflection in a beam:
i) Simply supported carrying UDL.
ii) Cantilever carrying concentrated load at free end.
c) Write the torsion equation and explain the terms along with their units.
d) Two columns are of same cross-sectional area and length. One has both ends hinged while other has one end hinged and other fixed. Which column will have greater load bearing capacity?
e) Write the assumption made during study of thick cylinders.

4x5

PART-A

Q.2 a) A mild steel bar 25 mm diameter and 250 mm long is placed inside a brass tube having an external diameter of 30 mm and internal diameter at 25 mm. The combination is the subjected to an axial load at 45 kN. Find:
i) The stress in the tube and rod.
ii) The shortening of the rod.

10

b) At a point in a piece of material there is tensile stress of 85 MPa and compressive stress of 40 MPa at a plane perpendicular to it. There is also a shear stress of 50 MPa upon each of these planes. Determine the plane of maximum shear stress and the resultant stress on this plane.

10

Q.3 a) Derive an expression for slope and deflection of cantilever beam carrying uniformly distributed load.

10

b) A T beam has the dimensions as shown below. The beam is subjected to a bending moment of 500 Nm. Determine the maximum tensile and compressive stresses in the beam.

10
Q.4  

a) What is the torque transmitted by a thick tube of 5 cm internal diameter and 5 mm thick when the shear stress is not to exceed 41 MPa? Find the angle of twist on a length of 2.5 m and the shear stress at the inner periphery. Take $G=80$ GPa.

b) A copper tube with an external diameter of 7.5 cm is placed inside a steel tube of same internal diameter. The wall thickness of tubes is 3 mm each. The ends of the tubes are rigidly fixed to each other, and a torque of 1 kNm is applied to them. Determine the maximum shear stress in each tube. Take $G$ for copper=40 GPa and $G$ for steel=80 GPa.

Q.5  

a) A steel rod, 5 cm in diameter and 3 m long when unloaded, is suspended from one end and has a weight of 5 kN threaded to it. The weight is allowed to fall freely from a height of 3 cm on to the head formed at the lower end of the rod. Find the maximum stress produced in the rod. Take $E=210$ GPa.

b) Derive an expression for maximum stress due to impact loading.

Q.6  

a) Derive an equation for hoop stresses produced in thin spherical vessels. Calculate the change in volume of the vessel.

b) Derive the Lame’s equation for thick pressure vessels subjected to internal pressure only.

Q.7  

a) Calculate the Euler’s cripple load for a column fixed at one end and free at other.
b) Find the maximum deflection at centre of a semi-elliptical spring.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
MANUFACTURING TECHNOLOGY-II (M-404A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is the function of chip breakers? How do they work?  
b) Why are cutting tools coated? What are the common coating materials?  
c) Explain the terms: machinability and machinability index.  
d) What are the differences between planning and shaping operations and their applications?  
e) What are various types of machining operations that can be performed on a lathe?

4x5

PART-A

Q.2  
a) Derive an expression to show the relationship between chip thickness ratio, shear angle and rake angle.  

12  
b) Discuss the sources of heat generation and its distribution among chip, tool and workpiece.  

8

Q.3  
a) What are the common mechanisms causing wear on cutting tools? Explain in brief.  

14  
b) Tool life of HSS tool is 50 minutes at a cutting speed of 32 m/min for mild steel workpiece. If the cutting speed is increased by 50%, how the tool-life will be affected? Assume n=0.2.  

6

Q.4  
a) Derive an expression for optimum cutting speed in turning for maximum production rate.  

15
b) Explain the term: Total cost of Machining.  

**PART-B**

Q.5  

a) With the help of a neat sketch, show the main parts of a drilling machine.  

b) What are various milling accessories? Explain any one of them.

Q.6  

a) What various operations are performed on a centre lathe? Explain the drilling and boring operations on lathe.

b) Derive an expression to determine machining time on a lathe.

Q.7  

a) With the help of a neat sketch, show the geometry of plain milling cutter and explain.

b) How do you classify different types of drills?
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
KINEMATICS OF MACHINES (M-405)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain different types of kinematic pairs giving example for each one of them. 2
b) In what way a mechanism is different from a machine? 2
c) Sketch and explain any one inversions of a double slider crank chain. 2
d) Define the degree of freedom. 2
e) Show that slider crank mechanism is a modification of the basic four bar chain. 2
f) Explain the following:
   i) Lower pair and higher pair.
   ii) Interference in gears.
   iii) Kennedy’s theorem.
   iv) Inversion of mechanism.
   v) Pressure angle for cam. 2x5

PART-A

Q.2 In a four bar chain ABCD, AD is fixed and is 300 mm long. The crank AB is 80 mm long and rotates at 120 rpm clockwise, while the link CD=160 mm oscillates about D BC and AD are of equal length. Find the angular velocity of link CD when angle BAD=60°. 20

Q.3 A pair of gears, having 20 and 10 teeth, respectively, are rotating in mesh, the speed of the smaller being 1500 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 4 mm. 20
Q.4  a) What is a pantograph and what are its uses?  

b) What is the function of a quick return mechanism and where can it be used? Describe with a suitable sketch, construction and working of Whitworth’s quick return mechanism.

**PART-B**

Q.5  Draw the profile of a cam operating a roller follower when the axis of the follower passes through the axis of cam shaft from the following data:
   a) Follower to move outwards through 40 mm during 60° of cam rotation.
   b) Follower to dwell for the next 45°.
   c) Follower to return to its original position during next 90°.
   d) Follower to dwell for the rest of the cam rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward and the return stroke. The least radius of cam is 50 mm. Diameter of the roller is 30 mm.

Q.6  An epicyclic gear consists of gears A, B and C as shown in fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C.

Q.7  a) Explain type, number and dimensional synthesis.

b) A four bar mechanism is required such that the input and output angles are coordinated as:
   Input crank angles are 30°, 50°, 80°.
   Output angles are 0°, 30°, 60°.
Synthesize the mechanism.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
KINEMATICS OF MACHINES (M-405A)  

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define degree of freedom.  
b) What is meant by equivalent mechanism?  
c) Sketch and explain any one inversion of a single slider crank chain.  
d) Explain different kinds of kinematic pairs giving example for each one of them.  
e) Explain the following terms: lower pair and higher pair.  
f) What is interference in gears?  
g) Discuss pressure angle for cam.  
h) Write about the contact ratio of gears.  
i) Discuss the various types of gear trains.  
j) What is function generation?

2x10

PART-A

Q.2  
a) State and prove the condition for constant velocity ratio of toothed wheels. Define the undercutting in gears.  

10

b) Derive an expression for minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth.  

10

Q.3  
a) Sketch and explain any two inversions of a double slider crank chain.  

10

b) How the mechanism of higher pair can be replaced by the lower pair mechanism?  

10

Q.4  
An epicyclic train of gears is arranged as shown in the figure. How many revolutions does the arm, to which the pinions B and C attached, make:  
a) When A makes one revolution clockwise and D makes half a revolution anticlockwise.
b) When A makes one revolution clockwise and D is stationary? The number of teeth on the gears A and D are 40 and 90, respectively.

![Diagram of gears A and D]

**PART-B**

Q.5 A cam is to be designed for a knife edge follower with the following data:
   a) Cam lift = 40 mm during 90° of cam rotation with SHM.
   b) Dwell for the next 30°.
   c) During the next 60° of cam rotation, the follower returns to its original position with SHM.
   d) Dwell during the remaining 180°.
   The radius of the base circle of cam is 40 mm.
   Draw the cam profile, when the line of stroke of the follower passes through the axis of the cam shaft.

Q.6 The crank of slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. Determine the linear velocity and acceleration of the midpoint of the connecting rod, at a crank angle of 45° from the inner dead centre position.

Q.7 a) Explain type, number and dimensional synthesis.

b) Synthesize a slider crank mechanism so that the displacement of the slider is proportional to the square of the crank rotation in the interval $45^0 \leq \theta \leq 135^0$. Use three precision points with Chebyshev’s spacing.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
INDUSTRIAL ENGINEERING (M-501)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Explain briefly factors considered for wages.  
b) What are functions of production planning and control?  
c) Define inventory and list types of inventory.  
d) Explain flow process chart.  
e) What factors affect selection of matrix handling equipment?

4x5

PART-A

Q.2  
a) Explain functions and objectives of personal management.  

10  
b) What does term ‘worker’s participation in management means’? How it is achieved?

10

Q.3  
a) What is production process? Explain various types of production systems.  

10  
b) What are various costs associated with inventory control and explain Economic Order Quantity (EOQ)?

10

Q.4  
a) Explain the procedure followed for method study.  

10  
b) What are micro motion studies? Explain THERBLIGS and its use.

10

PART-B

Q.5  
a) Explain value engineering and how does it differ from value analysis. Give techniques of value engineering.  

10  
b) Explain principles of material handling and types of material handling equipment.
Q.6  a) Explain the factors influencing the choice of a manufacturing process.

b) Describe mass and batch production system with their characteristics.

Q.7  a) Enumerate the factors responsible to replace an equipment, although it may be running.

b) A new material handling costs `25,000/- (installed) including the cost of relayout. This decreases the number of material handling workers by five. After adding increased maintenance and power costs, the net monetary operating advantage is estimated as `1200/- per year. If estimated economic life is five years, calculate the rate of return before tax and after tax. Assume a depreciation term of ten years.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
INDUSTRIAL ENGINEERING (M-501A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Differentiate between production and productivity.
b) Explain briefly direct and indirect costs.
c) Give objectives of inventory control.
d) What are various functions of production planning and control (PPC)?
e) Differentiate between variables and attributes in SQC.

4x5

PART-A

Q.2
a) Explain work study with its two main components.
   10

b) What are various recording techniques used in method study and explain any one with an example?
   10

Q.3
a) What is production cost and explain various classifications of production cost?
   8

b) A manufacturing firm incurs a fixed cost of `18000/- . The variable costs accounts `8/- per unit and selling price is `13/- . Find the number of pieces to be produced to break even.
   12

Q.4
a) What is economic order quantity? Derive it graphically and mathematically.
   8

b) A manufacturer requires rivets at an approximate rate of 5000 kgs per year. The cost of rivets is `40/kg. The carrying cost is 10% per year. Procurement cost is `200/- per order. Calculate:
   i) Number of orders and what quantity. Also calculate total inventory.
   ii) Number of orders and quantity if ordering cost is `470/- per order and carrying cost is 15%.
   12
PART-B

Q.5 a) Explain the types of production systems being followed in manufacturing company and how does PPC helps in improving the production system? 8

b) Five jobs are to be processed on two machines M1 and M2 in order M1, M2. Processing time in hours are given below:

<table>
<thead>
<tr>
<th>Jobs</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>M2</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>

Determine the sequence that minimizes the total elapsed time. Find the total elapsed time and idle time on machines. 12

Q.6 a) Explain the concept of variations. Distinguish between control charts for variables and attributes. 10

b) Control charts for $\bar{x}$ and $\sigma$ are maintained for the weight in kg of the contents of a certain container. The subgroup size is 10. The values of $\bar{x}$ and $\sigma$ are computed for each subgroup. After 18 subgroups $\sum \bar{x} = 595.8$ and $\sum \sigma = 8.24$, compute the value of $\sigma'$ on the assumption that process is in control.

$(A_1=1.03; B_4=1.72; B_3=0.28; C_2=0.9227)$ 10

Q.7 Write short notes on:

a) Taguchi principles and methods.  b) Rajiv Gandhi National Quality Award.

b) JIT inventory system.  d) KAIZEN. 5x4
Q.1 Briefly explain the following:
   a) D’Alembert’s principle.
   b) Force along connecting rod in a reciprocating engine.
   c) Dynamic balancing.
   d) Transfer of a force from one plane to another.
   e) Active gyroscopic couple.
   f) Effect of gyroscopic couple on a ship during rolling.
   g) Sensitiveness of a governor.
   h) Stability of a governor.
   i) Forced vibrations.
   j) Node in a shaft under torsional vibration.

Q.2 The crank and connecting rod of a vertical petrol engine, running at 2000 rpm are 60mm and 300mm long, respectively. The diameter of the piston is 150mm and the mass of the reciprocating parts is 1.5kg. During the expansion stroke when the crank has turned 30° from TDC, the gas pressure is 700kN/m². Determine the following:
   i) Net force on the piston
   ii) Force in the connecting rod
   iii) Thrust on the cylinder walls
   iv) Crank effort
   v) Thrust on crank shaft bearings

Q.3 A rotor is completely balanced when masses of 2kg and 1.2kg are added temporarily in planes A and D each at 200mm radius as shown in the figure. The balanced mass in plane A is along the x-axis, whereas in the plane D, it is 120° counter-clockwise. The actual balancing is to be done by adding permanent
masses in planes $B$ and $C$ each at 120 mm radius. Find the magnitudes and directions of the masses $B$ and $C$.

![Diagram](image)

20

Q.4  

a) Derive an expression for gyroscopic couple of a spinning body performing precessional motion.

b) The turbine rotor of a ship has a mass of 2.4 tones and rotates at 2000 rpm clockwise when viewed from the stern. The radius of gyration of the rotor is 300 mm. Determine the gyroscopic couple and its effect when the:

i) Ship turns to right at a radius of 300 m with a speed of 30 km/h.

ii) Ship pitches with bow lowering at an angular velocity of 0.9 rad/s.

iii) Ship rolls with an angular velocity 0.3 rad/s.

15

PART-B

Q.5  

a) Describe the working of an inertia governor with neat sketch. How is inertia governor better than a centrifugal governor?

b) Each arm of a Porter governor is 250 mm long and is pivoted on the axis of the governor. The radii of rotation of the balls at the minimum and maximum speeds are 100 mm and 150 mm, respectively. The mass of the sleeve is 30 kg and of each ball is 5 kg. If friction at the sleeve is 22 N, find the range of speed of the governor.

14

Q.6  

a) Explain method to find natural frequency of a vibrating system by energy method.
b) A machine mounted on springs and fitted with a dashpot has a mass of 60 kg. There are three springs, each of stiffness 12 N/mm. The amplitude of vibration reduces from 45 mm to 8 mm in two complete oscillations. Assuming that the damping force varies as the velocity, determine the:
   i) Damping coefficient
   i) Ratio of frequencies of damped and undamped vibrations.

Q.7 A shaft 1.5 m long is 95 mm in diameter for the first 0.6 m of length, 60 mm diameter for the next 0.5 m of length and 50 mm for the remaining length. The shaft carries two flywheels at two ends with masses 900 kg and 700 kg and radius of gyration 0.85 mm and 0.55 mm, respectively. Determine the location of the node and the natural frequency of free torsional vibrations of the system. The modulus of rigidity of the shaft material is 80 GNm².
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
DYNAMICS OF MACHINES (M-502A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly explain the following:
   a) Transfer of a force from one plane to another.
   b) Difference between static and dynamic balancing.
   c) Resultant unbalanced force when a fraction of the reciprocation mass is balanced.
   d) Hammer blow.
   e) Precessional motion of a rotating disc.
   f) Active and reactive gyroscopic couples.
   g) Stability of a governor.
   h) Hunting in a governor.
   i) Equilibrium conditions for a two force member.
   j) Piston effort in engine force analysis.

2x10

PART-A

Q.2 A, B, C and D are four masses carried by a rotating shaft at radii 100\,mm, 150\,mm, 150\,mm and 200\,mm, respectively. The planes in which the masses rotate are spaced at 500\,mm apart and the magnitudes of B, C and D are 9\,kg, 5\,kg and 4\,kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft is in complete balance.

20

Q.3 The following data refer to two cylinder locomotive with cranks at 90°. Reciprocating mass per cylinder=300\,kg, crank radius=0.3\,m, driving wheel diameter=1.8\,m. Distance between cylinder centre lines=0.65\,m. Distance between the driving wheel centre planes=1.55\,m. Determine:
   i) The fraction of the reciprocating masses to be balanced if hammer blow is not to exceed 46\,kN at 96.5\,km/h
   ii) The variation in tractive effort
iii) The maximum swaying couple.

Q.4  a) Derive expressions for vertical reactions at each of the outer and inner wheels of a four wheeler while taking a turn. Use usually used terms for moment of inertia angular velocity, radius of wheels/engine and radius of curvature of the turn. 

b) Find the angle of inclination from vertical of a two wheeler negotiating a turn. Combined mass of the vehicle with rides is 300 kg, moment of inertia of engine flywheel is 0.5 kgm², moment of inertia of each wheel is 1 kgm², speed of engine is 5 times that of wheels and in the same direction. Height of centre of gravity of rider with vehicle is 0.5 m. Two wheeler speed is 80 km/h, wheel radius is 300 mm and radius of turn is 60 m.

PART-B

Q.5  a) Explain the following for a governor:
   i) Equilibrium speed
   ii) Governor effort
   iii) Sensitivity of a governor

b) A proper governor has all forearms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 60 kg. The extreme radii of rotation are 150 mm and 200 mm. Determine the range of speed of the governor.

Q.6  a) Explain the conditions for equilibrium of a member with two forces and a torque.

b) A slider crank mechanism with the following dimensions is acted upon by a force $F = 3kN$ at $B$ as shown in the figure. $OA = 100 mm$, $AB = 450 mm$. Determine the input torque $T$ on the link $OA$ for the static equilibrium of the mechanism.
Q.7 The crank and connecting rod of a vertical single cylinder gas engine running at 2000 rpm are 50\text{mm} and 250\text{mm}, respectively. The diameter of the piston is 90\text{mm} and the mass of the reciprocating parts is 1.4\text{kg}. During power stroke, when the piston has moved 20\text{mm} from the top dead centre position, the pressure on the piston is 800\text{kN/m}^2. Determine the:

i) Net force on the engine

ii) Thrust in the connecting rod

iii) Thrust on the sides of cylinder walls

iv) Engine speed at which the above values are zero.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
MACHINE DESIGN (M-503)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are the causes of stress concentration?
     b) What is Goodman line?
     c) What types of stresses are induced in shafts?
     d) Which theories of failure are applicable for shafts?
     e) What are applications of springs?
     f) What type of stress is induced in a helical compression spring?
     g) What is thrust bearing?
     h) What are objectives of lubrication in bearing?
     i) What is a parallel helical gear?
     j) What are design considerations in forgings?

2x10

PART-A

Q.2  a) Explain the modified Goodman diagram for torsional shear stresses.  10

b) A forged steel bar; 50 mm in diameter is subjected to a reversed bending stress of 250 N/mm². The bar is made of steel 40C8 (Sut=400 N/mm²). Calculate the life of the bar for a reliability of 90 %.  10

Q.3  a) What are disadvantages of hollow shaft over solid shaft?  6

b) A solid circular shaft of diameter d is subjected to a bending moment of Mb and torsional moment of Mt. Prove that according to maximum principal stress theory:

\[ \frac{S_{Pl}}{f_s} = \frac{16}{\pi d^3} \left[ M_b + \sqrt{M_b^2 + M_t^2} \right] \]

14
Q.4  a) Define stiffness of spring. What do you mean by active and inactive coils of springs?

b) It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index is 6. The spring is made of patented and cold drawn steel wire. The ultimate tensile strength and modulus of rigidity of spring’s materials are 1090 and 81370 N/mm², respectively. The permissible shear stress for spring wire should be 50 % of ultimate tensile strength. Design the spring and Calculate:
   i) Wire diameter.
   ii) Mean coil diameter.
   iii) Number of active coils.
   iv) Total number of coils.
   v) Free length of spring.
   vi) Pitch of coil.

Q.5  a) Name the various types of ball bearings. What is \( L_{10} \) life?

b) A ball bearing with a dynamic load capacity of 22.8 kN is subjected to a radial load of 10 kN. Calculate:
   i) Expected life in million revolutions that 90 % of bearings will reach.
   ii) The corresponding life in hours, if the shaft is rotating at 1450 rpm.

Q.6  a) State law of gearing with a suitable sketch. Define various terminology of a spur gear.

b) In a pair of spur gears, the number of teeth on pinion and gear are 20 and 100, respectively. Module is 6 mm. Calculate:
   i) Centre distance.
   ii) Pitch circle diameter of pinion and gear.
   iii) Addendum and dedendum.
   iv) Tooth thickness.

Q.7  a) Define ergonomics. Explain ergonomics and value engineering considerations in design.

b) State and explain standardization in machine design. What are design considerations in casting?
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
PRODUCTION ENGINEERING (M-504)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain sequence of operations in process planning.
b) Differentiate between a jig and a fixture.
c) Draw a neat diagram of a locating device in a jig.
d) Differentiate between drilling and reaming.
e) Define cutting speed and feed in machining operation.
f) What is the function of the tang of a drill?
g) State the purpose of a chip-breaker.
h) What is the relation between productivity and production?
i) Enlist the factors influencing productivity.
j) How steam cleaning works?

2x10

PART-A

Q.2
Explain the effects of various angles of the teeth of a plain milling cutter with the help of the neat sketches. What is “up milling” and “down milling”?
20

Q.3
a) State the design considerations for a jig.
6
b) Draw a neat diagram of a jig and explain the various parts and its functions. How does a jig differ from a fixture?
14

Q.4
a) What are the common operations which can be performed on a drilling machine? Describe them in brief with the help of neat sketches.
14
b) What do you understand by the terms: drilling, reaming and boring? How do they differ from each other?
6

PART-B
Q.5  a) Explain the effects of various angles of the teeth of a plain milling cutter with the help of a neat sketches.  
     b) Sketch different types of form tools. How are they classified?  

Q.6  Explain the various tools and techniques to improve productivity.  

Q.7  Write short notes on:
     a) Polishing
     b) Tumbling
     c) Shot peening
     d) Vapour degreasing
     e) Steam Cleaning
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
PRODUCTION ENGINEERING (M-504A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following briefly:
   a) State difference between a jig and a fixture.
   b) How the grain size of grinding wheel is specified?
   c) Enlist various methods to manufacture gears.
   d) Explain the term loading and glazing as applied to grinding wheel.
   e) Define the term: lay used in surface roughness representation.
   f) Differentiate between shot blasting and sand blasting.
   g) Define the term: process planning.
   h) State the functions of a bush in a drill jig.
   i) Why three sets of tap i.e. taper, plug and bottoming taps are required to cut threads of particular size?
   j) Differentiate between roughness and waviness.

   2x10

   PART-A

Q.2 A batch of 1,000 components of mild steel are to be produced from a blank \( \phi 82 \times 72 \text{mm} \) long. Generate the process sheet for the components.
Q.3  
a) Explain the function of jigs and fixture and enlist types of jigs and fixtures.  
   6  
b) Explain various types of locating devices used in jigs and fixtures.  
   7  
c) Explain various types of clamps used in jigs and fixtures  
   7

Q.4  
a) Explain how threads can be produced by thread tapping, die threading and  
thread rolling.  
   10  
b) How the major diameter and minor diameter of a screw thread are measured?  
   10

PART-B
Q.5  
a) State advantages and disadvantages of gear hobbing process.  
   10  
b) With the help of a neat sketch, explain how the pitch of spur gear is  
measured and checked.  
   10

Q.6  
a) Differentiate between truing and dressing along with their definition.  
   5
b) Explain each term in detail for the following specification of grinding wheel-51A36L5V23.

Q.7
a) State the difference between polishing and buffing.

b) Describe the different measures of surface roughness.

c) Describe the process of Honing State its merits and demerits along with applications.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
PRODUCTION ENGINEERING (M-504B)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO
questions from Part A and TWO questions from Part B. Each question carries
equal marks.

Q.1 Answer the following questions briefly and draw neat sketches wherever
required:
   a) State the function of bush in a drill jig.
   b) Differentiate between punching and blanking.
   c) In punching operation, why shear is provided to punch.
   d) Enlist various methods to manufacture gears.
   e) State the significance of truing and dressing.
   f) How abrasive type are specified in a grinding wheel?
   g) Define the term: process planning.
   h) Why three sets of tap i.e. taper, plug and bottoming tap are required to cut
      the threads of particular size?
   i) State the function of jig and fixture.
   j) Define the term part print analysis.

2x10

PART-A

Q.2 A batch of 900 components of mild steel are to be produced from a blank of
φ40mm×125mm. Generate the process sheet for components.
Q.3  a) Explain 3–2–1 location principle in detail. Also describe the numbers of degrees of freedom for a free body in space.  

b) Explain different type of clamps used in jigs and fixtures.  

Q.4  A hole of 60\(mm\) diameter is to be produced in a steel plate 2.5\(mm\) thick. The ultimate shear strength of the plate material is 450\(N/mm^2\). Take percentage penetration as 40% of thickness of sheet. 

Estimate:

i) Punching force
ii) Punch diameter
iii) Work done

Q.5  a) Classify the grinding processes according to type of surface produced by them.  

b) Explain the each term in detail for following specification of a grinding wheel: 

\[5\ 1\ A\ 3\ 6\ L\ 5\ V\ 2\ 3\]

Q.6  a) Explain gear cutting by milling and hobbing process with neat sketches.  

b) Enlist various methods to manufacture threads. Explain any two of them in detail.  

Q.7  a) Explain various elements of cost in detail to manufacture any product.  

b) Estimate the time to drill a 12.7\(mm\) diameter hole in a brass plate of 50\(mm\) thick. The cutting speed is 75\(m/min\) and feed is 0.175\(mm/revolution\).
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
METROLOGY, MEASUREMENT AND CONTROL (M-505)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define metrology.
b) Name four angle measuring instrument.
c) Name the material used for making micrometer spindle tip.
d) Why do we prefer 3-wire method over 2-wire method for thread measurement?
e) What are bellows?
f) What is a tachometer? Give its applications.
g) How thermisters differ from resistors?
h) Differentiate between absolute pressure and gauge pressure.
i) What are static characteristics of instruments? Give two examples?
j) Explain open loop system and how does it differ from closed loop system?

2x10

PART-A

Q.2
a) What are comparators? Explain the mechanical comparator with a neat sketch and its limitations.

10

b) Define surface roughness. How we use interferometry to measure surface roughness? Explain with a neat sketch.

10

Q.3
a) Name the instrument used for low pressure measurement and explain McLeod gauge with sketch and drive expression for pressure.

10

b) Enumerate five instruments used for temperature measurement.

3

c) Explain total radiation pyrometer with a neat sketch and give its areas of application.

7

Q.4
a) What is the difference between a sensor and transducer? Explain with an example.
5
b) What are strain gauges? How do we rate them? What are its various types? Explain with a sketch.

15

**PART-B**

Q.5 a) Derive an expression for first order response when sinusoidal input is provided. 10
b) Enumerate various types of static characteristics of instrument and explain each of them.

10

Q.6 a) What do you understand by system stability? How can we decide the stability by Routh and Hurwitz criteria? 10
b) What is transfer function? Determine the loop transfer function and characteristics equation for the given feedback system and determine its stability feedback.

\[ H(s) = 4s, \quad G(s) = \frac{2}{s(s+3)} \]

10

Q.7 a) What are DAC converters? Explain the working of DAC converter with a sketch.

10
b) Write short notes on:
   i) System analyzers.
   ii) Amplifiers and its use.

5x2
Q.1 Describe the new product development process through:
   a) The process
   b) Idea generation
   c) Idea screening
   d) Concept development and testing
   e) Business analysis
   f) Competition analysis
   g) Beta testing and marketing testing
   h) Technical implementation
   i) Commercialization
   j) New product pricing

Q.2 A product development team found a challenge to design a new car for which the analysis of a market is done. The market analyzed has an average age more than 40.
   a) Make a SWOT analysis keeping in view product design.
   b) What all sectors would you like to put in SWOT analysis and why?
   c) Where would you like to put the age in whole analysis and why?
   d) Please explain two other relevant factors in priority, which you feel are important and why?

Q.3 Describe Michael Porter’s model of five forces. How this model explains the automotive sector of India? In the automobile sector in India when you think Michael Porter’s model of five forces is applicable?
   a) Justify with the table/diagram the relevance of this model.
   b) Using the value chain system explain the above.
Q.4 Explain:
   a) What are internal sources of secondary data?  
   b) What are external sources of secondary data?  
   c) What are the advantage and disadvantages of using secondary data?  

Q.5 Elaborate:
   a) Secondary market research  
   b) Qualitative (primary) market research  
   c) Quantitative market research  
   d) Idea generation and idea management  
   e) Fuzzy front end  

Q.6 Describe the following in detail:
   a) The activities in the product development process.  
   b) The role of a new product process manager.  
   c) Product innovation charter.  
   d) Stage concept generation.  
   e) Common gate criteria.  

Q.7 Peter F. Drucker has given ideas on the future of Society, organizations, Professionals and technology. What will become the most important technology issue in his view? Discuss in detail.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
MACHINE DESIGN-I (M-508)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write the types of feasibility studies in machine design.
b) How will you select fits and tolerance?
c) What types of threads are used in a power screw?
d) What types of rivet joints are used?
e) What do you mean by fillet joints in welding?
f) What are advantages of V-belts?
g) Classify different types of clutches.
h) Write desirable properties of good friction material.
i) What is the function of brakes?
j) What is internal expanding shoe brake? Where do we use it?

2x10

PART-A

Q.2 a) Explain the concept of problem identification in machine design.

10
b) What is brainstorming? Explain the procedure advantages and disadvantages of brainstorming.

10

Q.3 a) Explain with neat sketches, the terminology used in screw threads.

8
b) A wall bracket is attached to the wall be means of four identical bolts, two at ‘A’ and two at ‘B’ as shown in figure. Assuming that the bracket is held against the wall and prevented from tipping about the point ‘C’ by all four bolts. Using an allowable tensile stress in the bolts as 35 N/mm², determine the size of bolts on the basis of maximum principal stress theory.
Q.4  
   a) Explain with neat sketches the types of butt joints in welding.  
   8 
   b) Two plates of 10 mm thickness each are to be joined by means of single 
      rivetted double strap butt joint. Determine the rivet diameter, rivet pitch strap 
      thickness of the joint. Working stresses in tension and shearing are 80 MPa 
      and 60 MPa respectively.  

12  

**PART-B**

Q.5  
   a) Write the advantages, disadvantages and application of chain drives.  
   6 
   b) A pump is driven by an electric motor through open type flat belt drive. 
      Determine the belt specifications for the following data: 
      Motor pulley diameter=300 mm, Pump pulley diameter=600 mm, 
      \( \mu_s=\mu_l=0.25 \), centre distance between pulley=1000 mm, motor speed=1440 
      rpm, power transmission =20 kW belt density=1000 kg/m\(^3\), thickness of belt 
      =5 mm. Allowable stress for belt material =2 MPa  
   14 

Q.6  
   a) Derive the expression for torque transmitting capacity for a single plate 
      friction clutch based on uniform pressure and uniform wear theory.  
   15 
   b) Draw and label the neat diagram of cone clutch.  
   5 

Q.7  
   a) List the important factors upon which capacity of a brake depends.  
   6 
   b) A solid C.I. disk, 1 m in diameter and 0.2 m thick, is used as fly wheel. It is 
      rotating at 350 rpm. It is brought to rest in 1.5 s. by means of a brake.
Calculate the energy absorbed and torque capacity of brake if mass density of C.I. is 7200 kg/m$^3$. 

14
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
MACHINE DESIGN-I (M-508)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by problem identification in machine design?
b) What are advantages of threaded joints?
c) Write advantages and limitations of power screw.
d) Write various modes of failure in case of riveted joints.
e) Define caulking and fullering.
f) Write the use of clutch assembly.
g) What are important points in design of chain drive?
h) List advantages and disadvantages of flat belt drive.
i) Sketch and level band brake.
j) Write names of different types of brake.

2x10

PART-A

Q.2
a) Explain different types of feasibility study in design philosophy.
   10
b) Describe the following:
   i) Selection of materials
   ii) Factor of safety

   10

Q.3
a) Write advantages, disadvantages and applications of multiple start screws.
   8
b) Structural connection shown in the figure is subjected to an eccentric force P=10 kN with an eccentricity of 500 mm from CG. Centre distance between bolt 1 and 2 is 200 mm and between 1 and 3 is 150 mm. If \( S_{yt} = 400 \text{ N/mm}^2 \) and \( \text{fos} = 2.5 \), Determine the size of bolts.
Q.4  a) Write short notes on:
   i) Types of riveted joints
   ii) Advantages of welded joint over riveted.

   b) A plate 75 mm wide and 10 mm thick is joined with another steel plate by means of single transverse and double parallel fillet welds as shown in the figure. The joint is subjected to a maximum tensile force of 55 kN. The permissible tensile and shear stresses are 70 and 50 N/mm$^2$ respectively. Determine the required length of each parallel fillet weld.

PART-B

Q.5  a) Derive the condition for transmission of maximum power in belt drive.

   b) It is required to select a flat belt drive for a compressor running at 720 rpm, which is driven by 25 kW, 1440 rpm motor, space is available for a centre distance of 3 m.
Q.6  
a) Derive the expression for torque transmitting capacity for a single plate friction clutch based on uniform pressure and uniform wear theory.  

b) Differentiate between brake and clutch.

Q.7  
a) What is a self energizing brake and when does a brake becomes self-locking?  

b) A four wheeled automobile car has a total mass of 1000 kg. M.I of each wheel about a transverse axis through CG is 0.5 kgm$^2$. Rolling radius of the wheel is 0.35 m. Rotating and reciprocating parts of engine and transmission system are equivalent to M.I of 2.5 kgm$^2$, which rotates at five times the road-wheel speed. Car is travelling at a speed of 100 km/hr on a plane road. When the brakes are applied car decelerates at 4.9 m/s$^2$. There are brakes on all four wheels. Calculate: i) energy absorbed by each brake ii) torque capacity of each brake.
Q.1 a) Discuss degeneracy case in simplex method.
b) Name three basic steps used to solve Hungarian method of assignment.
c) Define and describe Fulkerson’s rule for numbering of events in PERT / CPM techniques.
d) Define a decision tree. Write various steps followed in decision tree analysis.
e) Describe Monte-Carlo simulation technique of forecasting.

PART-A

Q.2 a) Using graphical method, maximize objective function \( z = 6x_1 + 4x_2 \), subject to following constraints:

\[
\begin{align*}
4x_1 + 5x_2 &\leq 10 \\
3x_1 + 2x_2 &\leq 9 \\
8x_1 + 3x_2 &\leq 12 \\
x_1, x_2 &\geq 0
\end{align*}
\]

b) A manufacturer makes 2 products A and B. Three machines are required to manufacture each unit of product A and B. Their processing times and total availability of hours during a particular production run is as given below:

<table>
<thead>
<tr>
<th>Machines</th>
<th>Processing times in hrs</th>
<th>No of hours available during a particular production run</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Product A</td>
<td>Product B</td>
</tr>
<tr>
<td>M I</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>M II</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>M III</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

Profit/Unit of product A and B are Rs. 8/- and Rs. 18/- respectively. How many numbers of product A and product B should be made so as to make maximum profit?
Q.3  a) Product capacities of factories $F_1, F_2, F_3$ and $F_4$ and holding capacities of warehouses $A, B, C$ and $D$ in number of units are as given in table below. Also unit costs of transportation from each factory to each warehouse are shown in hundreds of Rs. Solve transportation problem for optimal cost:

<table>
<thead>
<tr>
<th>From Factory</th>
<th>To Warehouse</th>
<th>Total Factory Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>F_1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>F_2</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>F_3</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>F_4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total warehouse</td>
<td>30</td>
<td>40</td>
</tr>
</tbody>
</table>

b) A department has 4 staff and 4 tasks are to be performed. Staff differ in efficiency and task differ in their intrinsic difficulty. Estimates of earning in hundreds of Rs. each staff would earn is given in matrix below. How should tasks be allocated, one to each staff so as to maximize total earning:

<table>
<thead>
<tr>
<th>Staff</th>
<th>Task</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>5</td>
<td>40</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>25</td>
<td>35</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>15</td>
<td>25</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>15</td>
<td>5</td>
<td>30</td>
<td>15</td>
</tr>
</tbody>
</table>

Q.4  a) Write theorems of duality.

b) For following LPP write it dual:
Minimize:
Subject to

Optimise $z$ using dual-simplex method.

**PART-B**
Q.5  a) In a toll arrangement of a newly opened bridge on a highway, there is one attendant at toll gate. Vehicles arrive at toll gate at the rate of $120/Hr$ and it takes the attendant on an average 15 seconds to attend a car. Arrivals are as per poison while service is as per exponential distribution. Find:
   i) Proportion of time attendant is busy.
   ii) Probability that system has no vehicles.
   iii) Expected number of vehicles in the system.
   iv) Expected number of vehicles waiting to be served.

b) A project’s activities and their optimistic time, pessimistic time and most likely time in days is as given below. Draw network, find total project time. Find critical path and variance of project:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Optimistic time (in days)</th>
<th>Pessimistic time (in days)</th>
<th>Most likely (time in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2</td>
<td>3</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>1 3</td>
<td>2</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>1 4</td>
<td>6</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>2 5</td>
<td>2</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>2 6</td>
<td>5</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>3 6</td>
<td>3</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>4 7</td>
<td>3</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>5 7</td>
<td>1</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>6 7</td>
<td>2</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

Q.6  a) Define simulation. Also write limitations of Monte-Carlo simulation technique.

b) A company manufactures 200 mopeds. Daily production varies from 196 to 204 depending upon availability of raw materials. Probability distribution of production/day is as given below:

<table>
<thead>
<tr>
<th>Production per day</th>
<th>196</th>
<th>197</th>
<th>198</th>
<th>199</th>
<th>200</th>
<th>201</th>
<th>202</th>
<th>203</th>
<th>204</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.05</td>
<td>0.09</td>
<td>0.12</td>
<td>0.14</td>
<td>0.20</td>
<td>0.15</td>
<td>0.11</td>
<td>0.08</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Finished mopeds are transported in specially designed three storied lorry which can accumulate 200 mopeds only. Using following 15 random numbers, simulate the process to find:
   i) Average number of mopeds waiting in factory.
   ii) Average number of empty spaces in lorry.
   Random numbers are 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54, 10
Q.7

a) Define resource leveling. Why is it required?

b) A company is currently working with a process which after paying for materials, labour etc, brings a profit of Rs. 12,000/-. Following alternatives are available to the company:
   i) Company can conduct research \( R_1 \) which will cost the company Rs. 10,000/- and has 90% chance of success. If it proves a success, company will get gross profit of Rs. 25,000/-. 
   ii) Company can conduct research \( R_2 \) which is expected to cost the company Rs. 8,000/- and has 60% probability of success. If it proves a success the company will get gross profit of Rs. 25,000/-. 
   iii) Company can purchase a new process and pay Rs. 6,000/- as royalty. This new process will get gross profit of Rs. 20,000/-. 
   iv) Company can continue the current process.
   Prepare decision tree and also find optimal solution.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
CAD/CAM (M-602)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain a design process.  
b) What is parallel projection?  
c) What is approximation spline?  
d) Describe constructive solid geometry.  
e) Define cell decompositioning.  
f) What is DNC?  
g) What is flexible automation?  
h) Define adaptive control.  
i) What is group technology?  
j) Discuss benefits of FMS.

2x10

PART-A

Q.2 a) Define CAD, CAM, and CIM. Give a brief description of their applications in industries.  

b) The edge of a cube have the co-ordinates, A(0, 0, 0), B(0, 0, 15), C(0, 15, 0), D(0, 15, 15) E(15, 0, 0), F(15, 0, 15), G(15, 15, 0)and H(15, 15, 15). The cube is rotated from its above initial position by an angle of 45º about X-axis and then translated by (15, 15, 15) units. Determine the co-ordinates of the edges in the final position.

10

Q.3 a) What is blending function? Give their properties.  

b) Define Bezier curve. Also give their properties. Find equation of Bezier curve which passes through point (0, 0) and (-2, 1) and is controlled through points (7, 5) and (2, 0).

12
Q.4 Explain the following:
   a) Ruled surface.
   b) Surface of revolution.
   c) Boundary representation.
   d) Surface modelling.  

   **PART-B**

Q.5 a) Explain numerical control system. Give the types of numerical control system with figure.  

   **10**

   b) Describe principal of operation of open loop and closed loop CNC machine.  

   **10**

Q.6 a) Differentiate between manual part programming and computer assisted part programming.  

   **10**

   b) Write a part program for a shaft of 30 mm diameter to make a stepped shaft with dimensions as shown in the figure. Use appropriate speed and feed when material of the shaft is mild steel.  

   **10**

Q.7 a) Describe the purpose of process planning. How are computers used in such planning?  

   **10**

   b) Why group technology is developed? Write its advantages.  

   **10**
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
HEAT TRANSFER (M-604)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is the driving force for heat transfer?
b) Define thermal diffusivity.
c) How does a fin enhance heat transfer at a surface?
d) What is the utility of extended surfaces?
e) What is lumped capacity?
f) What are Heisler charts?
g) What is a radiation shield?
h) State Stefan-Boltzmann law.
i) Define heat exchanger effectiveness.
j) What is meant by fouling factor?

2x10

PART-A

Q.2
a) Derive an expression for temperature distribution under one dimensional steady state heat conduction through a plane wall.

10

b) A small electric heating application uses wire of 2mm diameter with 0.8mm thick insulation \((K=0.12\,W/m^\circ C)\). The heat transfer coefficient \((h_i)\) on the insulated surface is 35\(W/m^2\,^\circ C\). Determine the critical thickness of insulation in this case and the percentage change in the heat transfer rate if the critical thickness is used, assuming the temperature difference between the surfaces of the wire and surrounding air remains unchanged.

10

Q.3
a) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for fin insulated at the tip.

10

b) A steel rod \((K=32\,W/m^\circ C)\), 12mm in diameter and 60mm long, with an insulated end, is to be used as a spine. It is exposed to surroundings with a
temperature of $60^\circ C$ and a heat transfer coefficient of $55 \text{ W} / \text{m}^2 \cdot ^\circ C$. The temperature at the base of fin is $95^\circ C$.

Determine:

i) The fin efficiency.

ii) The temperature at the edge of the spine.

iii) The heat dissipation.

10

Q.4 a) What are the assumptions for lumped capacity analysis? 5

b) How Heisler charts are used to obtain temperature distribution when both conduction and convection resistance are almost of equal importance? 5

c) Glass spheres of 2 mm radius and at $500^\circ C$ are to be cooled by exposing them to an air stream at $25^\circ C$. Make calculations for the maximum value of convection coefficient that is permissible, and the minimum time required for cooling to a temperature of $60^\circ C$. Assume the following property values: density $2250 \text{ kg/m}^3$. Sp. Heat $850 \text{ J/kgK}$ and conductivity $1.5 \text{ W/m} - \text{deg}$. 10

PART-B

Q.5 a) Calculate the heat generated in the body of a man if for comfortable living, the body is to be at $35^\circ C$ whilst the environmental conditions are at $15^\circ C$. The body of the man may be idealized as a cylinder of $30 \text{ cm}$ diameter and $160 \text{ cm}$ height.

Use the correlation:

$$N_u = 0.12 \ (Gr \ Pr)^{1/3}$$

10

b) A submarine can be assumed to have cylindrical shape with rounded nose. Assuming its length to be $50 \text{ m}$ and diameter $5.0 \text{ m}$, determine the total power required to overcome boundary friction if it cruises at $8 \text{ m/s}$ velocity in sea water at $20^\circ C$ ($P = 1030 \text{ kg/m}^3$), $\nu = 1 \times 10^{-6} \text{ m}^2 \text{ /s}$. Use the correlation:

$$\overline{C_f} = \frac{0.455}{[10g_{10} \text{ Re}_L]^{2.58}}.$$ 10

Q.6 a) Define the following terms as applied to radiation heat transfer:

i) Black, gray and real surface.
ii) Emissive power and intensity of radiation. 10

b) A steel rod of \(20\,mm\) diameter has been mounted axially in a heat treatment muffle furnace of inside diameter \(160\,mm\). The inside surface temperature of the muffle is at \(1360\,K\) and has an emissivity of 0.85, while the emissivity of the surface of the rod is 0.6. Find the time required to heat the rod from \(700\,K\) to \(800\,K\) assuming that it occupies full length of the furnace. For the rod material, take specific heat as \(0.65\,kJ/kgK\) and the density as \(7840\,kg/m^3\). 10

Q.7  a) Derive an expression for logarithmic mean temperature difference (LMTD) in case of parallel flow heat exchangers. 10

b) An oil cooler for a lubrication system has to cool \(1000\,kg/h\) of oil \((C_p = 2.09\,kJ/kg^\circ C)\) from \(80^\circ C\) to \(40^\circ C\) by using a cooling water flow of \(1000\,kg/h\) at \(30^\circ C\). Give your choice for a parallel flow or counter-flow heat exchanger, with reasons. Calculate the surface area of the heat exchanger, if the overall heat transfer coefficient is \(24\,W/m^2^\circ C\). Take \(C_p\) of water \(= 4.18\,kJ/kg^\circ C\). 10
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
HEAT TRANSFER (M-604)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) How does heat transfer differ from thermodynamics?
    b) What is Fourier law of conduction?
    c) Discuss the effectiveness of a fin.
    d) Define the term thermal capacity of a material.
    e) What is meant by transient heat conduction?
    f) Define displacement thickness.
    g) Define shape factor.
    h) What is a radiation shield?
    i) How are heat exchangers classified?
    j) Define film and dropwise condensation.

2x10

PART-A

Q.2 a) What is meant by critical thickness of insulation?
    A thin cylinder of radius \( r \) is lagged to an outer radius \( r_0 \) with an insulating material of thermal conductivity \( k \). Show that the maximum steady radial heat transfer rate occurs when \( r_0 = k/h_0 \), where \( h_0 \) is the heat transfer rate against \( r_0 \) for all values of \( r_0 \) between \( r \) and infinity. Ignore the cylinder end effects.

10

b) A reactor’s wall, 320 mm thick, is made up of an inner layer of fire brick (\( k=0.84 \) W/m\(^\circ\)C) covered with a layer of insulation (\( k=0.16 \) W/m\(^\circ\)C). The reactor operates at a temperature of 1325 \(^\circ\)C and the ambient temperature is 25\(^\circ\)C.
    i) Determine the thickness of fire brick and insulation which gives minimum heat loss;
    ii) Calculate the heat loss presuming that the insulating material has a maximum temperature of 1200 \(^\circ\)C.

10

Q.3 a) Set up expression for temperature distribution during steady state heat conduction in a plane wall with internal heat generation when both the
surfaces are maintained at common temperature.

b) The cylindrical head of an engine is 1 m long and has an outside diameter of 50 mm. Under typical operating conditions, the outer surface of the head is at a temperature of 150°C and is exposed to ambient air at 40°C with a conductive coefficient of 80 kJ/m²-hr-deg. The head has been provided with 12 longitudinal straight fins which are 0.75 mm thick and protrude 2.5 cm from cylindrical surface. Workout the increase in heat dissipation due to addition of fins. Also calculate the temperature at the centre of the fin. It may be presumed that the fins have insulated tip and that the thermal conductivity of the cylinder head and fin material is 260 kJ/m-hr-degree.

Q.4 a) Explain the following:
   i) Transient heat conduction
   ii) Lumped Capacity

b) A 3.6 cm diameter egg, approximately spherical in shape, is initially at 25°C temperature. To boil it to the consumer’s taste, it needs to be placed for 225 seconds in a saucepan of boiling water at 100°C.
   i) For how long should a similar egg for the same consumer be boiled when taken from a refrigerator at a temperature of 5°C.
   Thermo-physical properties of egg are:
   \( k = 2.5 \text{ W/m K} \); \( \rho = 1250 \text{ kg/m}^3 \); \( c = 2200 \text{ J/kg K} \);
   and the heat transfer coefficient for the shell and shell-water interface may be taken as 280 W/m²-K.
   ii) Compare the centre temperature attained with that computed by treating the egg as a lumped-heat-capacity system.

5x2

PART-B

Q.5 a) Discuss the following:
   i) Nusselt number.
   ii) Prandtl number.

b) What factors affect the value of convection coefficient for water flowing inside a circular tube? Within a condenser shell, water flows through one hundred thin-walled circular tubes (diameter=22.5 mm and length 5 m) which have been arranged in parallel? The mass flow rate of water is 65 kg/s and its inlet and outlet temperatures are known to be 22°C and 28°C respectively. Predict the average convection coefficient associated with water flow.
Q.6  a) A thin shield of emissivity \( \varepsilon_s \) (on both sides) is placed between two infinite parallel plates of emissivities \( \varepsilon_1 \) and \( \varepsilon_2 \); and temperatures \( T_1 \) and \( T_2 \), respectively. 
   If \( \varepsilon_1 = \varepsilon_2 = \varepsilon_s \), show that temperature of the shield is given by:
   \[
   T_s = \left( \frac{T_1^4 + T_2^4}{2} \right)^{\frac{1}{4}}
   \]

b) The radiation shape factor of the circular surface of a thin hollow cylinder of 10 cm diameter and 10 cm length is 0.1716. What is the shape factor of the curved surface of the cylinder with respect to itself?  

10

Q.7  a) Show the temperature variation along the length of heat exchanger, when:
   i) Hot and cold fluids flow in parallel and counter flow fashion.
   ii) Hot fluid as used for evaporating another liquid.
   iii) Steam condenses on the outside of a condenser tube with water flowing inside the tube as a coolant.

b) What do you understand by nucleate boiling? Explain subsequent growth and motion of bubbles.

10
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
HEAT TRANSFER (M-604)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the significance of heat transfer?  
b) What is ‘Newton’s law of cooling’?  
c) What do you understand by ‘fin efficiency’?  
d) Why aluminium is used as a fin material?  
e) What is lumped capacity?  
f) Define boundary layer thickness.  
g) Which is not correctly matched?  
i) Black body .................... $\alpha = 1$  
ii) Opaque body .................. $\alpha + \tau = 1$  
iii) Transparent body .............. $\tau = 1$  
iv) For gases ........................ $\alpha + \tau = 1$  
h) What is ‘capacity ratio’ in heat exchanger?  
i) What is pool-boiling?  
j) Discuss: i) Reynold’s number ii) Prandtl number 

2x10

PART-A

Q.2  a) Derive an expression for temperature distribution under steady conduction for a cylinder. Also show that the heat flow rate is given by:

$$Q = 2\pi kl \frac{t_1 - t_2}{\log_e \frac{r_2}{r_1}}$$

Where, $\ell$ → length of the cylinder,  
$t_1$, $t_2$ → Temperature at inner and outer surface of cylinder respectively,  
$t_1$, $r_2$ → Inner and outer radius of cylinder respectively  
k → Thermal conductivity of cylinder material.

10

b) Saturated steam at 110° C flows inside a copper pipe (thermal conductivity 450 W/m K) having an internal diameter of 10 cm and an external diameter of
12 cm. The surface resistance on the steam side is 12000 W/m² K and that on the outside surface of the pipe is 18 W/m² K. Determine the heat loss from the pipe if it is located in space at 25°C. How this heat loss would be affected if the pipe is lagged with 5 cm thick insulation of thermal conductivity 0.22 W/m K.

Q.3 a) Set up expression for temperature distribution during steady state heat conduction in a plane wall with internal heat generation when both the surfaces are maintained at common temperature.

b) The cylindrical head of an engine is 1 m long and has an outside diameter of 50 mm. Under typical operating conditions, the outer surface of the head is at a temperature of 150°C and is exposed to ambient air at 40°C with a conductive coefficient of 80 kJ/m²-hr-deg. The head has been provided with 12 longitudinal straight fins which are 0.75 mm thick and protrude 2.5 cm from cylindrical surface. Workout the increase in heat dissipation due to addition of fins. Also calculate the temperature at the centre of the fin. It may be presumed that the fins have insulated tip and that the thermal conductivity of the cylinder head and fin material is 260 kJ/m-hr-degree.

Q.4 a) Explain the following:
   i) Biot and Fourier number.
   ii) Heisler charts.

b) A cylindrical ingot, 25 mm radius and 250 mm height, initially at 800°C is dipped in water at 25°C with convective heat transfer coefficient of 2.5 W/m°C and dipping continues till the temperature drops to 400°C. Subsequently the ingot is kept exposed to air at 25°C with convective coefficient of 27.5 W/m°C till it attains a temperature of 80°C. If the ingot material has thermal conductivity 65 W/m°C, specific heat 250 J/kg K and density 820 kg/m³, make calculations for the total time required for the ingot to reach the temperature from 800°C to 80°C.

PART-B

Q.5 a) Discuss the following:
   i) Nusselt number.
   ii) Prandtl number.

b) What factors affect the value of convection coefficient for water flowing inside a circular tube? Within a condenser shell, water flows through one hundred thin-walled circular tubes (diameter=22.5 mm and length 5 m) which have been arranged in parallel? The mass flow rate of water is 65 kg/s and its inlet
and outlet temperatures are known to be 22 °C and 28 °C respectively. Predict the average convection coefficient associated with water flow.

10

Q.6 a) Derive an expression for radiant heat exchange between two large concentric cylinders.

b) Explain the meaning of the term geometric factor in relation to heat exchange by radiation. Derive an expression for the geometric factor $F_{11}$ for the inside surface of a black hemispherical cavity of radius R with respect to itself.

10

Q.7 a) Derive an expression for logarithmic mean temperature difference (LMTD) in the case of counter-flow heat exchangers.

b) Exhaust gases ($C_p=1.12 \text{ KJ/Kg K}$) flowing through a tubular heat exchanger at the rate of 1200 kg/hr are cooled from 400 °C to 120 °C. The cooling is affected by water ($C_p=4.18 \text{ kJ/kg K}$) that enters the system at 10 °C at the rate of 1500 kg/hr. If the overall heat transfer coefficient is 500 kJ/m²hrk, what heat exchanger area is required to handle the load for i) parallel flow and ii) counter flow arrangement?

10
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
IC ENGINES AND GAS TURBINES (M-621)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the assumption made in an air standard cycle?
   b) Define specific weight and work ratio.
   c) Explain MPFI with advantages.
   d) Describe what happens if the gap of spark plug increase or decreases.
   e) Explain cetane rating.
   f) What do you understand by rating of lubricants?
   g) What are radiators and explain their working principle?
   h) Explain why the temperature of exhaust gases is less or more w.r.t. atmosphere.
   i) Why do we use turbine for power generation?
   j) Explain detonation.

PART-A

Q.2 a) Derive an expression for thermal efficiency and mean effective pressure for dual cycle on P-h and T-S diagram.

b) In an ideal diesel cycle, the pressure and temperature are 1.09 bar and $35^\circ C$, respectively. The maximum pressure in the cycle is $47 \times 10^5 Pa$ and the heat supplied during the cycle is 545 kJ/kg. Determine:
   i) the compression ratio.
   ii) the temperature at the end of compression.
   iii) the temperature at the end of constant pressure combustion.
   iv) the air standard efficiency.
   Assume $r = 1.4$ and $C_p = 1.004 kJ/kgK$ for air.

Q.3 a) Derive an expression for mass flow rate of air at venturi. Assume $C_p = 1.005 kJ/kgK$, $r = 1.4$ and $R = 0.287 kJ/kgK$ for air.
b) Briefly explain SI engine mixture requirement for various operating conditions. 10

Q.4  
a) Write in detail about stages of combustion in an SI engine. 10

b) Can we use compact combustion chamber? If yes, explain different types of combustion chambers. 10

**PART-B**

Q.5  
a) Discuss a lubrication system and its different types and briefly explain one of them with a diagram. 10

b) What are the factors which affect mechanical friction and upto what is the percentage of energy input loss for a reciprocating engine with a good engine design. 10

Q.6  
a) Briefly explain Willan’s line method and Morse test to estimate the performance of the engine. 10

b) Explain indicated mean effective pressure indicated power brake power and brake mean effective pressure for an engine. 10

Q.7  
a) Explain different methods for improving thermal efficiency of open cycle gas turbine on P-h and T-S diagram. 10

b) Briefly explain closed cycle gas turbine with energy balance equation. Also write its merits and demerits. 10
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
POWER PLANT ENGINEERING (M-622)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on the following:
a) Classification of energy sources.
b) What is a Stirling cycle?
c) Significance of draft tubes.
d) What is Deaeration?
e) What is an ash handling system?
f) What is a PFBC system?
g) What is a PWR type nuclear reactor?
h) What is the basic nuclear reaction that takes place in nuclear plants?
i) Input-output curves.
j) Economics load sharing.

2x10

PART-A

Q.2 a) Discuss briefly the basic thermo-dynamic cycles used in power plants.
10
b) Discuss about the factors which are considered while site selection for a power plant is made.
10

Q.3 a) How is the type of turbine selected in a certain hydro plant? Discuss the effects of head, specific speed, height of installation and capacity on the selection process.
10
b) What do you understand by the term: cavitations? What are its effects? How can it be minimized?
10

Q.4 a) Explain in detail the setup and working principle of modern thermal power plants
b) Why are the economisers tubes often finned or gilled on the gas side?

PART-B

Q.5 a) Explain with a neat sketch the arrangement of combined plants like steam and gas turbine power plants.

b) In a cogeneration binary cycle, superheated steam enters the turbine with a mass rate of 5 kg/s at 40 bar, 440 °C and expands isentropically to 1.5 bar. Half of the flow is extracted at 1.5 bars and used for industrial process heating. The remaining steam passes through a heat exchanger, which serves as the boiler of the refrigerant-12 cycle and the condenser for the steam cycle. The condensate leaves the heat exchanger as saturated liquid at 1 bar, where it is combined with the return flow from the industrial process at 60 °C and 1 bar before being pumped isentropically to the steam generator. The refrigerant-12 cycle is an ideal Rankine cycle with refrigerant entering the turbine at 16 bar, 100 °C and saturated liquid leaving the condenser at 9 bar. Determine:
   i) The rate of heat transfer in the steam generator.
   ii) The net power output of the binary cycle.
   iii) The rate of heat transfer to the industrial process.

Q.6 Explain in detail with a neat sketch, basic nuclear reaction, principles of nuclear energy and working of a nuclear power plant.

Q.7 a) Write briefly about tariff methods of electrical energy.

   a) Explain the following:
      i) Incremental rate theory.
      ii) Heat rate.
      iii) Cost of electrical energy.
      iv) Operating characteristics of a power plant.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
AUTOMOBILE ENGINEERING (M-624)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following:
   a) Four wheel drive.
   b) Vehicle frame.
   c) Requirement of a clutch.
   d) Epicyclic gear box.
   e) Overdrive.
   f) Slip joint.
   g) Wheel alignment.
   h) Wheel balancing.
   i) Leaf springs.
   j) Catalytic converter.

   2x10

PART-A

Q.2 a) Differentiate between front engine front drive vehicles and front engine rear drive vehicles. 10

b) What are future trends in automobiles? Explain them. 10

Q.3 a) With the help of a neat sketch, explain construction and working of a diaphragm spring clutch. 10

b) Differentiate between:
   i) Wet and dry clutch.
   ii) Single and multi-plate clutch. 5x2

Q.4 a) Describe the working of a synchromesh gear box with the help of a neat sketch.
10
b) Describe different types of live rear axles and explain their advantages and disadvantages.

PART-B

Q.5  a) Enumerate the components of a suspension system and state their functions briefly.

b) Define the following terms:
   i) Camber.
   ii) Toe in.
   iii) King pin inclination.
   iv) Caster angle.

2½x4

Q.6  a) What are advantages and disadvantages of disc brakes compared with drum brakes?

b) Differentiate between mechanical and hydraulic braking systems.

5

c) What are different causes of tyre wear? Explain them.

10

Q.7  a) "Battery is the heart of electrical system in an automobile". Explain.

b) Write short notes on the following:
   i) Vehicle lighting system.
   ii) Positive crank case ventilation system.

5x2
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
SOLAR ENERGY AND ITS APPLICATIONS (M-626)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain scattered radiation.
b) Describe Zenith angle.
c) State why the solar constant is not a constant?
d) Explain air-mass ratio.
e) Why solar radiation is treated as monodirectional radiation?
f) Describe terrestrial spectrum.
g) Describe Reynolds number and its usefulness.
h) State function of a solar collector.
i) Value of density ($\rho$) for in compressible fluid is _______ and in a pipe of constant diameter D, $\frac{dv}{dx}$ is ________.
j) How much time Earth takes to move through one degree?

2x10

PART-A

Q.2
a) Name the instrument used to measure the direct radiation. Explain constructional details and its working with a neat sketch covering the limitations. 10
b) What is a spectrum? Explain the difference between terrestrial and extraterrestrial spectrums. 10

Q.3
a) Calculate the sunset hour angle and day length at a location with latitude 35° N on Feb 14. 10
b) Describe in brief:
   i) Function of sun shine recorder.
   ii) Expression for declination angle.
   iii) Latitude angle.
   iv) Difference between direct radiation and scattered radiation.
Q.4  a) Calculate the hour angle at 3.30 pm.  
    b) List the various orientations of a flat-plate solar collector and explain which orientation gives overall best performance.  
    c) Explain in detail the solar constant.  

**PART-B** 

Q.5  a) Describe the principle of separation of solar ponds.  
    b) State the applications of solar ponds.  
    c) Describe in detail the constructional details and functioning of salt gradient non-convective solar pond with a neat schematic diagram.  

Q.6  a) Describe in detail the latent heat storage with a neat schematic diagram mentioning the maternal used and its applications.  
    b) Explain thermal energy storage and why it is required?  
    c) State the major characteristics of thermal energy storage.  

Q.7  a) Describe in detail the community heating and cooling system using solar collectors and bring out its advantages over individual house heating and cooling.  
    b) Describe in detail the solar gas absorption refrigeration scheme with a neat schematic diagram and its applications. Also list the maternal used.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
REFRIGERATION AND AIR-CONDITIONING (M-821)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer in brief:
   a) What is difference between a refrigerator and heat pump?
   b) Discuss frosting and defrosting evaporators.
   c) Define humidification and dehumidification.
   d) Write the chemical formulae for R-12 and R-22.
   e) Give units of refrigeration and refrigeration effect.

4x5

PART-A

Q.2 A Bell-Coleman refrigeration system is used to produce 10 tons of refrigeration. The cooler and refrigerator pressure are 4.2 bars and 1.4 bars. Air is cooled in cooler to 45º C and temperature of air at the inlet of the compressor is -20º C. For an ideal cycle, calculate COP, mass of air circulated /min, theoretical piston displacement of compressor and power required per ton of refrigeration. Assume C_p for air as 1.005 kJ/kg-k.

20

Q.3 The temperature limits of an ammonia refrigeration system are 25º C and -10º C. If the refrigerant is dry saturated at the end of compression, calculate the COP. Assuming the state of refrigerant at the exit of condenser as saturated liquid, use the following table:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>hf kJ/kg</th>
<th>Latent heat (h_g - h_f)</th>
<th>Sf kJ/kg - k</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>298.9</td>
<td>1166.94</td>
<td>1.1242</td>
</tr>
<tr>
<td>-10</td>
<td>135.37</td>
<td>1297.68</td>
<td>0.5473</td>
</tr>
</tbody>
</table>

20
Q.4  a) Mention the function of each fluid in three fluid vapour absorption systems with a neat diagram.  

b) Discuss the advantages of vapour absorption refrigeration system over a vapour compression refrigeration system.

10

PART-B

Q.5  a) Explain the following terms:

i) Dry Bulb temperature.

ii) Dew point and wet bulb temperature.

iii) Degree of saturation.

iv) Sensible heat factor.

v) Bypass factor.

2x5

b) Moist air at 1 atmospheric pressure and 30° C contains 10 gm of vapour per kg d-a. Assume that air and water vapour mixture behave as an ideal gas and saturated pressure of water vapour at 30° C is 3.167 kPa. Then calculate the relative humidity.

10

Q.6  The room sensible and latent heat loads for an air conditioned space are 25 kW and 5 kW, respectively. The room condition is 25° C dry bulb temperature and 50 % relative humidity. The outdoor condition is 40° C dry bulb temperature and 50 % relative humidity. The ventilation requirement is such that on mass flow rate basis, 20 % fresh air is introduced and 80 % of air supply is recirculated. The by-pass factor of the cooling coil is 0.15. Determine:

a) Supply air flow rate.

b) Outside air sensible heat.

c) Outside air latent heat

d) Grand total heat.

e) Effective room sensible heat factor.

20

Q.7  a) What is volumetric efficiency of a compressor? Find the expression of the volumetric efficiency in terms of working pressure ratio.

10

b) Explain the following in detail.

i) Condenser.

ii) Expansion devices.

10
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
REFRIGERATION AND AIR-CONDITIONING (M-821)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer in brief:
   a) Write the chemical formulae for R-11 and R-22.
   b) Discuss the frosting and defrosting evaporator.
   c) Define specific humidity and relative humidity.
   d) Explain the term “tonne of refrigeration” and refrigeration effect.
   e) Define sensible heating and sensible cooling.

   4x5

PART A

Q.2 Air is used as a refrigerant in Bell-Coleman cycle. Draw T-S and P-V diagrams for this cycle and derive the COP. If the temperature at end of heat absorption is 0°C and the end of heat rejection is 30°C, determine the temperature at all the salient points and the volume flow rate at the inlet to the compressor and at exit of the expander for 1 tonne capacity of cooling. (Take pressure at inlet to compressor as 1 bar and \( \gamma_p = 4 \).)

   20

Q.3 A refrigeration system operating on simple vapor compression refrigeration cycle has a COP of 6.5, the enthalpy of saturated liquid and saturated vapour at the operating condensing temperature of 35°C are 69.55 kJ/kg and 201.45 kJ/kg, respectively. The saturated refrigerant vapour leaves the evaporator at an enthalpy of 187.53 kJ/kg. Find the refrigerant temperature at compressor discharge. [\( C_p \) of vapour refrigerant is equal to 0.6155 kJ/kg-k].

   20

Q.4 Drive an expression for the COP of an ideal vapour absorption system in terms of temperature \( T_G \) at which heat is supplied to the generator, the temperature \( T_E \) at which heat is absorbed in the evaporator and the temperature \( T_C \) at which heat
is discharged from condenser and absorber.

20

**PART-B**

Q.5 a) Atmospheric air at 100 kPa and 30° C has a relative humidity of 70 %. The saturation pressure of water vapour at 30° is 4.25 KPa. Find the partial pressure of dry air in KPa.

10

b) Explain the following terms:
   i) Dry bulb temperature.
   ii) Dew point and wet bulb temperature.
   iii) Degree of saturation.
   iv) Sensible heat factor.
   v) Bypass factor.

2x5

Q.6 Room sensible and latent heat loads for an air conditioned space are 25 kW and 5 kW, respectively. The room condition is 25° C dry bulb temperature and 50 % relative humidity. The outdoor condition is 40° C dry bulb temperature and 50 % relative humidity. The ventilation requirement is such that on mass flow rate basis, 20% fresh air is introduced and 80% of supply air is recirculated. The bypass factor of the cooling coil is 0.15.

Determine:
   i) Supply air flow rate.
   ii) Outside air sensible heat.
   iii) Outside air latent heat.
   iv) Grand total heat.
   v) Effective room sensible heat factor.

20

Q.7 a) What is volumetric efficiency of a compressor? Find an expression of the volumetric efficiency in terms of working pressure ratio.

10

b) Explain the following in detail:
   i) Condenser.
   ii) Expansion devices.

5x2
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
MODERN MACHINING METHODS (M-835)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  

a) State the mechanism of material removal in AJM.
b) State the applications of WJM.
c) State the functions of a liquid used in USM.
d) State the effect of “Concentration of the electrolyte” on the efficiency of ECM.
e) State the principle of chemical machining.
f) State the applications of EDM.
g) State the advantage of LASER drilling.
h) What are transferred type and non-transferred type plasma arc systems in PAM?
i) State the advantages and limitations of EBM.
j) State the basic principle of electro-chemical grinding (ECG).

2x10

PART-A

Q.2  

Compare and analyse the unconventional machining processes based on:
a) Physical parameters.
b) Capacity to shape.
c) Economics of the processes.

20

Q.3  

Write short notes on the following:
a) Functions of slurry, transducer and concentrator in USM.

5  
b) Types of abrasive used in USM.

5  
c) Principle of abrasive jet machining (AJM).

5  
d) Limitations of water jet machining (WJM).

5

Q.4  

a) Explain the principle of electro-chemical machining (ECM).

5
b) Explain briefly the factors governing the accuracy of parts produced by ECM.  
5

c) Explain the essential properties of an electrolyte in ECM.  
5

d) Explain the photo-chemical blanking.  
5

**PART-B**

Q.5  
a) With the help of a neat sketch explain the mechanism of material removal in EDM.  
8

b) Explain with sketches the different feasible dielectric flushing techniques applicable in case of EDM.  
12

Q.6  
a) Explain in brief the production of LASER beam and working principle of LBM.  
10

b) Explain the working principle of EBM process.  
10

Q.7 Write short notes on *any two*:

a) Electro-chemical grinding (ECG).

b) Wire-cut EDM.

c) Electro-chemical honing.

d) Electro-stream drilling.  
10x2
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
MODERN MACHINING METHODS (M-835)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following questions:
   a) Distinguish between conventional and unconventional machining processes.
   b) Identify the process parameters of USM.
   c) State the function of attenuator used in WJM.
   d) State the effect of SOD on MRR of AJM process.
   e) Why is ECM process referred as reverse electrolysis?
   f) Name the tool (cathode) making methods of ECM process.
   g) State the significance of “critical resistance” in EDM generators.
   h) Name the material used in electrode tip of PAM. Why?
   i) State the process capabilities of EBM.
   j) Name the types of lasers used in manufacturing process.

   2x10

PART-A

Q.2 What are various types of modern machining methods? Enumerate the differences between them in respect of type of energy, mechanism of metal removal, transfer media, energy source.

   20

Q.3 Write short notes on the following:
   a) Abrasive slurry in USM
   b) Cutting tool design consideration in USM
   c) Intensification technology in WJM
   d) Attenuator and accumulator used in WJM

   5x4

Q.4 Write short notes on the following:
   a) Self adjusting features of ECM

   5
   b) Working life of electrolyte in ECM

   5
c) Areas of application of Chemical Machining

**PART-B**

Q.5  
 a) Draw a typical relaxation circuit used for the EDM power supply and derives the expression for the material removal rate.

15

b) What are different types of power supplies used in EDM?

5

Q.6  
 a) Explain in brief the working principle of plasma arc machining.

10

b) Describe with sketch a typical laser system for machining process.

10

Q.7  
 Write short notes on *any two* of the following:

a) Rotary ultrasonic machining

b) Electro-chemical spark machining

c) Wire-cut EDM

d) Electro-chemical grinding

10x2
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED MATHEMATICS-I (MA-101/MA-101A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Give an example of monotonically increasing sequence which is:
   i) Convergent
   ii) Divergent
b) Test whether the series is convergent or not:
   \[ 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} \ldots \]
c) Find the \( n \)-th derivative of \( \log(ax+b) \)
d) If \( u = \sin \left( \frac{x}{y} \right) \), \( x = e^t \) and \( y = t^2 \), find \( \frac{du}{dt} \) as a function of \( t \).
e) If \( u = x^y \) then \( \frac{\partial u}{\partial x} \) is equal to:
   i) 0
   ii) \( yx^{y-1} \)
   iii) \( x^y \log x \)
   iv) None of the above
f) Expand \( \tan^{-1} x \) in the powers of \( x \).
g) Find the particular integral of \( \frac{d^2y}{dx^2} - \frac{dy}{dx} = 3 \).
h) Write down the order and degree of the differential equation \( \frac{dy}{dx} = x^2 - 1 \)
i) Evaluate: \( \int_0^{\pi/2} \sin^4 x \cdot \cos^5 x \, dx \)
j) Give the physical interpretation of the gradient of any function.

2x10

PART-A

Q.2  Discuss the convergence of the series:
a) \[ \sum \frac{1 \cdot 3 \cdot 5 \cdot 7 \ldots (2n-1)}{2 \cdot 4 \cdot 6 \cdot 8 \ldots 2n} \]

10
b) \[ \sum_{n=1}^{\infty} \frac{(-1)^n 2^n}{n^2} \]

c) \[ \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2} \]

Q.3

a) Compute the value of \( \sin 31^\circ \) to four decimal places.

b) If \( x = \tan y \), then prove that: \( (x^2 + 1)y_{n+1} + 2nx y_n + n(n-1)y_{n-1} = 0 \)

Q.4

a) The temperature \( T \) at any point \((x, y, z)\) in space is \( T = 400xyz^2 \). Find the highest temperature at the surface of a unit sphere \( x^2 + y^2 + z^2 = 1 \)

b) Verify Euler’s theorem for the function: \( u = \sin^{-1} \left( \frac{x}{y} \right) + \tan^{-1} \left( \frac{y}{x} \right) \)

c) If \( y_1 = \frac{x_2 x_3}{x_1}, \quad y_2 = \frac{x_1 x_3}{x_2}, \quad y_3 = \frac{x_1 x_2}{x_3} \), then show that: \( \frac{\partial (y_1, y_2, y_3)}{\partial (x_1, x_2, x_3)} = 4 \)

PART-B

Q.5

a) Solve the simultaneous differential equations:
\[ Dx + y = \sin t \]
\[ x + Dy = \cos t \]
Subject to the condition at \( t = 0; \quad x = 2, \text{ and } y = 0 \)

b) Solve \( \frac{d^3 y}{dx^3} - 3 \frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} - 2y = e^x + \cos x \)

c) Solve \( x^2 y + dx - (x^3 + y^3) dy = 0 \)

Q.6

a) Sketch the region bounded between \( x = -y^2 \) and \( y = x + 2 \). Also find its area.
b) Show that \( \int_0^\infty x^m e^{-a^2x^2} \, dx = \frac{1}{2} \frac{m+1}{a^{m+1}} \) 

7

c) Change the order of integration of: \( \int_0^1 \int_0^{\sqrt{y}} dx \, dy \) 

6

Q.7  
b) Find the total work done in moving a particle in a force field given by \( \vec{F} = 3xy \hat{i} - 5z \hat{j} + 10 \hat{k} \) along the curve \( x = t^2, \ y = 2t, \ z = t^3 \) from \( t = 1 \) to \( t = 2 \). 

6

c) Evaluate \( \int_C \vec{F} \cdot d\vec{r} \) where \( C \) is the curve consisting of straight lines from \((0,0,0)\) to \((1,0,0)\) then to \((1,1,0)\) and then to \((1,1,1)\). 

7

c) If \( \vec{F} = (3x^2 + 6xy) \hat{i} - 14yz \hat{j} + 20xz^2 \hat{k} \). Evaluate \( \iiint_V \nabla \cdot \vec{F} \, dV \) along the closed region bounded by the planes \( x = 0, \ y = 0, \ z = 0 \) and \( 2x + 2y + z = 4 \). 

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End Semester Examination, Dec. 2014  
B. Tech. – First Semester  
APPLIED MATHEMATICS-I (MA-101 / MA-101A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Test for convergence / divergence \(1 + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \frac{5}{6} + \ldots + \frac{n}{n+1} + \ldots \infty\).

b) Define Leibnitz’s Rule for \(n^{th}\) differential coefficient of the product of two functions.

c) Find the extreme value of \(x^2 + y^2 + 6x + 12\).

d) Find the complementary function of \((D^3 + 1)y = 0\).

e) If \(x = r \cos \theta, \ y = r \sin \theta\); find \(\left(\frac{\partial r}{\partial x}\right)_{y}, \left(\frac{\partial y}{\partial \theta}\right)_{r}\).

f) Find: \(\beta \left[\frac{9}{2}, \frac{7}{2}\right]\).

g) What is the direction derivative of \(f = xy^2 + yz^3\) at the point \((2,-1, 1)\) in the direction of normal to the surface \(x \log z - y^2 = 4\) at \((-1, 2)\).

h) Give an example of a monotonic decreasing sequence which is convergent.

i) Evaluate: \(\int_{0}^{a} \int_{0}^{\sqrt{a^2-y^2}} \sqrt{a^2-x^2-y^2} \, dx \, dy\).

j) Find: \(\frac{dy}{dx}\), when \(x^y + y^x = c\).

2x10

PART-A

Q.2  
a) Discuss the convergence of \(\sum \frac{1}{(\log n)^n}\).  

b) Test the series \(1 - \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} - \frac{1}{4\sqrt{4}} \ldots \ldots\) for

i) absolute convergence  

ii) conditional convergence.
c) Test for convergence of the series \( \sum \frac{(n!)^2 x^{2n}}{(2n)!} \).

Q.3  

a) Expand \( (\sin^{-1} x)^2 \) by using Maclaurin’s series.

b) Expand \( \tan \left(x + \frac{\pi}{4}\right) \) in powers of \( x \) and evaluate \( \tan 46.5^0 \).

Q.4  

a) If \( x = r \cos \theta, \ y = r \sin \theta, \ Z = z \), evaluate \( \frac{\partial(x, y, Z)}{\partial(r, \theta, z)} \).

b) Find the maximum and minimum value of \( x^3 + y^3 - 3axy \).

c) If \( \frac{x^2}{a^2 + u} + \frac{y^2}{b^2 + u} + \frac{z^2}{c^2 + u} = 1 \), prove that:
\[
\left( \frac{\partial u}{\partial x} \right)^2 + \left( \frac{\partial u}{\partial y} \right)^2 + \left( \frac{\partial u}{\partial z} \right)^2 = 2 \left( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} \right).
\]

PART-B

Q.5  

a) Change the order of integration in the integral and evaluate \( \int \int_{0}^{4a} \int_{x^2/4a}^{2} dy dx \).

b) Prove that \( \beta \left(m, \frac{1}{2}\right) = 2^{2m-1} \beta(m, n) \).

Q.6  

a) Evaluate \( \int_{C} (y - \sin x)dx + \cos x \cdot dy \) where \( C \) is the plane triangle enclosed by the lines \( y = 0, \ x = \frac{\pi}{2} \) and \( y = \frac{2}{\pi} x \).

b) What is the directional derivative of \( f = xy^2 + yz^3 \) at the point \( (2, -1, 1) \) in the direction of normal to the surface \( x \log z - y^2 = -4 \) at \((-1, 2, 1)\).

c) Prove that \( \text{div} (\text{grad} \ r^n) = n(n+1)r^{n-2} \).
Q.7  a) Solve: \( \frac{d^2y}{dx^2} + y = \csc x \)  

b) Solve: \( \frac{dx}{dt} + y = \sin t; \quad \frac{dy}{dt} + x = \cos t; \) given that \( x = 2 \) and \( y = 0 \) when \( t = 0 \).
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
APPLIED MATHEMATICS-II (MA-201 / MA-201A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Give an example of a $3 \times 3$ matrix of rank 1.
b) Are the equations $x + 2y = 1$, $7x + 14y = 12$ consistent?
c) The period of $\cos 3x$ is $x = \phantom{0}$. 
d) Check whether $f(t) = \begin{cases} -1, & -1 < t < 0 \\ 1, & 0 < t < 1 \end{cases}$ is even or odd.
e) Write one dimensional wave equation.
f) Solve the differential equation $z = px + qy + a^2 b$
g) $w = \log z$ is analytic every where except at $z = \phantom{0}$.
h) The poles of $f(z) = \frac{z^3 - 1}{z^3 + 1}$ are \phantom{0}.
i) Define a unit step function.
j) Write the Fourier sine transform of $f(t)$.

2x10

PART-A

Q.2 a) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

10

b) Find the non-singular matrices $P$ and $Q$ such that $PAQ$ is in the normal form for the matrix:

\[
A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}
\]

6

c) Are the following vector linearly dependent? If so, find the relation between them, $x_1 = (3, 2, 7), x_2 = (2, 4, 1), x_3 = (1, -2, 6)$.

4
Q.3  
a) Obtain the Fourier series for the function \( f(x) = |x|, -\pi < x < \pi \).

10

b) Find the Fourier expansion of \( f(x) = x.\sin x \) in the interval \((-\pi, \pi)\).

10

Q.4  
a) Solve \((y+z)p + (z+x)q = x + y\)

5

b) Solve \(xyz = z^2\)

5

c) A tightly stretched string of length \( \ell \) with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity \( V_0 \sin \frac{\pi x}{\ell} \). Find the displacement \( y(x,t) \).

10

PART-B

Q.5  
a) Find the analytic function \( f(z) \), where \( u = e^z \sin 2y \) is the real part of \( f(z) \).

7

b) Find Laurent’s series about \( z = \pi \) for the function \( f(x) = \frac{\sin z}{z - \pi} \).

6

c) Evaluate \( \int_{C} \frac{\cos \pi z^2}{(z-1)(z-2)} dz \), where \( C \) is the circle \( |z| = 3 \).

7

Q.6  
a) Express \( f(x) = \begin{cases} 1 & \text{for } 0 \leq x < \pi \\ 0 & \text{for } x > \pi \end{cases} \) as Fourier sine integral and hence evaluate \( \int_{0}^{\infty} \frac{1 - \cos(\pi \lambda)}{\lambda} \sin(x\lambda) d\lambda \).

5

b) State and prove the relation between Fourier and Laplace transforms.

5

c) Find the Fouriers cosine transform of \( e^{-x^2} \).

10

Q.7  
a) Find Laplace transform of \( \frac{e^{-at} - e^{-bt}}{t} \).

5
b) Find \( L^{-1}\left\{ \frac{s}{(s^2 + a^2)^2} \right\} \)

c) Using Laplace transform, solve:
\[(D - 2)x - (D + 1)y = 6e^{3t} \text{ and }\]
\[(2D - 3)x + (D - 3)y = 6e^{3t}\]
given that \( y = 0, x = 3 \) when \( t = 0 \).
Q.1. One morning Rama and Vishal were talking to each other face to face at a crossing. If Vishal's shadow was exactly to the left of Rama, which direction was Rama facing?
A. East   B. West   C. North   D. South

Q.2. Five children were administered psychological tests to know their intellectual levels. In the report, psychologists pointed out that the child A is less intelligent than the child B. The child C is less intelligent than the child D. The child B is less intelligent than the child C and child A is more intelligent then the child E. Which child is the most intelligent?
A. A   B. B  C. D  D. E

Q.3. M * N means M and N are of the same age;
M - N means N is younger than M;
M + N means M is younger than N;
Priyanka * Saroj - Priya means
A. Priya is the youngest.
B. Priya is the oldest.
C. Saroj is younger than Priya
D. None of these

Q.4. There are three different boxes A, B and C. Difference between weights of A and B is 3 kgs. And between B and C is 5 kgs. Then what is the maximum sum of the differences of all possible combinations when two boxes are taken each time?
A. 8   B. 16   C. 12   D. Can not be determined

Q.5. Two numbers are greater than the third number by 25% and 20% respectively. What percent of first number is the second number?
A. 92%   B. 94%   C. 98%  D. None of these

Q.6. On 8th Dec, 2005 Saturday falls. What day of the week was it on 8th Dec, 2004?
A. Sunday   B. Thursday   C. Tuesday   D. Friday

Q.7. A student finds the average of 10 positive integers. Each integer contains two digits. By mistake, the boy interchanges the digits of one number say ba for ab. Due to this, the average becomes 1.8 less than the previous one. What was the difference of the two digits a and b?
A. 8   B. 6   C. 2   D. 4

Q.8. When 242 is divided by a certain divisor the remainder obtained is 8. When 698 is divided by the same divisor the remainder obtained is 9. However, when the sum of the two numbers 242 and 698 is divided by the divisor, the remainder
obtained is 4. What is the value of the divisor?
A. 11  B. 17  C. 13  D. 23

Q.9. Mr. Thomas invested an amount of Rs. 13,900 divided in two different schemes A and B at the simple interest rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 3508, what was the amount invested in Scheme B?
A. Rs. 6400  B. Rs. 6500  C. Rs. 7200  D. Rs. 7500  E. None of these

Q.10. If log 2 = 0.30103, the number of digits in 2^64 is:
A. 18  B. 19  C. 20  D. 21

Q.11. My brother is 3 years elder to me. My father was 28 years of age when my sister was born while my mother was 26 years of age when I was born. If my sister was 4 years of age when my brother was born, then what was the age my father when my brother was born?
A. 35 yr  B. 34 yr  C. 33 yr  D. 32 yr

Q.12. Introducing a woman, Nisha said, ‘She is the daughter-in-law of the grandmother of my father’s only son.” How is the woman related to Nisha?
A. Grandmother  B. Sister-in-law  C. Sister  D. Mother

Q.13. It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the cars is:
A. 2:3  B. 3:2  C. 3:4  D. 4:3

Q.14. A train starts from Delhi at 6:00 am and reaches Ambala cantt. at 10am. The other train starts from Ambala cantt. at 8am and reached Delhi at 11:30 am, If the distance between Delhi and Ambala cantt is 200 km, then at what time did the two trains meet each other?
A. 8:46am  B. 8:40am  C. 8:56am  D. 8:50am

Q.15. How many nos. between 4000 and 9000 can be formed using the digits: 3, 4, 7 and 9
A. 54  B. 128  C. 192  D. None of these

Q.16. After the typist writes 12 letters and addresses 12 envelopes, she inserts the letters randomly into the envelopes (1 letter per envelope). What is the probability that exactly 1 letter is inserted in an improper envelope?
A.1/12  B. 0  C. 12/212  D. 11/12

Q.17. In a queue I am the last person while my friend is seventh from the front. If the person exactly between me and my friend is on the 23rd position from the front, what is my position in the queue?
A. 37  B. 36  C. 38  D. 39

Q.18. Smita was making a cube with dimensions 5*5*5 using 1*1*1 cubes. What is the number of cubes needed to make a hollow cube looking of the same shape?
A. 98  B. 104  C. 100  D. 61

Q.19. Count the number of parallelogram in the given figure.

A. 8  B. 11  C. 12  D. 15

Q.20. The sides of a triangle are in the ration of ½:1/3:1/4. If the perimeter is 52cm, then the length of the smallest side is
a. 9 cm  b. 10 cm  c. 11 cm  d. 12 cm
Q.21. The diagonal of a square is 20 cm. Then its area is
a. 80      b. 120      c. 200      d. 400
Q.22. How many numbers between 11 and 90 divisible by 7?
A. 10       B. 11       C. 12       D. 13
Q.23. SCD, TEF, UGH, ____, WKL
A. CMN       B. UJI       C. VIJ       D. IJT
Q.24. Look at this series: 7, 10, 8, 11, 9, 12, ...
What number should come next?
A. 7       B. 10       C. 12       D. 13
Q.25. Here are some words translated from an artificial language.
dionot means oak tree
blyonot means oak leaf
blycrin means maple leaf
Which word could mean "maple syrup"?
A. blymuth       B. hupponot       C. patricrin       D. crinweel
Q.26. A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do it in:
A. 15 days       B. 20 days       C. 25 days       D. 30 days
Q.27. A pump can fill a tank with water in 10 hours. Because of a leak, it took 2 hours more to fill the tank. The leak can drain all the water of the tank in:
A. 40 hours       B. 60 hours       C. 80 hours       D. 14 hours
Q.28. A does 80% of a work in 20 days. He then calls in B and they together finish the remaining work in 3 days. How long B alone would take to do the whole work?
A. 23 days       B. 37 days       C. 37.5 days       D. 40 days
Q.29. If 50% of the 2:3 solution of the milk and water is replaced with water, then the concentration of the solution is reduced by,
A. 25%       B. 33.33%       C. 50%       D. 75%
Q.30. At the birthday party of Sherry, 40% chose to give him clothes as gift and 25% chose to shake hands with him. 10% chose to both gift him and shake hands with him. How many persons turned out at the party?
A.35       B. 75       C. 55       D. 25
Q.31. There are 20,000 people living in Defence Colony, Gurgaon. Out of them 9000 subscribe to Star TV Network and 12,000 to Zee TV Network. If 4000 subscribe to both, how many do not subscribe to any of the two?
A.3000       B. 2000       C. 1000 D. 4000
Q.32. Rita told Mani,"The girl I met yesterday at the beach was the youngest daughter of the brother-in-law of my friend's mother " How is the girl related to Rita's friend ?
A. Cousin       B. Daughter       C. Neice       D. Aunt
Q.33. Starting from the point X, Jayant walked 15 m towards west. He turned left and walked 20 m. He then turned left and walked 15 m. After this he turned to his right and walked 12 m. How far and in which directions is now Jayant from X?
A. 32 m, South       B. 47 m, East       C. 42 m, North       D. 27 m, South
Q.34. If a and b are positive integers and \((a-b)/3.5 = 4/7\), then
Q.35. In June a baseball team that played 60 games had won 30% of its game played. After a phenomenal winning streak this team raised its average to 50%. How many games must the team have won in a row to attain this average?
A. 12
B. 20
C. 24
D. 30

Q.36. M men agree to purchase a gift for Rs. D. If three men drop out how much more will each have to contribute towards the purchase of the gift?
A. D/(M-3)
B. MD/3
C. M/(D-3)
D. 3D/(M^2 - 3M)

Q.37. There are two candles of equal lengths and of different thickness. The thicker one lasts of six hours. The thinner 2 hours less than the thicker one. Ramesh lights the two candles at the same time. When he went to bed he saw the thicker one is twice the length of the thinner one. How long ago did Ramesh light the two candles?
A. 3
B. 2
C. 4
D. 1

Q.38. Two trees are there. One grows at 3/5 of the other. In 4 years, total growth of trees is 8 ft. what growth will smaller tree will have in 2 years.
A. <2 ft
B. 2 ft
C. 2 1/4 ft
D. 2 1/2 ft

Q.39. In a mixture, R is 2 parts, S is 1 part. In order to make S to 25% of the mixture, how much R is to be added?
A. 1/2 part
B. 2/3 part
C. 1 part
D. 5/4 part

Q.40. David gets on the elevator at the 11th floor of a building and rides up at the rate of 57 floors per minute. At the same time, Albert gets on an elevator at the 51st floor of the same building and rides down at the rate of 63 floors per minute. If they continue travelling at these rates, then at which floor will their paths cross?

Q.41. At a parking place, 36 vehicles are parked in a single row. After the first car there is one scooter, after the second car there are two scooters and after the third car there are three scooters and so on. What is the total number of scooters in the row?
A. 24
B. 26
C. 28
D. 31

Q.42. Which should come in place of the Question Mark - 94,166, 258,?,4912
A.3610
B.1644
C.1026
D. None of these

Q.43. Which should come in place of the Question Mark?
17,17,68,612,?
A.9792
B.9700
C.9820
D.8945

Q.44. Five newly born babies were weighed by the doctor.In her report, she stated that child A is lighter than child B. Child C is lighter than child D. Child B is lighter than child D, but heavier than child E. Which child is the heaviest?
A.E
B.D
C. C
D. A

Q.45. Rama remembers that she met her brother on Saturday, which was after the 20th day of a particular month. If the 1st day of the month was Tuesday, then on which date did Rama meet her brother?
A.24th
B. 23rd
C. 25th
D. None of these

Q.46. How many three digit odd numbers can be formed if the repetition of digits 1, 2, 3, 4, 5, 6 when the repetition of the digits is not allowed?
A. 108
B. 60
C. 120
D. 64

Q.47. At what time between 5.30 and 6 will the hands of the clock be at right angle?
A. 43 5/11 min past 5
B. 43 7/11 min past 5
C. 40 min past 5  D. 45 min past 5

Q.48. What is the third term in a sequence of numbers that leave remainder of 1, 2 and 3 when divided by 2, 3 and 4 respectively?
A. 11    B. 17    C. 19    D. 35

Q.49. If A + B means A is the sister of B; A x B means A is the wife of B, A % B means A is the father of B and A - B means A is the brother of B. Which of the following means T is the daughter of P?
A. P x Q % R + S - T    B. P x Q % R - T + S
C. P x Q % R + T - S    D. P x Q % R + S + T

Q.50. Which of the following numbers will completely divide \((4^{61} + 4^{62} + 4^{63} + 4^{64})\)?
A. 3    B. 10    C. 11    D. 13
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
APPLIED MATHEMATICS-III (MA-341A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Evaluate \( \frac{d}{dx} \sin^2 x \).
    b) Find \( \frac{dy}{dx} \) if \( y = (x + \sqrt{x^2 + 1})^m \).
    c) Evaluate \( \int \frac{\cos x}{1 + \sin x} \, dx \).
    d) Find \( \int_{a}^{b} f(x) \, dx \), if:
       i) \( f(x) \) is odd.
       ii) \( f(x) \) is even.
    e) Find the degree of the function \( f(x, y) = \frac{x^{\frac{1}{2}} + y^{\frac{1}{2}}}{x^n + y^n} \).
    f) If \( f(u) \) is a homogeneous function of degree \( n \) in \( x \) and \( y \) then \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \) ________.
    g) If \( u = x^y \), then find \( \frac{\partial u}{\partial x} \).
    h) If \( u, v, w \) are functions of three independent variables \( x, y, z \), then \( u, v, w \) are not independent of each other if \( \frac{\partial (u, v, w)}{\partial (x, y, z)} = 0 \). \((\text{True/False})\)
    i) For maxima or minima of \( u = x^2 y^2 + x - xy \), we must have \( 2xy^2 + 1 - y = 0 \) and ________.
    j) Define Gamma function.

2x10

PART-A
Q.2  a) Find \( \frac{dy}{dx} \) if \( y = e^{3x} + \sin(x) + \log x^2 \). 

b) If \( y = a \cos(\log x) + b \sin(\log x) \), prove that \( x^2 y_2 + xy_1 + y = 0 \).

c) Differentiate the function \( y = x \log \frac{x-1}{x+1} \).

Q.3  a) Evaluate \( \int e^{ax} \sin bx \, dx \).

b) Evaluate \( \int_{-\pi}^{\pi} x \sin x \, dx \).

c) Evaluate the integral \( \int_{0}^{2} f(x)dx \), where:
\[
f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2-x), & 1 \leq x \leq 2 \end{cases}
\]

Q.4  a) State and prove Euler’s theorem.

b) If \( u = \sin^{-1}\left( \frac{x+y}{\sqrt{x}+\sqrt{y}} \right) \), prove that:
\[
x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -\sin u \cos 2u \frac{\partial u}{4 \cos^3 u}.
\]

c) If \( x = u(1-v) \) and \( y = uv \), then find \( \frac{\partial (x,y)}{\partial (u,v)} \).

PART-B

Q.5  a) Expand \( \sin x \) in ascending powers of \( x - \frac{\pi}{2} \) by use of Taylor’s series.

b) Test the function \( f(x,y) = x^3 y^2 (6 - x - y) \) for maximum or minimum for points not at the origin.
Q.6  

a) Prove that \( \beta(m,n) = \beta(m+1,n) + \beta(m,n+1) \).

5

b) Evaluate the following integral by changing the order of integration:
\[
\int_0^\infty \int_x^\infty e^{-y} dy dx.
\]

7

c) Find the area lying between the parabola \( y = 4x - x^2 \) and the line \( y = x \).

8

Q.7  

a) A vector field is given by \( \vec{A} = \left\{ (x^2 + xy^2)i + (y^2 + x^2y)j \right\} \). Show that the field is irrotational and find the scalar potential.

10

b) If \( \vec{F} = 2yi - zj + xk \), evaluate \( \int_c \vec{F} \times d\vec{r} \) along the curve \( x = \cos t, y = \sin t, z = 2\cos t \) from \( t = 0 \) to \( t = \frac{\pi}{2} \).

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
APPLIED MATHEMATICS (MA-341A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Find \( \frac{d^2y}{dx^2} \), if \( y = (\sin^{-1} x)^2 \).

b) Evaluate \( \int \frac{x^2}{(2 + 3x^3)^3} \, dx \).

c) Evaluate \( \int \sin 4x \sin 8x \, dx \).

d) If \( y = x^3 + \sin x \), find \( \frac{dy}{dx} \).

e) Find derivative of \( x^2 \cdot e^x \).

f) If \( \phi(x) = x^2 + y^2 + z^2 \), then find grad \( \phi \).

g) Prove that \( \beta(m,n) = \beta(m+1,n) + \beta(m,n+1) \).

h) Write the formula for Maclaurin’s series expansion.

i) Write the relation between Beta and Gamma functions.

j) Define vector point function and scalar point function.

2x10

PART-A

Q.2  a) If \( y = \cos x \), show that \( \frac{d^2y}{dx^2} + y = 0 \).

10

b) If \( y = A \cos nx + B \sin nx \), show that \( \frac{d^2y}{dx^2} + n^2 y = 0 \).

10

Q.3  a) Evaluate \( \int \frac{2x}{(x^2 + 1)(x^2 + 3)} \, dx \).

10
b) Evaluate \( \int e^{2x} \sin x \, dx \).

Q.4  

a) If \( x + y + z = u \), \( y + z = uv \), \( z = u,v,w \), show that \( \frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2 v \).

b) Verify Euler's theorem for the function \( u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right) \).

**PART-B**

Q.5  

a) If \( f(x) = x^3 + 8x^3 + 15x - 24 \), calculate the value of \( f\left(\frac{11}{10}\right) \) by the application of Taylor series.

b) Find the maximum and minimum value of \( x^3 + y^3 - 3axy \).

Q.6  

a) Write the definition of beta function and prove that \( \beta(m, n) = \beta(n, m) \).

b) Change the order of integration of \( \int_0^\infty \int_0^e \frac{e^{-y}}{y} \, dx \, dy \) and hence solve.

b) Evaluate the double integral, \( \int_{x=0}^1 \int_{y=x}^1 (x^2y + xy^2) \, dy \, dx \).

Q.7  

a) Find the directional derivative of \( f = x^2 y z + 4xz^2 \) in the direction \( 2\hat{i} - \hat{j} - 2\hat{k} \) at the point (1, -2, -1).

b) Write down physical interpretation of divergence and curl.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth / Sixth Semester  
NUMERICAL METHODS AND OPTIMISATION TECHNIQUES (MA-501)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Find the relative and percentage errors of the number 8.6, if both the digits are correct.  
b) Find the missing term in the following table:

<table>
<thead>
<tr>
<th>x</th>
<th>f(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>81</td>
</tr>
</tbody>
</table>

c) State intermediate value property. Write the interval in which the root of the following equation lies: $x \log_{10} x - 1.2 = 0$  
d) Write the convergence criteria of iterative method for the system of simultaneous linear equations.  
e) Write the normal equations of the curve $y(x) = a + bx + cx^2$  
f) Write the quadrature formula for Weddle’s rule.  
g) Let $A(x,y)u_{xx} + B(x,y)u_{xy} + C(x,y)u_{yy} + F(x,y,u,u_x,u_y) = 0$ be a second order partial differential equation. Write the conditions when the given equation is elliptic, parabolic and hyperbolic.  
h) For the equation $\frac{dy}{dx} = f(x,y); \ y(x_0) = y_0$ . Write the iterative formula of Runge-Kutta method of 4th order.

2½x8

PART-A

Q.2  
a) Given that $a = 10 \pm 0.05; \ b = 0.0356 \pm 0.002; \ c = 15300 \pm 100; \ d = 62000 \pm 500$  
Find the maximum value of the absolute error in  
i) $a + b + c$  
ii) $c^3$

b) The following values of $x$ and $y$ are given:

| x  | 1 | 2 | 3 | 4 | 7 |

10
Using Lagrange’s interpolation formula, find \( y(5) \).

Q.3  
\( f(x) \) | 2 | 4 | 8 | 16 | 128  

Using Lagrange's interpolation formula, find \( y(5) \).

Q.3  a) Find the root of the equation: \( \cos x - xe^x = 0 \) by Newton-Raphson method correct to four decimal places.

b) Solve the equation: \( x \log_{10} x = 1.2 \) by Regula-Falsi method. Correct to four decimal places.

Q.4 a) Solve the following equation by Gauss elimination method:
\[
2x + y + z = 10; \quad 3x + 2y + 3z = 18; \quad x + 4y + 9z = 16
\]

b) Using Gauss-Seidel method, solve:
\[
54x + y + z = 110; \quad 2x + 15y + 6z = 72; \quad -x + 6y + 27z = 85
\]

\( \text{PART-B} \)

Q.5 a) From the following table:
\[
\begin{array}{|c|c|c|c|c|c|}
\hline
x & 3 & 5 & 11 & 27 & 34 \\
\hline
f(x) & -13 & 23 & 899 & 17315 & 35606 \\
\hline
\end{array}
\]
Find \( f'(10) \).

b) Find the approximate value of \( \int_{0}^{\pi/2} \sqrt{\cos x} \cdot dx \) by dividing the interval into six parts.

Q.6 a) Given that \( \frac{dy}{dx} = y - x^2; \quad y(0) = 1 \) using modified Euler’s method to obtain \( y(0.2) \) and \( y(0.4) \). Correct to three decimal places.

b) Use Runge-Kutta method of 4\textsuperscript{th} order to solve \( \frac{dy}{dx} = x^2 + y^2; \quad y(0) = 1 \) Determine the approx value of \( y(0.1) \) and \( y(0.2) \). Correct to four decimal places.
Q.7 Use the simplex method to solve the following LP problem:

Max \( z = 3x_1 + 5x_2 + 4x_3 \)

subject to the constraints:

\[ \begin{align*}
2x_1 + 3x_2 & \leq 8 \\
2x_2 + 3x_3 & \leq 10 \\
3x_1 + 2x_2 + 4x_3 & \leq 15
\end{align*} \]

and, \( x_1, x_2, x_3 \geq 0 \)
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth Semester
NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES (MA-501)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Write the relation between $\Delta$ and $\epsilon$.
    b) What are the direct methods for finding solution of linear simultaneous equations?
    c) Write the order of error for trapetoidal, Simpson’s $\frac{1}{3}$ and Simpson’s $\frac{3}{8}$ rules.
    d) Define a linear programming problem and optimum solution.
    e) What are the normal equations to fit a parabola $y = ax^2 + bx + c$ to n observations.
    f) Show that $f(x) = x^7 - 3x^4 + 2x^3 - 5 = 0$ has at least four imaginary roots.
    g) Write an advantage of Runge-kutta method over Taylor’s series method.
    h) Write Newton’s divided difference formula.
    i) Write the condition of failure of Newton-Raphson method.
    j) Define a convex region.

2x10

PART-A

Q.2  a) Fit a law of the type $y = ae^{bx}$ to the data:

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>1.05</td>
<td>2.10</td>
<td>3.85</td>
<td>8.30</td>
</tr>
</tbody>
</table>

10

b) Given $u_1 = 40, u_3 = 45, u_5 = 54$. Find $u_2$ and $u_4$

10

Q.3  a) Use the method of false position to find the fourth root of 32 correct to three decimal places.

10
b) Find the positive root of \( x^4 - x = 10 \) correct to three decimal places using Newton-Raphson method.

Q.4

a) Apply Gauss-Seidal iteration method to solve the equations:
\[
20x + y - 2z = 17;
3x + 20y - z = -18;
2x - 3y + 20z = 25;
\]

b) Test for consistency and solve the following system of equations by Gauss Jordan method:
\[
5x + 3y + 7z = 4;
3x + 26y + 2z = 9;
7x + 2y + 10z = 5;
\]

**PART-B**

Q.5

a) From the table below, for what value of \( x; y \) is minimum. Also find this value of \( y \):

<table>
<thead>
<tr>
<th>( x )</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>0.205</td>
<td>0.240</td>
<td>0.259</td>
<td>0.262</td>
<td>0.250</td>
<td>0.224</td>
</tr>
</tbody>
</table>

b) Evaluate \( \int_0^1 \frac{x^2}{1 + x^3} \, dx \) using Simpson’s \( \frac{1}{3} \)rd rule.

Q.6 Solve by Taylor’s series method the equation \( \frac{dy}{dx} = \log(xy) \) for \( y(1.1) \) and \( y(1.2) \); given \( y(1) = 2 \).

Q.7

a) Minimize \( z = x_1 - 3x_2 + 2x_3 \)

subject to
\[
3x_1 - x_2 + 2x_3 \leq 7
-2x_1 + 4x_2 \leq 12
-4x_1 + 3x_2 + 8x_3 \leq 10
x_1, x_2, x_3 \geq 0
\]
b) Write the dual of the following problem and solve the dual

Maximize \( z = -2x_1 - 2x_2 - 4x_3 \)

subject to

\[
\begin{align*}
2x_1 + 3x_2 + 5x_3 & \geq 2 \\
3x_1 + x_2 + 7x_3 & \geq 5 \\
x_1 + 4x_2 + 6x_3 & \leq 5 \\
x_1, x_2, x_3 & \geq 0
\end{align*}
\]
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
NUMERICAL METHOD AND OPTIMIZATION TECHNIQUES (MA-501)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) In solving simultaneous equations by Gauss-Jordan method, the coefficient matrix is reduced to which matrix.
b) Which of the following methods converges faster: Gauss Seidel method or Gauss Jacobi's method?
c) Write Newton's forward interpolation formula.
d) The condition for the convergence of the iteration method for solving \( x = \phi(x) \) is ________.
e) Write intermediate value theorem.
f) Define feasible region.
g) Write the matrix form of LPP.
h) Write formulae for R-K method of order four.
i) What are the normal equations to fit a straight line \( y = mx + c \) ?
j) The interval in which a real root of the equation \( x^3 - 2x - 5 - 0 \) line is ____.

2x10

PART-A

Q.2  a) Using Newton's forward formula, find the value of f (1.6), if:

<table>
<thead>
<tr>
<th>( x )</th>
<th>1</th>
<th>1.4</th>
<th>1.8</th>
<th>2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>3.49</td>
<td>4.82</td>
<td>5.96</td>
<td>6.5</td>
</tr>
</tbody>
</table>

10

b) Using Newton's divided difference formula evaluate f(8) and f(15), given:

<table>
<thead>
<tr>
<th>( x )</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>10</th>
<th>11</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>48</td>
<td>100</td>
<td>294</td>
<td>900</td>
<td>1210</td>
<td>2028</td>
</tr>
</tbody>
</table>

10
Q.3 Using Newton’s Raphson formula establish the given formula for cube root of
N: \( x_{n+1} = \frac{1}{3} \left[ 2x_n + \frac{N}{x_n^2} \right] \), where N is a positive number and hence find cube root of
12. 20

Q.4 Solve the system of equations:
\( 5x - y - 2z = 142 \)
\( x - 3y - z = -30 \)
\( 2x - y - 3z = -5 \)
by Gauss Jordan method. 20

**PART-B**

Q.5 a) Evaluate: \( \int_{0}^{4} e^{x} \, dx \) by simpson’s 1/3rd rule
using \( e^1 = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60 \). 10

b) From the following table find the maximum value of y:

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>27</td>
</tr>
</tbody>
</table>

10

Q.6 Use Euler’s method to solve for y at \( x=0.1 \) from the equation \( \frac{dy}{dx} = x + y + xy \)
and \( y(0) = 1 \). Taking step size =0.025. 20

**OR**

Using R-K method of 4th order, find \( y(0.2) \) for the equation \( \frac{dy}{dx} = \frac{y-x}{y+x} \), \( y(0) = 1 \).
Take \( h=0.2 \) 20

Q.7 a) Using simplex method:
Solve the following LPP:
Maximize: \( z = x_1 - 3x_2 + 3x_3 \)
Subject to:
\[3x_1 - x_2 + 2x_3 \leq 7,\]
\[2x_1 + 4x_2 \geq -12,\]
\[-4x_1 + 3x_2 + 8x_3 \leq 10\]
\[x_1, x_2, x_3 \geq 0\]
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – First Semester
MATHEMATICS-I (MA-I-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Evaluate \(60 P_2\) and \(12 C_5\).
   b) Find the first four terms of the sequence defined by \(a_n = 4n^2 + 3\).
   c) Using Binomial theorem, find the value of \((101)^4\).
   d) If \(\tan \theta = \frac{12}{5}\); find the values of \(\cot \theta, \cos \theta\).
   e) Find the equation of the line passing through the point (1, 2) having slope 3.
   f) Find the equation of the line passing through the points (1, 2) and (3, 4).
   g) Write the equation of the circle whose centre is (2, 3) and radius is 4.
   h) Find the equation of the parabola with vertex at (0, 0) and focus at (2, 0).
   i) Find the distance between the points (2, 3, 4) and (5, 6, 7).
   j) Write the section formula is three dimenions.

2x10

PART-A

Q.2  
   a) The arithmetic mean between two numbers is 34 and G.M. is 16. Find the numbers.
   b) The sum of first three terms of a G.P. is 16 and the sum of the next three terms is 128. Determine the first term, common ratio and the sum to \(m\) terms of the G.P.

10

Q.3  
   a) Find the coefficient of \(x^{-17}\) in the expansion of \((x^4 - \frac{1}{x^3})^{15}\).
   b) Resolve in partial fractions, \(\frac{3x+1}{(x+3)(x-1)^2}\).

10
Q.4  a) Find the number of arrangements of the words:
   i) Manav Rachna
   ii) University
   iii) Faridabad
   b) Find the value of \( m \), if:
      \[ \frac{|m|}{2|m-2|} \] and \( \frac{|m|}{4|m-4|} \) are in the ratio 2:1.

PART-B

Q.5  a) Show that \( \sin 38^\circ \cos 22^\circ + \cos 38^\circ \sin 22^\circ = \frac{\sqrt{3}}{2} \).

   b) \( \cot 2x + \tan x = \cos ec \ 2x \).

   c) If \( \tan x = 2 \tan y \),
      prove that \( \frac{\sin (x + y)}{\sin (x - y)} = 3 \).

Q.6  a) Find the angle between two lines:
      \[ \sqrt{3}x + y = 1 \] and \( x + \sqrt{3}y = 1 \).

   b) Find the perpendicular distance from the point (3,-5) on the line
      \[ 3x - 4y - 26 = 0 \].

Q.7  a) Find the coordinates of foci, the vertices, the length of the major axis, minor axis, latus-rectum and eccentricity of the conic represented by \( 4x^2 + y^2 = 100 \).

   b) Find the equation of the circle, whose centre is (3,-2) and which passes through the intersection of the line:
      \[ 5x + 7y = 3 \] and \( 2x - 3y = 7 \).
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Second Semester
MATHEMATICS-II (MA-I-201)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) If \[ \begin{bmatrix} x-2 & -3 \\ 3x & 2x \end{bmatrix} = 3, \] find the value of \( x \).

b) Let \[ \begin{bmatrix} 3 & y \\ x & 1 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}. \] Find possible values of \( x \) and \( y \) if \( x, y \) are natural numbers.

c) Find a matrix \( X \) such that \( 2A + B + X = 0 \) where \( A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix} \) and \( B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix} \).

d) Find \( |Z| \) and \( \overline{Z} \) for \( Z = 15 - 8i \).

e) If \( f \) is defined by \( f(x) = x^2 \), Find \( f'(2) \).

f) Define differentiability of a function at a point

g) \( y = \log(\sec x) \), find \( \frac{dy}{dx} \).

h) Define a convex region with an example.

i) Write matrix form of LPP.

j) Define upper and lower triangular matrices with an example of each.

2x10

\[ \text{PART-A} \]

Q.2 a) Find the value of \( x \) if \[ \begin{vmatrix} 2 & 4 \\ 5 & 1 \end{vmatrix} = \begin{vmatrix} 2x & 4 \\ 6 & x \end{vmatrix} \]

b) Show that \[ \begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x) \]
Q.3  a) Compute the adjoint of the matrix $A$ given by $A = \begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & 0 \end{bmatrix}$ and verify that $A(adj \ A) = |A| I = (adj \ A)A$.

b) Let $A = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -1 & 2 \\ 4 & -5 \end{bmatrix}$ Find $AB$ and $BA$ and show that $AB \neq BA$.

Q.4  a) Find the value of $\frac{1+i}{1-i}$

b) Find the value of $i^{2012}$

c) Calculate the complex conjugate of $z = \left( \frac{a+bi}{a-bi} \right)^2 + \left( \frac{a-bi}{a+bi} \right)^2$

Q.5  Differentiate the following:

a) $e^{x^2}$

b) $xe^x$

c) $\log(\tan x)$

d) $e^x \log(1+x^2)$

Q.6  a) Find the approximate change in the volume $V$ of a cube of side $x$ meters caused by increasing the side by 2%.

b) Use differentials to approximate $\sqrt{25.2}$

Q.7  a) Solve graphically,

Maximize $z = 3x + 2y$

subject to:
b) A painter has exactly 32 units of yellow dye and 54 units of green dye. He plans to mix as many gallons as possible of color A and B. Each gallon of color A requires 4 units of yellow dye and 1 unit of green dye. Each gallon of color B requires 1 unit of yellow dye and 6 units of green dye. Formulate the LPP so as he can mix maximum number of gallons.
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Third Semester  
MATHEMATICS-III (MA-I-301)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Evaluate \( \int \left(1 - x^{-1} + x^2\right) dx \)  

b) Solve by fundamental theorem of calculus:  
\[ \int_{\alpha}^{\pi/2} \cos^2 x \, dx \]  

2

c) Solve:  
\[ \frac{dy}{dx} = e^{x+y} \]  

2

d) Eliminate the arbitrary constants and obtain the differential equation:  
\[ y = cx + c^2 \]  

3

e) Find mean of first \( n \) natural numbers.  

3

f) A committee of 2 persons is selected from 2 men and 2 women. What is the probability that the committee will have no men?  

3

g) In any \( \triangle ABC \), prove that:  
\[ c^2 = a^2 + b^2 - 2ab \cos c \]  

4

PART-A

Q.2  
a) Evaluate:  
\[ \int \frac{3x^2 - 17x^2 + 36x - 35}{x^2 - 4x + 4} \, dx \]  

7

b) Evaluate:  
\[ \int \frac{dx}{\sin^{3/2} x \cos^{5/2} x} \, dx \]  

7

c) Evaluate:  
\[ \int x^2 \cos^2 x \, dx \]  

6
Q.3  a) Solve: \( (x + y + 1)^2 \frac{dy}{dx} = 1 \)

b) Solve: \( 3e^x \tan y \, dx + (1 + e^x) \sec^2 y \, dy = 0 \) given that \( y = \pi / 4 \) when \( x = 0 \)

Q.4  a) Find the area under the curve \( y = 3x^2 + 2 \) bounded by the x-axis and the lines \( x = 0 \) and \( x = 2 \)

b) Find area under the ellipse: \( \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \)

**PART-B**

Q.5 a) Calculate mean, variance and standard deviation for the following distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>30-40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
<th>80-90</th>
<th>90-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3</td>
<td>7</td>
<td>12</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>2</td>
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</table>

b) The mean and variance of 7 observations are 8 and 16, respectively. If five of the observations are 2, 4, 10, 12 and 14, find the remaining two observations.

Q.6 a) A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that will be: i) Red ii) Yellow iii) Blue iv) Not blue.

b) \( A \) and \( B \) are 2 events such that \( P(A) = 0.54 \), \( P(B) = 0.69 \) and \( P(A \cap B) = 0.35 \). Find: i) \( P(A \cup B) \) ii) \( P(A' \cap B') \) iii) \( P(A \cap B') \)

Q.7 a) Given \( \bar{a} = 2\hat{i} + 2\hat{j} - \hat{k}, \quad \bar{b} = 6\hat{i} - 3\hat{j} + 2\hat{k} \). Find \( \bar{a} \times \bar{b} \) and also determine sine of the angle between \( \bar{a} \) and \( \bar{b} \).

b) Forces of magnitudes 5, 3, 1 units acts in the directions \( 6\hat{i} + 2\hat{j} + 3\hat{k}, -3\hat{i} - 2\hat{j} + 6\hat{k} \), \( 6\hat{i} - 3\hat{j} - 6\hat{k} \), respectively on a particle which is displaced from the point \((2, -1, -3)\) to \((5, -1, 1)\). Find work done by force.
End Semester Examination, Dec. 2014  
M. Tech. (Industrial Engineering) - First Semester  
ADVANCED MATHEMATICAL TECHNIQUES (MA-M-101)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Let \( W \) be the subspace of \( \mathbb{R}^5 \) spanned by the following vectors:  
\[ u_1 = (1,2,1,3,2), \quad u_2 = (1,3,3,5,3), \quad u_3 = (3,8,7,13,8) \]  
\[ u_4 = (1,4,6,9,7) \quad u_5 = (5,13,13,25,19) \]  
Find a basis of \( W \) consisting of the original given vectors and find \( \dim W \).  

b) Let \( F: \mathbb{R}^4 \rightarrow \mathbb{R}^3 \) be the linear mapping defined by  
\[ F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t) \]  
Find a basis and the dimension of:  
i) The image of \( F \)  
ii) The kernel of \( F \).

Q.2  
a) Define inner product space. Let \( V \) be an inner product space containing vectors  
\( u, v, w \) in \( \mathbb{R}^4 \). Show that:  
\[ <3u - 2v, w> = 3 <u, w> - 2 <v, w> \]  
where \( u = (1,3,-4,2) \), \( v = (4,-2,2,1) \), \( w = (5,-1-2,6) \)

b) Find the characteristic polynomial and the corresponding characteristic vectors of \( A \).  
\[
A = \begin{bmatrix}
1 & 1 & 2 \\
0 & 3 & 2 \\
1 & 3 & 9
\end{bmatrix}
\]

Q.3 Using simplex method, solve the following linear programming problem:  
Maximize \( z = 16x + 17y + 10z \)  
subject to the constraints:  
\[ x + y + 4z \leq 2000 \]  
\[ 2x + y + z \leq 3600 \]  
\[ x + 2y + 2z \leq 2400 \]
and \( x, y, z \geq 0 \)

Q.4 Using dynamic programming problem, solve Max \( z = u \cdot v \cdot w \)
Subject to the constraints:
\[
\begin{align*}
    u + v + w &= 10 \\
    u, v, w &\geq 0
\end{align*}
\]

Q.5 a) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of distribution.

b) In a bombing action, there is 50% chance that any bomb will strike the target. Two direct hits are needed to destroy the target completely. How many bombs are required to be dropped to give a 99% chance or better of completely destroying the target.

Q.6 a) Find the first four moments of the binomial distribution.

b) A manufacturer knows that the razor blades he makes, contain on an average 0.5% of defectives. He packs them in packets of 5. What is the probability that a packet picked at random will contain 3 or more faulty blades?

Q.7 Using the method of separation of variables. Solve the equation:
\[
\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, \text{ subject to the condition } u(o, y) = u(l, y) = u(x, 0) \text{ and } u(x, a) = \sin \left( \frac{n\pi x}{l} \right)
\]

Q.8 For the spring system given below:

Where \( k_1 = 100 \, N/mm \)
\[ k_2 = 200 \, N/mm \]
Find

a) Global stiffness matrix
b) Displacement of nodes 2 and 3
c) The force in spring 2.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Second Semester
APPLIED MECHANICS (M-I-201)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is concept of rigid body in engineering mechanics?
    b) State Lami’s theorem.
    c) Define Varignon’s theorem
    d) Write the concept of a couple.
    e) Name different force systems.
    f) What do you mean by angle of friction?
    g) Differentiate between centre of gravity and centroid.
    h) What do you mean by mechanical advantage of a lifting device?
    i) State law of machines.
    j) Write laws of static friction.

2x10

PART-A

Q.2  a) Discuss in detail the applications of applied mechanics in practical fields.
    b) Explain static and dynamic concept of applied mechanics.

Q.3  a) Explain the principle of transmissibility of forces from one point to another point.

8
A particle at O is acted by the forces as shown above in the figure. Find the resultant of all the forces and its direction.

Q.4  a) What is law of moments? Write its application.  
     b) Four forces $F$, $2F$, $3F$ and $4F$ are acting along four sides of a square $ABCD$, taken in order. Find the magnitude, direction of the resultant forces.

PART-B

Q.5  a) Explain the term friction in a simple screwjack. 
     b) A body resting on a rough horizontal plane required to pull of $180 \, N$ inclined at $30^\circ$ to the plane just to move it. It was found that a push of $220 \, N$ inclined at $30^\circ$ to the plane just moved the body. Determine the weight of body and coefficient of friction.

Q.6  a) Write the steps to locate centroid of a composite body. 
     b) Locate the centre of gravity of a frustum of solid cone having base diameter $= 200 \, mm$, top diameter $= 100 \, mm$ and height of frustum $= 15 \, mm$.

Q.7  a) Explain the working principle and application of worm and worm wheel. 
     b) Write short notes on: 
        i) Reversible machine        ii) Self locking machine.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
ENGINEERING MECHANICS (M-I-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is a force?  
b) What are the conditions of equilibrium in two dimensional concurrent force systems?  
c) Name the methods to find the load transmitted in members of trusses.  
d) Write the laws of Coulomb friction.  
e) Define moment of inertia.  
f) Write the SI unit of work and power.  
g) What are stress and strain?  
h) Write Hamilton principle.  
i) Write bending equation and meaning of the terms used.  
j) What do you mean by rigid in engineering mechanics?

2x10

PART-A

Q.2  
a) Briefly describe the laws of mechanics.  

10  
b) Three forces of magnitude $48\ kN$, $64\ kN$ and $80\ kN$ are acting at a point $O$ as shown in the figure. Calculate a pair of forces along $OA$ and $OB$, which will keep the system in equilibrium.

10
Q.3  
   a) Define truss and explain any one method to determine the load transmitted in truss members.  
   b) Determine the moment of $100 \, N$ force acting at $B$ about moment centre at $A$ as shown in the figure.

Q.4  
   a) Define moment of inertia and explain either parallel axis theorem or perpendicular axis theorem.  
   b) Locate the centroid of I-section as shown in the figure.

**PART-B**

Q.5  
   a) A ball is thrown vertically upwards with an initial velocity of $36 \, m/s$. After two seconds, another ball is thrown vertically upwards. What should be its initial velocity so that it crosses the first ball at a height of $30 \, m$.  
   b) Explain D’Alembert’s principle.

Q.6  
   a) Draw stress-strain diagram for ductile materials and explain the various stages.  
   b) A shaft of diameter of $50 \, mm$ is subjected to a torque of $1 \, kNm$. Determine:
i) Shear stress developed
ii) Angular twist over 1 m length of shaft.

Q.7 Write the principle of virtual work. Explain method of minimum potential energy.

20
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Third Semester  
WORKSHOP TECHNOLOGY-I (M-I-302)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any five:
   a) Define welding process and explain various types of flames used in oxy-acetylene torch with their uses.
   b) What are various types of electrodes used in welding and what are their advantages?
   c) Enlist various accessories used on lathe and explain any one of them.
   d) What are the functions of risers in casting?
   e) What are the necessary properties required in cutting tool materials?
   f) Differentiate between drilling and boring.

   4x5

   PART-A

Q.2 Explain TIG welding with a neat sketch and state its advantages over MIG welding.

   20

Q.3 a) How do we specify electrodes according to BIS standards?

   10

   b) Explain principle and working of thermit welding with a neat sketch.

   10

Q.4 a) Explain the procedure for making moulds and various types of moulds used in foundry.

   15

   b) Explain various defects that occur in casting and their remedies with a figure.

   5

   PART-B

Q.5 a) What are risers? Explain various types with sketch and their advantages.

   10
b) What are the various defect detection methods in casting?  
10

Q.6  
a) Explain various operations that can be performed on a lathe.  
10  
b) Explain the impact of speed and feed in drilling operation in detail.  
6  
c) Differentiate between jigs and fixtures.  
4

Q.7  
a) Describe through a neat sketch the tool signature / tool geometry of a single point cutting tool with along purpose of each angle.  
10  
b) What are advantages of cemented carbide tool over a carbide tool?  
5  
c) What are the functions of cutting fluid in machining?  
5
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
STRENGTH OF MATERIALS (M-I-303)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Strength of material is:
   i) Fixed quantity
   ii) Variable quantity
   iii) Changeable with time
   iv) Constant at all time
b) What is Poisson’s ratio?
c) Write down the formula for hoop stress.
d) What is simple bending?
e) What is neutral axis of beam?
f) What is the torsion formula for a circular shaft?
g) What is strain energy?
h) What is buckling load?
i) What is a strut?
j) What are the temperature stress and strain?

2x10

PART A

Q.2 A shaft is subjected to a torque of 16000 Nm. If the maximum permissible stress in the material of the shaft is 65 N/mm², find
   i) the diameter of solid shaft.
   ii) the dimensions of a hollow circular shaft, if the thickness is 10% of the internal diameter.

20

Q.3 Derive the equation \( \frac{M}{I} = \frac{E}{R} = \frac{\sigma}{\gamma} \) for the simple bending of a beam. List the assumptions made therein.

20
Q.4 At a point in a material, $\sigma_x = 50\,MPa$, $\sigma_y = 100\,MPa$ and $\tau_{xy} = -25\,MPa$. Calculate the normal and shear stress on a plane inclined at 45° to the $y-axis$.

**PART-B**

Q.5 (a) What are the various theories of failure, when a material is subjected to stress? Discuss any two of them.

(b) A mild steel bar of diameter 300$mm$ and length 2.4$\,m$ is subjected to a tensile load of 90$kN$. Find the strain energy stored in bar if the load is applied gradually.

Q.6 A cylinder is 3$m$ long, 0.75$m$ in diameter and 12.5$mm$ thick at a atmospheric pressure. Calculate the dimensions when subjected to an internal pressure of 1.5$MPa$. What is the maximum shear stress in the shell?

Q.7 (a) State the assumptions made in driving the Euler’s formula.

(b) A closed coil helical spring has 20 turns wire of diameter 25$mm$. The mean radius of the coil is 100$mm$. Find the maximum stress and elongation of the spring under the axial load of 2$kN$. Take $G=85\,GPa$.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
THERMODYNAMICS (M-I-304)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a quasistatic process?
b) State Zeroth’s law of thermodynamics.
c) Define free expansion process.
d) What is PMMFK?
e) State limitations of Ist law of thermodynamics.
f) What do you mean by the term: entropy?
g) Define the term: availability.
h) What is a pure substance?
i) State Gibson Dalton’s law.
j) Define dryness fraction of steam.

2x10

PART-A

Q.2 a) The properties of a closed system change the following relation between pressure and volume as PV=3.0 where P is in bar V is in m$^3$.
Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar.

10

b) Explain thermodynamic equilibrium.

5

c) Define heat and work.

5

Q.3 a) Write down the general energy equation for steady flow system and simplify when applied for the following system:
i) Steam nozzle.

ii) Steam turbine.

10

b) Air at 1.02 bar, 22° C, initially occupying a cylinder volume of 0.015 m$^3$ is compressed reversibly and adiabatically by a piston to a pressure of 6.8 bar calculate:
i) Final temperature and volume.

ii) Work done.

10
Q.4  a) Prove the equivalence of Kelvin-Plank and Clausius statement of second law of thermodynamics.  

b) A cyclic heat engine operates between a source temperature of 1000º C and a sink temperature of 40º C. Find the least rate of heat rejection per kW net output of the engine.

10

PART-B

Q.5  a) Derive an expression for availability in steady flow system.  

b) Explain the concept of available and unavailable energy. When does the system become dead?

10

Q.6  a) Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined.

b) Write a short note on Mollier chart.

10

Q.7  a) What is the difference between an ideal and a perfect gas?

b) State Avogadro’s law.

c) A mixture of hydrogen (H\textsubscript{2}) and oxygen (O\textsubscript{2}) is to be made so that the ratio of H\textsubscript{2} to O\textsubscript{2} is 2:1 by volume. If the pressure and temperature are 1 bar and 25º C respectively, calculate:
   i) The mass of O\textsubscript{2} required.  
   ii) The volume of the container.

4

12
End Semester Examination, Dec. 2014
B. Tech. (Integrated) - Fourth Semester
MATERIALS AND METALLURGY (M-I-401)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write down the applications of fibre glass.
b) Define fracture and classify it.
c) Write down the effect of adding carbon in Iron.
d) Martensite + Aging = ___________.
e) What is skin-effect?
f) Write down the co-ordination number for BCC crystal structure.
g) Zero dimensional defect in material is also known as ________ defect.
h) Low carbon steel + very slow furnace cool = ________ structure.
i) What is uniform corrosion?
j) Failure of metal/alloy under non-uniform cyclic loading is known as ________ fracture.

2x10

PART-A

Q.2 a) Explain edge dislocation and screw dislocation with a diagram. 10
b) Calculate the total number of atoms in BCC structure and also drive an expression for its atomic packing factor. 10

Q.3 a) Draw Fe–C equilibrium diagram. Mark each line, phase, reactions and transition point. 15
b) Write down the importance of TTT diagram. 5

Q.4 a) What is heat treatment? Why do we need it? Give the advantages and limitations of heat treatment. 10
b) What is stress relieving annealing?  

c) State the advantages of induction hardening over flame hardening.  

**PART-B**

Q.5  
a) Explain the brittle and ductile fracture with a diagram.  

b) Explain that why season cracking takes place in materials.  

c) Define plastic deformation with the help of stress-strain curve.  

Q.6  
a) Explain creep and also draw the creep curve.  

b) Write short notes on:  
   i) Crevice corrosion  
   ii) Pitting corrosion  

c) How can corrosion be minimized in iron and steel?  

Q.7  
a) What are ceramic materials? Classify them.  

b) Write down the benefits of using composite materials.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
HYDRAULICS AND HYDRAULIC MACHINES (M-I-402)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define dynamic and kinematic viscosity.
b) Define the terms buoyancy and centre of buoyancy.
c) Define the terms:
   i) Discharge.
   ii) Two-dimensional flow.
d) What is a flow net?
e) What is priming in pumps?
f) Define the terms:
   i) Jet ratio.
   ii) Flow ratio.
g) Define net positive suction head.
h) What is a breaking jet?
i) What is the Euler’s equation of motion?
j) Distinguish between laminar and turbulent flow.

2x10

PART-A

Q.2
a) Explain the concept of surface tension.

b) Define the terms:
   i) Density.
   ii) Specific gravity.
   iii) Weight density.

5

Q.3
a) State Bernoulli’s theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli’s equation and also state its assumptions.

15
b) The diameters of a pipe at two sections are 10 cm and 20 cm, respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at smaller section is 5 m/s.

Q.4 a) Derive an expression for the velocity distribution for a viscous flow through a circular pipe.

b) Define the following:
   i) Local co-efficient of drag.
   ii) Average co-efficient of drag.
   iii) Stream function.
   iv) Mixing length.
   v) Viscous flow.

**PART-B**

Q.5 a) With the help of a neat sketch, explain the constructional and operational details of Francis turbine.

b) Distinguish between impulse and reaction turbines.

c) Water is flowing through a pipe at the end of which a nozzle is fitted. The diameter of the nozzle is 100 mm and the head of water at the centre nozzle is 100 m. Find the force exerted by the jet of water on a fixed vertical plate. Where \( C_v \) is 0.95.

Q.6 a) Explain the construction and operation of Kaplan turbine with the help of a neat sketch.

b) Define the terms:
   i) Unit speed.
   ii) Unit power.
   iii) Specific speed of turbines.
   iv) Unit discharge.
   v) Draft tube.

Q.7 a) Differentiate between centrifugal and reciprocating pump.

b) Differentiate between single acting and double acting reciprocating pump.
c) What is an air vessel? Describe the function and operation of air vessel with help of a neat sketch.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
APPLIED THERMODYNAMICS (M-I-403)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Principle of two stroke and four stroke cycle.
   b) Crank throw.
   c) Compression ratio.
   d) Clearance volume.
   e) Magneto ignition system.
   f) Radiator of an IC engine.
   g) Indicated horse power and brake horse power.
   h) Types of steam nozzles.
   i) Condenser efficiency.
   j) Fuels used in jet propulsion.

   2x10

PART-A

Q.2 a) Draw Otto, diesel and dual cycles on T-S and P-V diagrams.

   12

   b) Explain with a line diagram four strokes of an IC engine.

   8

Q.3 a) What are different processes used in increasing the efficiency of an IC engine? 10

   b) Explain the working of a solex carburettar with a line diagram.

   10

Q.4 a) Compare air cooling with water cooling system. Explain the function of thermostat in force cooling system.

   10

   b) Explain types and properties of lubricants.

   10

PART-B
Q.5  
a) Explain various methods used in finding the engine indicated and brake horse power.  
   b) Explain various types of pollutants in SI and CI engine and various norms for two- and four-wheel vehicles.

Q.6  
a) List out the various parts of a steam power plant with a simple line diagram.  
   b) Explain steam turbine functions and draw a line diagram for impulse turbine.

Q.7  
a) Compare gas turbines with reciprocating IC engine and give limitations of gas turbines.  
   b) Give the general layout of open cycle constant pressure gas turbine.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
WORKSHOP TECHNOLOGY-II (M-I-404)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you understand by the term: milling?
b) What is the difference between lathe and milling operations?
c) Draw a neat sketch of Gang Milling.
d) Which materials are used in manufacture of grinding wheels?
e) What are diamond wheels? Where are they used?
f) How is a shaping machine specified?
g) What are the two main differences between a planer and a shaper?
h) Draw a sketch of broach teeth with details.
i) What do you understand by press-working?
j) What is the difference between cold and hot forging?

2x10

PART-A

Q.2
a) What is the working principle involved in a milling operation? Draw a neat sketch of plain or horizontal milling machine.

b) How is a milling machine specified? Classify different types of milling machines.

c) What is the difference between face milling and angular milling?

Q.3
a) What is meant by grinding? What are natural and artificial abrasives used in a grinding wheel?

b) How will you proceed to mount a grinder wheel?

c) Write a short note on Centreless grinding.

Q.4
a) What is planer? Illustrate and describe its working principle. And how do you classify planers.
PART-B

Q.5  a) What is broaching? How different types of broaches are classified?  
 10
  b) What is the principle of broaching? Describe pull and push broaching with the 
   help of neat sketches.  
   10

Q.6  a) How are pressers classified? Give a few names of each type.  
   10
  b) Write short notes on:  
     i) Punching  
     ii) Piercing  
   5x2

Q.7  a) Differentiate open die forging and closed die forging.  
   6
  b) What are different types of rolling mills? Explain with neat sketches.  
   6
  c) What do you understand by the term: extrusion? What is difference between 
     direct and indirect extrusion?  
     8
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
MECHANICAL ENGINEERING DESIGN (M-I-405)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is an engineering design?
     b) Define endurance limit.
     c) What stresses act on screw fastenings?
     d) Define efficiency of a screw.
     e) Explain caulking and fullering.
     f) Define butt and lap joint.
     g) Define slip of the belt.
     h) What are different types of keys?
     i) What are the types of stresses induced in the shafts?
     j) What is a self-energizing brake?

2x10

PART-A

Q.2  a) Write a note on characteristics of a good designer.

10

b) Explain the stress-strain curve indicating various points on it.

10

Q.3  a) For supporting the travelling crane in a workshop, the brackets are fixed on steel columns as shown in fig. The maximum load that comes on the bracket is 12 kN acting vertically at a distance of 400 mm from the face of the column. The vertical face of the bracket is secured to a column by four bolts, in two rows (two in each row) at a distance of 50 mm from the lower edge of the bracket. Determine the size of the bolts if the permissible value of the tensile stress for the bolt material is 84 MPa.
b) A screw jack carries a load of 22 kN. Assuming the coefficient of friction between screw and nut as 0.15, design the screw. The permissible compressive and shear stresses in the screw should not exceed 42 MPa and 28 MPa, respectively.

Q.4 a) Explain the following terms in connection with riveted joints:
   i) Pitch.
   ii) Back pitch.
   iii) Diagonal pitch.
   iv) Margin.

b) Find the efficiency of double riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 65 mm. Assume:
Permissible tensile stress in plate =120 MPa,
Permissible shearing stress, in rivets =90 MPa,
Permissible crushing stress in rivets = 180 MPa.

PART-B

Q.5 a) Derive the expression for length of an open belt drive.

b) A leather belt 9 mm x 250 mm is used to drive a cost iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on the smaller pulley is 120° and the stress in tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m^3 and the coefficient of friction of leather on cast iron is 0.35.
Q.6 a) How are the keys classified? Draw neat sketches of different types of keys and state their applications. 5

b) What is the effect of keyway cut into the shaft? 5

c) A mild steel shaft transmits 20 kW at 200 r.p.m. It carries a central load of 900 N and is simply supported between the bearings 2.5 meters apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. 10

Q.7 a) A multiple disc clutch employs 3 steel and 2 bronze discs having outer diameter 300 mm and inner diameter 200 mm. For a coefficient of friction of 0.22, find the axial pressure and the power transmitted at 750 r.p.m., if the normal unit pressure is 0.13 N/mm\(^2\). Also find the axial pressure of the unit normal pressure, if this clutch transmits 22 kW at 1500 r.p.m. 10

b) A band brake acts on \(\frac{3}{4}\)th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 Nm. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the anticlockwise direction. 10
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Fifth Semester  
THEORY OF MACHINES (M-I-501)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are rigid and resistance bodies?  
b) What do you mean by degree of freedom of a kinematic pair?  
c) What are centrifugal governors?  
d) What is turning-moment diagramme?  
e) What is a displacement diagramme?  
f) Define base circle and trace point.  
g) What are different types of pulleys?  
h) What is pressure line and pressure angle of gears?  
i) What is meant by torsional vibration?  
j) What is hammer blow?  

2x10

PART-A

Q.2  
a) How are the kinematics pairs classified? Explain with examples.  

10  
b) What is a quick-return mechanism? Where are they used?  

10

Q.3  
a) A flywheel with a mass of 3kN has a radius of gyration of 1.6m. Find the energy stored in the flywheel when its speed increases from 315 r.p.m. to 340 r.p.m..  

10  
b) Derive the equation for Porter governor.  

10

Q.4  
A cam with minimum radius of 25mm is to be designed for a knife-edge follower with the following data:  
i) To raise the follower through 35mm during 60° rotation of the cam.  
ii) Dwell for next 40° of the cam rotation.  
iii) Descending of the follower during the next 90° of the cam rotation.  
iv) Dwell during the rest of the cam rotation.
Draw the profile of the cam if the ascending and descending of the cam are with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft.

20

PART-B

Q.5  a) Explain the advantages, disadvantages and applications of V-belts.
        10
b) The initial tension in a flat belt derive is 1800 N. The angle of lap on the smaller pulley is 170°. The co-efficient of the friction of the belt and pulley surface is 0.25. The pulley has a diameter of 0.9 m and it runs at 540 r.p.m. Determine the power that can be transmitted at the above speed. Neglect the centrifugal tension.
        10

Q.6  a) Explain how to analyse a reverted gear train.
        10
b) Make a comparison of cycloidal and involute teeth forms.
        10

Q.7  a) Find the natural frequency of a vibrating system by equilibrium method.
        10
b) Explain the method of finding the counter-masses in two planes to balance the dynamic unbalance of rotating masses.
        10
END SEMESTER EXAMINATION, DEC. 2014
B.TECH. (INTEGRATED) – FIFTH SEMESTER
REFRIGERATION AND AIR-CONDITIONING (M-I-502)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain the term “Tonne of refrigeration”.
b) Sketch the T-S and P-h diagram for the vapour compression cycles when the vapour after compression is dry saturated.
c) Name the different refrigerants generally used.
d) What are the different types of compressors used in refrigeration cycle?
e) Define the following:
   i) Relative humidity
   ii) Wet bulb temperature

4x5

PART-A

Q.2
a) What are the desirable properties of an ideal refrigerant?
   10
b) Draw ideal and actual P-V diagrams for a reciprocating compressor.
   10

Q.3
Prove that the performance factor of a Bell-Coleman cycle refrigeration system is given by:

\[ C.O.P. = \frac{T_2}{T_2 - T_1} \]

Where \( T_2 \) and \( T_1 \) are temperature of air at inlet and outlet (discharge) of compressor respectively. Explain with a neat sketch the working of this cycle.

20

Q.4
Find the theoretical C.O.P. for a CO\(_2\) machine working between the temperature range 25\(^\circ\)C and -5\(^\circ\)C. The dryness fraction of CO\(_2\) gas during the suction stroke is 0.6.

Following properties of CO\(_2\) are given:

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Liquid</th>
<th>Vapour</th>
<th>Latent Heat</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>°C</th>
<th>Enthalpy KJ/Kg</th>
<th>Entropy Kj/Kg k</th>
<th>Enthalpy KJ/Kg</th>
<th>Entropy Kj/Kg K</th>
<th>KJ/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>164.77</td>
<td>0.5978</td>
<td>282.23</td>
<td>0.9918</td>
<td>117.46</td>
</tr>
<tr>
<td>-5</td>
<td>72.37</td>
<td>0.2862</td>
<td>321.33</td>
<td>0.12146</td>
<td>248.76</td>
</tr>
</tbody>
</table>

**20**

**PART-B**

Q.5  
(a) When is dehumidification of air necessary and how it is achieved?  
(b) With the help of psychometric chart, explain the following processes: Heating and dehumidification process.

**10**

Q.6  
Draw the line diagram of window type air conditioner and explain its working with its controls.

**20**

Q.7  
Describe three fluid electrolux refrigerator functions with a neat diagram. Explain its working.

**20**

End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
INSPECTION AND QUALITY CONTROL (M-I-601)

Time: 3 hrs  
Max Marks: **100**

Note: Attempt **FIVE** questions in all. **Q.1 is compulsory.** Attempt any **TWO questions from Part A and TWO questions from Part B.** Each question carries equal marks.

Q.1  
(a) Final inspection.  
(b) Ring gauge.  
(c) Minimum material condition.  
(d) Sine bar.  
(e) Line standard.  
(f) Interference fit.  
(g) Errors in measurement.  
(h) Surface plate.
i) Interchangeability.

j) Process variations.

k) Transducer.

\[ 2 \times 10 \]

**PART-A**

Q.2  
\[ a) \] Explain in detail clearance, interference and transition fit with neat sketches. \[10\]

\[ b) \] Define inspection and explain various stages of inspection. \[10\]

Q.3  
\[ a) \] Draw a neat sketch of micrometer and explain its working principle. In addition, explain the mathematical derivation for finding its least count. \[10\]

\[ b) \] Describe the working principle and application of any mechanical comparator with a neat sketch. \[10\]

Q.4  
\[ a) \] Write a short note on measurement of geometric parameters such as straightness, flatness and parallelism. \[10\]

\[ b) \] Describe the procedure for alignment of a drilling machine. \[10\]

**PART-B**

Q.5  
\[ a) \] Consider a lot of 25 items out of which 3 items are defective. A sample of 5 items is selected at random for inspection purposes. Determine the respective probabilities of 0, 1, 2, and 3 defectives occurring in a sample of 5. \[14\]

\[ b) \] Write a short note on TQM. \[6\]

Q.6  
\[ a) \] Explain in detail family of ISO:9000 standards. Also explain various clauses of ISO 9001:2008. \[12\]

\[ b) \] Write a short note on acceptance sampling. \[8\]

Q.7  
\[ a) \] Explain the use of \( \bar{X} & R \) chart, P chart, and C chart. \[8\]

\[ b) \] Draw the \( \bar{X} & R \) chart for data given below and also comment on results:

<table>
<thead>
<tr>
<th>Sample#</th>
<th>8:00</th>
<th>8:30</th>
<th>9:00</th>
<th>9:30</th>
<th>10:00</th>
<th>10:30</th>
<th>11:00</th>
</tr>
</thead>
<tbody>
<tr>
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<td>5.0</td>
<td>9.0</td>
<td>2.0</td>
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<tr>
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<td>8.0</td>
<td>3.0</td>
<td>1.0</td>
<td>1.0</td>
<td>6.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

$A_2 = 0.577$

$D_4 = 2.114$

$D_3 = 0.00$
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
AUTOMOBILE ENGINEERING (M-I-602)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Name various types of car bodies.
   b) Function of transmission system.
   c) Torque converter.
   d) Over drive.
   e) Camber.
   f) Scrub radius.
   g) Use of fully floating rear axle.
   h) Propeller shaft.
   i) Leaf spring.
   j) Sprung weight.

2x10

PART-A

Q.2 a) Classify the automobiles according to various considerations. 10
   b) Explain how power is transmitted from engine to driving wheal with the help of a neat labelled sketch. 10

Q.3 a) What are the advantages of multiplate clutch over single plate clutch? 7
   b) Explain with a neat sketch construction and working of a differential. 10
   c) Explain function of universal joint. 3

Q.4 a) Discuss in detail the Ackerman steering gear. 10
   b) What is the function of a steering gear? Explain any one steering gear with a neat sketch. 10

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**PART-B**

Q.5  a) Explain the construction of tandem master cylinder with a neat sketch.  
     b) Describe the working of air-braking system through a suitable diagram.  

Q.6  a) Give the construction and working of MacPherson independent suspension system.  
     b) Give the details of various parts of a leaf spring.

Q.7  Write short notes on any four:  
     a) Functions and its constructional details of a dynamo.  
     b) Battery charging, chemical reactions during charge and discharge.  
     c) Constructional details of lead acid cell battery.  
     d) Procedure of aiming of headlights.  
     e) Capacity and efficiency of a battery.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
INSTALLATION, TESTING AND MAINTENANCE (M-I-603)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write shot notes on any four:
   a) Maintainability of a machine part.
   b) Material management.
   c) Role of foundations while installation of machine parts.
   d) Performance testing of machine parts.
   e) Vibration damping.

   5x4

PART-A

Q.2 a) Explain the term repair in brief.  

10

b) What do you mean by fits? Describe the types of fits with neat sketches.

10

Q.3 a) Explain the procedure for positioning of machine parts in exact location.

10

b) Explain erection and leveling in detail.

10

Q.4 a) What do you mean by overhauling of machine parts?

10

b) Explain the procedure in detail for testing the speed of machines. Also comment on performance of a machine.

10

PART-B

Q.5 a) Write short notes on:
   i) Maintenance planning
   ii) Availability of machine parts

10

b) Explain the different stages for maintenance of machine parts.

10
Q.6 Discuss maintenance. Explain any four types of maintenance in detail.

20

Q.7 a) What do you mean by history cards? Explain the significance of history card for a machine.

10

b) Explain the importance of storage of parts/ equipments required for maintenance purposes.

10
Q.1 Explain briefly any ten:
   a) Industrial engineering.
   b) Training and development.
   c) Professional ethics.
   d) Wages.
   e) Industrial hazards.
   f) Industrial Tribunals.
   g) Inventory control.
   h) Organisation.
   i) Trade unions.
   j) Strikes and lockouts.
   k) Labour welfare.

2x10

PART-A

Q.2 a) Explain the terms: group behavior and trade unions.

10

b) Give various grievance handling procedure.

10

Q.3 a) Explain the concept of motivation and methods to motivate industrial workers.

10

b) Give ten main characteristics of a good leader.

10

Q.4 a) What do you mean by incentives and explain various incentive schemes?

10

b) Explain various management functions.

10

PART-B
Q.5  a) Describe the various provisions of Employee State Insurance Act of 1948.  
10  
b) What do you mean by provident fund and how it helps the workers?  
10  

Q.6  a) What are the main causes of industrial accidents?  
10  
b) Give various types of material handling equipments and their uses in the industry.  
10  

Q.7  a) Explain economic order quantity and its importance in inventory control.  
10  
b) What do you mean by working capital and give its sources?  
10
Q.1 For the following cases specify which probability distribution to use in hypothesis test:

a) \( H_0 : \mu = 15, H_1 : \mu \neq 15, \bar{x} = 14.8, \hat{\sigma} = 3.0, n = 35 \)

b) \( H_0 : \mu = 9.9, H_1 : \mu \neq 9.9, \bar{x} = 10.6, \sigma = 2.3, n = 16 \)

c) \( H_0 : \mu = 57, H_1 : \mu > 57, \bar{x} = 65, \hat{\sigma} = 12, n = 42 \)

d) Why do we use chi-square test?

e) Why do we use analysis of variance?

3 \times 5

Q.2 American theaters knows that a certain hit movie ran an average of 84 days in each city, and the corresponding standard deviation was 10 days. The manager of the Southeastern District was interested in comparing the movie’s popularity in his region with that in all of American’s other theaters. He randomly chose 75 theaters in his region and found that they ran the movie an average of 81.5 days.

a) State appropriate hypotheses for testing whether there was a significant difference in the length of the picture’s run between theaters in the southeastern district and all of American’s other theaters.

b) At a 1 percent significance level, test these hypotheses.

7 \frac{1}{2} \times 2

Q.3 From a sample of 60 women taken from a population of over 5000 enrolled in a weight reducing program at a nationwide chain of health spas, the sample mean diastolic blood pressure is 101 and sample standard deviation is 42. At a significance level of 0.02, on average, did the women enrolled in program have diastolic blood pressure that exceeds the value of 75?

15

Q.4 Nine computer component dealers in a major metropolitan area were asked for their prices on two similar colour inkjet printers. The result of this survey are given below. At \( \alpha = 0.05 \), is it reasonable to assert that, on average, the Apson printer is less expensive that Okaydata printer?
Q.5
President of the National General Insurance company believe that length of stay in hospital are dependent on the types of health insurance that people have. He asked his statistician to check the matter. The statistician collected data on a random sample of 660 hospital stays and summarized them as follows:

<table>
<thead>
<tr>
<th>Fraction of Cost Covered by Insurance</th>
<th>Days in Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
</tr>
<tr>
<td>&lt;25%</td>
<td>40</td>
</tr>
<tr>
<td>25-50%</td>
<td>30</td>
</tr>
<tr>
<td>&gt;50%</td>
<td>40</td>
</tr>
</tbody>
</table>

At 0.01 level of significance, check whether length of stay and type of insurance are independent using chi-square test.

Q.6
For the following set of data, develop the regression equation that best describes the data. Also predict $y$ when the value of $x = 15$.

\[
\begin{array}{c|cccccccccc}
X & 13 & 16 & 14 & 11 & 17 & 9 & 13 & 17 & 18 & 12 \\
Y & 6.2 & 8.6 & 7.2 & 4.5 & 9.0 & 3.5 & 6.5 & 9.3 & 9.5 & 5.7 \\
\end{array}
\]

Q.7
a) Explain the term forecasting and its benefits. Describe various types of forecasting.

b) Describe various commonly observed demand pattern. Explain various quantitative methods of forecasting.
End Semester Examination, Dec. 2014  
M. Tech. (Industrial Engineering) - First Semester  
OPERATION PLANNING AND CONTROL (M-IE-103)

Time: 3 hrs  
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Explain the process of ‘operations planning and control’, with various components involved in it. Also explain the main objectives of ‘OPC’.  
15

Q.2 Explain the importance of economic order quantity (EOQ) in inventory control. Derive EOQ graphically and mathematically.  
15

Q.3 Explain the procedure of ‘Routing’. Enumerate the details involved in routing sheet.  
15

Q.4 Explain MRP-I system with various inputs and outputs involved in it. How does MRP-II improve over MRP-I?  
15

Q.5 What is aggregate planning and explain the different strategies being followed in it?  
15

Q.6 Explain the process of dispatching and difference between centralized and decentralized dispatching.  
15

Q.7 Write short note on any two:  
a) ABC analysis of inventory control.  
b) Scheduling.  
c) JIT inventory system.  
7½x2
End Semester Examination, Dec. 2014  
M. Tech. (Industrial Engineering) - First Semester  
MANAGEMENT CONCEPTS AND ORGANISATIONAL BEHAVIOUR  
(M-IE-104)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Describe the major contributions of following:  
a) Henri Fayal  
b) Frederick Taylor  
c) Frank and Lillian Gilbreth  
d) Henri L Gantt  
e) Max Weber

3x5

Q.2  
a) Explain five personality traits and assess various sub-trait that each personality trait is made up of.  
b) Describe various factors which influence the development of personality.

10

Q.3  
a) What are conflict and conflict management?  
b) Explain various modes used by people to address conflict.

5 10

Q.4  
a) Explain Maslow’s theory of need hierarchy.  
b) Explain X and Y theory of motivation.

10 5

Q.5  
a) What is meant by strong and weak culture?  
b) Explain various approaches which can be used for bringing cultural changes.

5 10

Q.6  
a) Explain basic concepts of Business Process Re-engineering (BPR). Describe basic steps while performing BPR.

10
b) Write a short note on BPR vs TQM.

Q.7 Write short notes on:

a) Knowledge management.

b) Driving force and impact of e-commerce.
End Semester Examination, Dec. 2014  
M. Tech. (Industrial Engineering) – First Semester  
WORK STUDY AND ERGONOMICS (M-IE-105)

Time: 3 hrs  
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Explain different kinds of productivity measurement.  
  
    b) What is the role of management in productivity programme?  

Q.2  
a) What do you understand by allowances in the context of time study? What are the various allowances?  
  
b) The observed time for an element of the job was 2 minute. The rating given as below:
    Still excellent B1 - 0.11
    Effort excessive A2 - 0.12
    Condition Good C - 0.02
    Consistency Good C - 0.01

    Determine the normal time for an element under observation.

Q.3  
a) Explain Simo chart. How it is constructed? Write down its advantages.  
  
b) Explain Cycle graph.

Q.4  
a) What is ergonomics? Explain four main constituent areas of study of ergonomics.  
  
b) Explain systems approach to ergonomics model.

Q.5  
a) Explain design considerations of visual displays.  
  
b) Write down differences between hand and foot controls.

Q.6  
a) What is micro motion study? Write down it purposes and advantages.
b) What are limitation of man and machine with respect to each other? 7

Q.7 a) What do you mean by incentives? Write down essential characteristics of good wage plan. 10

b) Classify incentives. 5
End Semester Examination, Dec. 2014
M. Tech. (Industrial Engineering) - First Semester
PROJECT MANAGEMENT (M-IE-204)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Explain the various stages in life cycle of a project.  

    7

    b) What are the characteristics of project and the methodology to identity the project?  

    8

Q.2  What is project management? Explain its five functions.  

    15

Q.3  Explain the Work Break Down structure (WBS) and organisation breakdown structure (OBS) and superimpose the both with an example.  

    15

Q.4  a) What is importance of various types of floats in project scheduling?  

    5

    b) A project consists of eight activities precedence relation and activity times are given. Draw the network and compute the critical path.

    

    | Activity | Immediate | Precedence | Activity time (weeks) |
    |---------|-----------|------------|-----------------------|
    | P       |           |            | 12                    |
    | Q       |           |            | 20                    |
    | R       |           |            | 28                    |
    | S       | R         |            | 12                    |
    | T       | P, Q      |            | 28                    |
    | U       | T, S      |            | 12                    |
    | V       | S         |            | 08                    |
    | W       | U, V      |            | 08                    |

   10

Q.5  A small project is composed of the following activities whose time estimates are given below:

    | Activity | Optimistic Time | Most Likely Time | Pessimistic Time |
    |---------|-----------------|------------------|-----------------|

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Q.6 

a) Draw the project network and find its critical path.

b) Find the expected deviation and variance for each activity.

c) Calculate the standard deviation of project.

d) What is the probability that the project will be completed at least four weeks earlier than expected time?

15

Q.6 

a) Explain the time and cost trade off graphically and the methodology to crash the network for optimum cost.

9

b) Explain project information system (PIS) and its objectives.

6
End Semester Examination, Dec. 2014
M. Tech. (Industrial Engineering) - Third Semester
MANAGEMENT INFORMATION SYSTEM (M-IE-301)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Explain the role of performance standard and feedback in effective management of business.

15

Q.2 Explain importance of computers for management information system in an organization.

15

Q.3 What are the features of networks and what benefits does it offer to the user?

15

Q.4 Explain the role of a model in problem solving. Explain the process of abstraction used in constructing the model.

15

Q.5 Explain the concept of database. What is the difference between data file, data bank and database?

15

Q.6 What is the importance of security in database environment? How is security offered to the user of database?

15

Q.7 Draw report format for payslip, good return note and balance sheet.

15
End Semester Examination, Dec. 2014
M. Tech. (Industrial Engineering) – Third Semester
SIMULATION AND MODELLING (M-IE-303)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What do you mean by random variables and write down their properties?  

b) What are the principles used in modeling? Discuss in details.

Q.2  a) What are types of models? Discuss static and dynamic model with a suitable example.

b) Describe numerical computation technique for continuous models.

Q.3  a) Discuss about hybrid simulation and feedback systems.

b) Write a simulation program to solve the following equations:
   \[ 3\dot{x} + 15 \ddot{x} + 50 \dddot{x} + 200x = 10 \]
   \[ \dddot{x} = \dddot{x} = \dot{x} = x = 0 \text{ at } t = 0 \]

Q.4  a) With neat sketch explain system dynamics diagrams.

b) Explain decay model.

c) Explain computers in simulation studies.

Q.5  a) Explain simulation of hydraulic systems.

b) Discuss the simulation of waiting line systems.

Q.6  Write short notes on:
   a) Analog and hybrid simulation.
b) How simulation helps for improving product quality?

7½x2

Q.7 The probability of a batter swinging at a ball is 0.7. When he swings the probability of his hitting is 0.6. If he hits ball probability of being caught is 0.5. Compute respectivity the occurrence of swinging, hitting and being caught. [Hints use table of random digits.]
End Semester Examination, Dec. 2014
M. Tech. (Industrial Engineering) - Third Semester
SUPPLY CHAIN MANAGEMENT (M-IE-322)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Consider the purchase of a can of soda at a convenience store. Describe the various stages in the supply chain and the different flows involved.

b) Give arguments to support the statement that Wal-Mart has achieved good strategic fit between its competitive and supply chain strategies.

Q.2  Identify the major drivers of supply chain. Explain any two along with key metrics that track the performance of the supply chain in terms of each driver.

Q.3  What differences in retail environment may justify the fact that fast moving consumer goods supply chain in India has for more distributors than it has in the United States?

Q.4  What are the characteristics of information to support effective supply chain decisions? How and what information is used while making decisions about each supply chain driver?

Q.5  How do trade promotions and price fluctuations affect co-ordination on a supply chain? What pricing and promotion policies can facilitated co-ordination?

Q.6  Explain how a reduction in lead time can help a supply chain reduce safety inventory without hurting product availability. What is the impact of supply uncertainty on safety inventory?

Q.7  Write short notes on:

a) Reverse logistics
b) Hub and spoke concept on supply chain
\[ 7 \frac{1}{2} \times 2 \]
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write two failures of classical mechanics.
b) Write Wien’s law and Rayleigh-Jeans law.
c) What do you mean by zero point energy?
d) Write two pumping methods.
e) Write two disadvantages of optical fibres.
f) Define electric potential.
g) Write one example each of light charged particle and heavy charged particle and heavy charged particle.
h) Define photoelectric effect.
i) What are quasars?
j) What is antimatter?

PART-A

Q.2 a) Derive Bose-Einstein distribution law. 16
b) Differentiate between Bose-Einstein and Fermi-Dirac statistics. 4

Q.3 a) A particle is in motion along a line between x=0 and x=a with zero potential energy and at points x<0 and x>a, the potential energy is infinite. Write the schrodinger equations the normalized eigen functions. 15
b) Explain the phenomenon of tunneling with an example. 5

Q.4 a) Give the principle, construction and working of semiconductor laser. 10
b) Derive the acceptance angle and numerical aperture of an optical fibre. 10

PART-B
Q.5  a) Show that $\nabla \cdot \vec{E} = 0$.

b) Derive Poisson’s and Laplace’s equations.

Q.6  a) Give the principle, construction and working of a scintillation counter.

b) Discuss the introduction of light charged particles with matter.

Q.7  a) What is big bang? Explain the time line of Big Bang in detail.

b) Explain dark energy.
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is compton effect?
b) Explain the concept of wave packet.
c) Write expression of energy levels and wave function for particle in a box.
d) What are the wavelengths of different transitions allowed in a He-Ne laser?
e) Give two advantages of an optical fibre.
f) Write Poisson’s and Laplace’s equation.
g) What is Gauss’s law in electrostatics?
h) In compton scattering experiments the wavelength of X-ray radiation at an angle of 45° is 0.025 Å. Determine the wavelength of incident radiation.
i) What is photo multiplier tube?
j) What is dark matter?

2x10

PART-A

Q.2 a) Derive the expressions for Schrödinger time-independent and time-dependent wave equations.

b) Explain Fermi-Dirac and Bose-Einstein statistics.

Q.3 A particle faces a one dimensional potential given by:
\[ V = 0 \quad \text{for} \quad x < 0 \]
\[ V = V_0 \quad \text{for} \quad x \geq 0 \]
a) Write down the Schrödinger wave equations for the particle and solve it.

b) Find the reflectance and transmittance for the case \( E < V_0 \).

Q.4 a) Discuss Einstein’s coefficients. Derive relations between them.
b) Explain the term acceptance angle and numerical aperture and deduce the expression for numerical aperture.  

**PART-B**

Q.5  
a) Show that the potential energy due to a charge distribution over the entire space is given by:

\[ W = \frac{\varepsilon_0}{2} \int_{all \ spaces} E^2 d\tau \]  

b) Show that \( E = -\nabla \Delta \).  

Q.6  
a) Explain the construction and working of a G.M. counter.  

b) Discuss different mechanisms which are responsible for the interaction of gamma rays with matter.  

Q.7  
a) Define the term “critical density of the universe”. What is the possible future of our universe?  

b) Write short notes on *any two*:

i) Doppler shift  
ii) White dwarf  
iii) Neutron star
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are de-Broglie waves?
b) Explain group velocity.
c) Write two applications of tunneling.
d) What is Laser pumping?
e) Give two advantages of an optical fibre.
f) Give full form of LASER and MASER.
g) Define Electric potential.
h) What is quenching?
i) What is Compton effect?
j) Define Stars.

PART-A

Q.2 a) Derive Planck’s law of black body radiation.

b) A photon of green light has a wave length of 520 nm. Determine its frequency and energy.

Q.3 a) Write Schrödinger wave equation for a free particle in a one-dimensional box. Determine the energy eigenstate and eigenvalues for the same.

b) Explain the phenomenon of tunneling in quantum physics.

Q.4 a) Give the principle, construction and working of He-Ne Laser.

b) Derive relation between Einstein’s coefficients.

PART-B
Q.5  a) What are Poisson’s and Laplace’s equation? Discuss the solution of Poisson’s equation. Also solve the Laplace equation in one dimension.  

12  
b) Define electric potential. Derive the potential due to different distribution of charges.  

8  

Q.6  a) What happens when nuclear emissions consisting of radiations and various particles like electrons, alpha particles etc. are incident on matter?  

10  
b) On what principle do the gas filed detectors work? Compare the working of an ionization chamber with a proportional counter.  

10  

Q.7  a) Explain the effect of gravity on light. What is gravitational red shift?  

10  
b) Write short notes on any two:  

i) White dwarf  
ii) Dark matter  
iii) Big Bang.  

5x2
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are metastable states? Discuss their importance.
b) Why is an optical fibre system more reliable than a conventional system?
c) What is Planck’s quantum hypothesis?
d) Why is Compton Effect not observed with visible light?
e) Suppose I am in an inertial frame and you move at a speed \( v = \frac{sm}{10} \) relative to me. Are you an inertial observer? Justify your answer.
f) What is a photon? Give the rest mass a photon.
g) A point charge \( q \) produces an electric potential of 15 volts at a distance of 5 cm from the charge. Determine the value of \( q \).
h) Show that \( K = 1 + \chi \), where symbols have their usual meanings.
i) What are polar and non-polar molecules?
j) Give the names of two heavy charges particles and two light charged particles.

2x10

PART-A

Q.2
a) Explain the principle, construction and working of a He-Ne laser. 10
b) Explain different types of optical fibre on the basis of mode of propagation and index. 7
c) Calculate the numerical aperture and acceptance angle of an optical fibre having core and cladding refractive index 1.62 and 1.52, respectively. 3

Q.3
a) Derive an expression for Schrödinger’s time independent wave equation. 6
b) Differentiate between Bose-Einstein and Fermi-Dirac statistic. 4
c) What is quantum mechanical one dimensional box? Write down Schrödinger’s wave equation for it and obtain energy eigenvalues.

Q.4  

a) Derive Lorentz transformation equations for space and time.

b) Calculate the rest energy of an electron in MeV.

c) Show that the mass of a body depends on its velocity. Deduce an expression for the variation of mass with velocity.

**PART-B**

Q.5  

a) What is electric field intensity? Obtain the electric field intensity due to:
   i) Point charge
   ii) Distribution of point charges
   iii) Continues distribution of charges

b) Derive the expression for divergence of electrostatic field and give its physical interpretation.

c) Given a potential of form \( V = \frac{A}{r} + B \), where A and B are constants and \( r \) is position vector. Check if the potential satisfies Laplace equation.

Q.6  

a) Discuss three electric vectors \( E, P \) and \( D \) in dielectrics. Find the relation among them.

b) State and prove Gauss law in the presence of a dielectric.

c) Derive an expression for energy density of electric field established in a dielectric medium.

Q.7  

a) What are gamma radiations? Discuss different mechanisms which are responsible for the interaction of gamma radiations with matter.

b) What is a scintillation counter? Explain its principal, construction and working. Also discuss its advantages and disadvantages.
End Semester Examination, Dec. 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is population inversion?
    b) Name various types of fibre optics.
    c) What is Compton Effect?
    d) What are Bosons and Fermions? Give an example for each.
    e) The mass of moving electron is 11 times its rest mass. Find its Kinetic energy.
    f) What is Gauss’s law in electrostatics?
    g) Write the Laplace’s equation. Apply it to determine the field between two parallel plates of a capacitor, separated by a distance ‘d’, such that one plate is at 0 potential and the other is at potential $V_0$.
    h) What is ‘pair production’?
    i) The electric susceptibility of a material is $2.21 \times 10^{-12} \text{ m} \cdot \text{NC}$. Calculate the value of dielectric constant and absolute permittivity of the material. Given $\varepsilon_0 = 9 \times 10^{-12} \text{ F/m}$.
    j) What are ‘Bremsstrahlung radiation’?

2x10

PART-A

Q.2  a) What is an optical fibre? Explain the term acceptance angle and numerical aperture and deduce the expression for numerical aperture.

10

b) Describe the construction and working of a semiconductor laser with necessary diagrams.

10

Q.3  a) Show that the de-Broglie group velocity associated with the wave packet is equal to the velocity of the particle.

8

b) Write the Schrödinger wave equation for a free particle in one dimensional box. Determine the energy eigenvalue and normalized wave function.

12
Q.4  a) Derive Lorentz transformation equations. Apply the equations to show that the lengths contract and time dilates.  

b) Establish the mass energy equivalence relation and explain its significance.  
c) Calculate the energy equivalent (in MeV) of a proton of mass $1.67 \times 10^{-27}$ Kg.  

**PART-B**

Q.5  a) Derive expressions for electric potential due to different distribution of charges.  
b) Obtain Cartesian solution of Laplace equation in one dimension for a parallel plate capacitor.  
c) Given a potential of the form $V = \frac{A}{r} + B$, where A and B are constants and r is a position vector. Check if the potential satisfies Laplace equation.  

Q.6  a) What are the three electric vectors in dielectrics? Establish the relationship between these vectors.  
b) Obtain an expression for the local field in a dielectric and derive the Clausius Mossotti relation.  
c) Explain different polarization mechanisms in a dielectric.  

Q.7  a) Discuss the interaction of light charged particles with matter with the help of a suitable diagram.  
b) Explain the construction and working of a GM counter.
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
APPLIED PHYSICS-II (PH-201)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are Miller indices?

b) Write Bragg’s law for x-ray diffraction.

c) Write the Clausius-Mossotti equation and explain the terms involved.

d) What is Larmor’s precession frequency?

e) Define antiferromagnetism.

f) What is superconductivity?

g) Name two high temperature superconductors.

h) Give one example each of direct and indirect band semiconductors.

i) What is a substrate?

j) Nanomaterials are mechanically stronger than bulk materials. Why?

2x10

PART-A

Q.2
a) A simple cubic crystal has atomic radius of 1.75 Å. Determine spacing of planer having Miller indices:

i) (200)  

ii) (202)  

2

b) What do you mean by Frenkel defects? Derive an expression for concentration of Frenkel defects.

12

c) Give a brief account of powder method for crystal structure analysis.

6

Q.3
a) Explain different types of polarization.

5

b) Derive an expression for the energy density of electric field established in a dielectric medium.

8

b) Discuss the behavior of a dielectric in an alternating field.

7
Q.4 Derive an expression for temperature dependence of paramagnetic susceptibility on the basis of Langevin’s theory. Discuss the failures of this theory.

20

PART-B

Q.5 a) Differentiate between type-I and type-II superconductors.

6

b) Derive the London equations and explain the Meissner effect using these equations.

14

Q.6 a) Briefly explain the physical properties of semiconductors.

4

b) What are the different methods of growing semiconductor crystals? Describe the Czochralski method of crystal growth.

12

c) Explain the phenomenon of optical absorption in semiconductors.

4

Q.7 a) What are nanomaterials? Discuss their physical and chemical properties of nanomaterials.

10

b) What are carbon nanotubes? What are their different types? Explain one method for producing carbon nanotubes.

10

End Semester Examination, Dec. 2014
B. Tech. – Second Semester
APPLIED PHYSICS-II (PH-201A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a crystal lattice?

b) What are Frenkel defects?

c) Give one point of difference between direct and indirect band semiconductors.

d) Define the term epitaxy.

e) How does the optical absorption affect the conductivity of a sample?
f) Define susceptibility and give its units.
g) Explain in brief ferrimagnetisms.
h) What is superconductivity?
i) Give two reasons why the properties of a material change at nanoscale.
j) What are the applications of nanomaterials in energy?

2x10

**PART-A**

Q.2 a) Explain rotating crystal method used for the determination of crystal structures.

b) X-ray diffraction studies are conducted on a simple cubic crystal. The X-rays of wavelength 1.54 Å show first order reflection by (220) plane at Bragg’s angle 30°. Determine the lattice parameter of the crystal.

c) Derive the necessary relation to show that concentration of Schottky defects in ionic crystal depends on temperature.

10

Q.3 a) The carrier concentration in n-type semiconductor is 10^{19} per m^2. What is the value of Hall coefficient?

b) Distinguish between direct and indirect band gap semiconductors.

c) Discuss any two of the following processes for crystal growth:
   i) Vapour phase epitaxy
   ii) Liquid phase epitaxy
   iii) Bridgeman method

10

Q.4 a) Explain the terms: photoconductivity, traps, photovoltaic effect and gain factor of a photoconductor.

b) Discuss the effect of impurity on photoconductivity. Describe the construction, working, characteristics and uses of a solar cell.

12

**PART-B**

Q.5 a) Derive an expression for the magnetic dipole moment of an atom.

b) Plot the hysteresis curve for a magnetic material. Label and explain the important features of the curve.

c) Write a note on ferromagnetism and give an account on domain theory of ferromagnetism.

10
Q.6  a) What are high temperature superconductors? Give some applications of superconducting materials.  

b) Distinguish between type-I and Type-II superconductors.  

c) Derive the London equations.  

Q.7  a) Describe two main approaches that are used in nanotechnology for building nanomaterials.  

b) Discuss physical properties of nanomaterials.  

c) Describe the important applications of carbon nanotubes.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – First Semester
PHYSICS-I (PH-I-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Convert a speed of 90km/h to m/s.
b) Derive dimensional formula for angular momentum.
c) What are concurrent forces?
d) State the law of parallelogram of forces.
e) Define moment of inertia.
f) Define work and give its unit.
g) What is meant by streamlined flow?
h) What is Reynold’s number?
i) State the laws of reflection of light.
j) What do you mean by refractive index?

2x10

PART-A

Q.2  a) Explain the principle of homogeneity of dimensions in a physical equation. Explain by giving an example.

5

b) Define a unit vector. Find the unit vector \( \vec{A} \), given \( \vec{A} = 2\hat{i} + 3\hat{j} + 2\hat{k} \).

5

c) Distinguish between scalar product and vector product. Also explain how will you add and subtract two vectors.

10

Q.3  a) State and explain Newton’s laws of motion.

6

b) What is impulse of a force? Explain the concept of impulse with an everyday example.

4

c) A projectile in fired with a velocity of 100m/s making an angle of 30° with the horizontal. Find the maximum height attained, total time of flight and the horizontal range of the projectile.

7
d) Explain in brief the linear velocity and angular velocity.

3

Q.4 a) Derive an expression for the angular momentum of a rigid body. State the law of conservation of angular momentum and give its two applications.

10

b) Write a short notes on torque and radius of gyration.

5

c) The moment of inertia of a body is $2.5 \text{kgm}^2$. Calculate the torque required to produce an angular acceleration of $18 \text{rad/s}^2$ in the body.

5

\textbf{PART-B}

Q.5 a) What is meant by energy of a body? State and prove work-energy theorem.

8

b) What are elastic and inelastic collisions? Show that in perfectly elastic collision, the relative velocity remains unchanged in magnitude, but is reversed in direction. 12

Q.6 a) State and explain Hooke’s law. Also obtain an expression for Young’s modulus of elasticity.

6

b) Derive an expression for thermal velocity attained by a spherical body falling through a viscous medium.

6

c) Write a short note on \textit{any one}:

i) Bernoulli’s theorem.

ii) Surface tension.

8

Q.7 a) State and derive the mirror formula for a convex mirror.

8

b) Draw a diagram depicting the image formation in a simple microscope and determine its magnifying power.

5

c) An object of size $3\text{cm}$ is placed $14\text{cm}$ in front of a concave lens of focal length $21\text{cm}$. Describe the image produced by the lens. What happens if the object is moved for further away from the lens?

7
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Second Semester  
PHYSICS-II (PH-I-201)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define electric potential at a point.  
b) What is Gauss’s law in electrostatics?  
c) Is Ohm’s law true for all conductors?  
d) What is the principle of working of a metre-bridge?  
e) Will a pendulum clock gain or lose time when taken to the top of a mountain?  
f) State Huygens principle.  
g) What is double retraction?  
h) What is laser pumping?  
i) Name various types of fibre optics.  
j) What is quenching?

2x10

PART-A

Q.2  
a) Obtain the electric field intensity due to non-conducting charged sphere at a point:  
i) Outside the sphere.  
ii) On the surface of the sphere.  
b) Explain the principle of a capacitor. Derive an expression for the capacitance of a parallel plate capacitor.

10

Q.3  
a) What do you understand by heating effect of current? Find the relation for the heat produced in a conductor for electric current.  

10

b) Briefly explain Peltier effect.  

4

b) From the circuit diagram, calculate the equivalent resistance between the points A and B.
Q.4  a) What do you understand by simple harmonic motion? Explain the terms: Amplitude, Time period, Frequency and Phase of a simple harmonic motion.  

\[ \text{10} \]

b) Derive an expression for time period and frequency of a simple pendulum.  

\[ \text{10} \]

**PART-B**

Q.5  a) Monochromatic light from a narrow slit falls on two parallel slits and interference fringes are obtained on the screen. Derive an expression for the fringe width.  

\[ \text{12} \]

b) What is diffraction? What are types of diffraction?  

\[ \text{4} \]

c) State and explain the law of Malus.  

\[ \text{4} \]

Q.6  a) Explain the construction and working of a ruby laser.  

\[ \text{10} \]

b) Discuss the propagation of light waves through an optical fibre. Derive an expression for numerical aperture of an optical fibre.  

\[ \text{10} \]

Q.7  a) On what principle do the gas filled detectors work? Compare the working of an ionization chamber with a proportional counter.  

\[ \text{10} \]

b) Describe the construction and working of a solid state detector.  

\[ \text{10} \]

**End Semester Examination, Dec. 2014**

B. Tech. (Integrated) – Sixth Semester

**EARTHQUAKE RESISTANT BUILDING CONSTRUCTION (C-I-601)**

Time: 3 hrs  
Max Marks: 100  

\[ \text{No. of pages: 1} \]

487/4
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the effect of earthquake on building?
     b) What is the difference between epicenter and hypocenter?
     c) What is disaster management?
     d) What do you mean by rescue operation?
     e) Define ductility.
     f) What is the use of IS: 1893:2002?
     g) What are P-waves?
     h) What do you mean by intensity of earthquake?
     i) When was Bhuj earthquake struck? What was its intensity?
     j) What are earthquake resistant buildings?

   2x10

   PART-A

Q.2  a) Explain in brief, seismic zones in India.          10
     b) Explain the term magnitude of earthquake and what are the causes of earthquake?            10

Q.3  a) Write a short note on Bhuj earthquake.             10
     b) How does building twist during earthquake? Explain with an example.                      10

Q.4  a) Explain the following terms:
     i) Seismic weight.
     ii) Response spectrum.
     iii) Natural period.
     iv) Critical damping.                                                                                 10
     b) What are the requirements of shear wall?                                                          5
     c) How design force is distributed in building?                                                      5

   PART-B

Q.5  a) What are the general principles for earthquake resistant design as per IS: 4326?             10
b) What are seismic resistance measures?  

10

Q.6 a) Explain in brief structural framing and deformability.  

10  
b) What are the precautions that are to be taken while planning and designing earthquake resistant buildings?  

10

Q.7 a) Write short note on:  
i) Casualty management.  
ii) Rescue operation.  
iii) Rescue equipments.  

5x3  
b) What are the safety measures to be adopted in rescue operations?  

5
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
CONSTRUCTION MANAGEMENT AND ACCOUNTS (C-I-602)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Write main objectives of construction management.
     b) List the various resources in construction industry.
     c) Define controlling.
     d) What do you mean by staffing function?
     e) Write a short note on pre-tender stage.
     f) What is cost optimization?
     g) Enlist safety measures during drilling.
     h) Briefly explain effect of grade and rolling resistance on the output of tractor pulled scrapers.
     i) What is a treasury challan?
     j) Write limitations of bar charts.

2x10

PART-A

Q.2  a) Write about the construction team, their function and inter relationship.
     10
     b) Explain the various stages in construction from conception to completion.
     10

Q.3  a) How do you prepare schedules for labour, materials, machinery and finances for small works?
     10
     b) Explain pre-tender stage and contract stage of construction planning.
     10

Q.4  a) Highlight the need for inspection and quality control in civil engineering work.
     10
     b) What are the corrective actions to be taken in the analysis of progress?
     10

PART-B
Q.5  a) What is a safety campaign? How does it help in avoiding accidents in construction industry?

10

b) What safety measures are to be adopted for?
   i) Drilling and blasting.
   ii) Demolitions.

10

Q.6  a) Describe power shovels, their functions, selection and sizes.

10

b) Write short notes on:
   i) Bull dozers.
   ii) Clam shells.

10

Q.7  a) Describe:
   i) Expenditure and revenue head.
   ii) Remittance and deposit head.

10

b) Write about MR labour, casual labour, their roll duties and responsibility of different cadres.

10
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
SOLID WASTE AND ENVIRONMENT POLLUTION (C-I-604)  

Time: 3 hrs  
Max Marks: 100  

No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
  a) Define solid waste generation.  
  b) What do you understand by waste minimization?  
  c) What are the different colors used for bins used for collection of biomedical waste.  
  d) Define air pollution and noise pollution.  
  e) Explain the term ecology and ecosystem.  
  f) What do you understand by plume?  
  g) Write down the secondary parameters of noise pollution.  
  h) What do you mean by incineration?  
  i) Define atmospheric stability.  
  j) Differentiate between biodegradable and non biodegradable waste.  

2x10

PART-A

Q.2  
  a) Explain briefly the techniques used for waste minimization.  
   10  
  b) What do you understand by recovery of resources? Explain how status and habits of people affect solid waste generation?  
   10

Q.3  
  a) How do you perform the exposure and risk assessment in hazardous waste management?  
   10  
  b) Explain briefly landfill disposal of hazardous waste.  
   10

Q.4  
  a) What are the characteristics of biomedical waste? What steps government is taking in health care facilities?  
   10  
  b) What are the environmental concerns considered in biomedical waste management? Also explain the colour coding for waste storage.  
   10
PART-B

Q.5  a) What is the role of ecology in environment issues? What are local, religional and global impacts?  
     b) Explain how ecological balance is maintained and how it gets distributed?  

Q.6  a) What are the primary and secondary parameters of air pollution? Explain the methods to control air pollution.  
     b) What do you understand by plume? Explain its various types with diagrams.  

Q.7  a) Write down the properties of sound waves. Also write down the various characteristics of noise.  
     b) What are the effects of noise pollutions? What are the measurement and control standards as per Indian guidelines?
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
BASIC OF STRENGTH OF MATERIALS (C-I-606)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) Define shear force.  
(b) Define buckling.  
(c) What is moment of inertia?  
(d) Define centre of gravity.  
(e) State parallel axis theorem.  
(f) What do you mean by radius of gyration?  
(g) State Hooke’s law.  
(h) What is factor of safety?  
(i) Explain volumetric strain.  
(j) What is poison ratio?  

Q.2  
(a) Explain in brief:  
(i) Elastic material.  
(ii) Plastic material.  
(iii) Ductile material.  
(iv) Brittle material.  
(b) Explain impact test in detail.  

Q.3  
(a) Derive a relation between modulus of elasticity and modulus of rigidity.  
(b) Explain the stress strain relationship of an elastic body with a sketch.  

Q.4  
(a) Explain the following:  
(i) Fixed beans.  
(ii) Continuous beans.  
(iii) Point of contra flexure.  
(iv) Loadings.  

PART-A  

2x10
b) What are the various types of beams and loadings? Explain in detail. 10

PART-B

Q.5  a) Find the centroid of an equal angle section 100 mm x 20 mm.

Fig.

10

b) Explain two major methods of finding out the centre of gravity of a body. 10

Q.6  a) State and prove the theorem of parallel axis applied to moment of inertia. 10

b) Find the moment of inertia of the section given below about the horizontal axis passing through the center of gravity of the section.

Fig.

10

Q.7  a) Describe the assumptions in the Euler's column theory. 10

b) Explain in brief:
   i) Crushing load. ii) Buckling.
   iii) Theory of long columns iii) Column and strut. iv)
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
STRUCTURAL MECHANICS (C-I-607)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  Answer briefly:
   a) State carry over theorem.
   b) How to calculate degree of indeterminacy?
   c) What are the conditions of equilibrium?
   d) Write the formula to account for temperature stresses in a cable.
   e) State the law of reciprocal deflection.
   f) Explain kinematically indeterminate structure.
   g) Give the points of difference between an arch and a beam.
   h) How many types of two hinged arch are there? Explain with diagrams.
   i) List different types of load.
   j) Define true arch and Corbelled arch.

2x10

PART-A

Q.2  a) Calculate indeterminacy in following structure

i) 

ii) 

5x2

b) What is free body diagram? How it is useful in the analysis? Explain.

10
Q.3  a) Derive an expression for central deflection of a simply supported beam of span \( 'l' \) and carrying a point load \( W \) at the mid span using strain energy method.

10

b) \( W=60 \) kN, span is 4 m, \( E=2\times10^5 \) N/mm\(^2\), \( I=10^8 \) mm\(^4\) in above part (a), calculate the deflection and strain energy stored in beam.

10

Q.4  a) Draw the BMD and SFD for a fixed beam AB of span and carrying a point load \( W \) at its center using slope deflection method.

10

b) A beam 8 m long is fixed at its ends. It carries a \( udl \) of 4500 N/m over the whole span. Find the maximum B.M and maximum deflection. Take \( E=200 \) kN/mm\(^2\) and \( I=5\times10^7 \) mm\(^4\).

10

PART-B

Q.5  a) Analyse the portal frame shown below:

15

b) Find the stiffness of a proped cantilever as a basic proposition of moment distribution method.

5

Q.6  a) A two-hinged arch AB of span 40 m and rise 8 m carries a point load of 30 kN at 10 m from left support. Determine the vertical and horizontal reaction at A and B.

10

b) i) State Eddys theorem.

ii) Determine horizontal thrust for a two hinged arch.

5x2
Q.7  a) A cable 30 m long is supported at two ends A and B at the same level with AB=20 m. The cable supports 180 N loads dividing the distance into equal parts. Find the shape of the cables and tension in the cable.

b) A cable carrying a load of 15 kN/m of horizontal span is stretched between supports 150 m apart. The supports are at the same level and the central dip is 10 m. Find the greatest and the least tension in the cable.
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) - First Semester
PRE STRESSED CONCRETE (C-MS-101)

Time: 3 hrs
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) List and explain the various tensioning devices.  
        7
        b) What is long-line system of pre-tensioning? Explain with a neat sketch.  
        8

Q.2  a) How will you calculate the resultant stresses at a section of PSC beam with eccentric tendon? Explain.  
        7
        b) How pressure line helps in understanding the load carrying mechanism of a PSC section? Explain.  
        8

Q.3  a) How do you calculate the effective pre-stress considering the loss due to successive tensioning of curved cables?  
        7
        b) List and explain the factors influencing the deflections of PSC members.  
        8

Q.4  a) What do you understand by partially continuous beams? Draw and label their different layouts.  
        7
        b) A continuous pre-stressed concrete beam ABC with AB=BC=17 m is having bonded tendons. The tendon has an eccentricity of -0.06 m at A, -0.24 m at D with AD=10 m, +0.12 m at B and has a parabolic curve eccentricity of -0.27 m at E with BE =8.5 m. Locate the line or pressure (i.e. C-line) in the concrete due to pre stress and a superimposed load of 17.5 kN/m inclusive of self weight of the beam. Pre-stress=1000 kN.  
        8

Q.5  a) Write a detailed note on “Bond in post tensioned construction”.  
        7
        b) A pre-tensioned beam of 7.0 m span has a symmetrical I-section. The flanges are 200 mm wide and 60 mm thick. The web thickness is 80 mm and the overall depth of the girder is 400 mm. The member is pre-stressed by 10 high
tensile steel wires of 5 mm diameter located on the tension side such that the effective eccentricity is 90 mm. The wires are arranged in 5 rows with 2 wires in each row in the web. The initial stress in the wire is 1300 N/mm$^2$ and the cube strength of concrete at transfer is 42 N/mm$^2$.

i) Determine the maximum vertical tensile stress developed in the transfer zone.

ii) Design the suitable mild steel reinforcement, assuming the permissible stress in steel as 140 N/mm$^2$.

Q.6  

a) What do you understand by “one way PSC slab”? How do you analyse it?

7

b) Design a pre-stressed concrete slab 4 m x 16 m to carry a live load of 9000 N/m$^2$. The slab is simply supported on four sides. Take $f_{ck}=45$ MPa, $f_p=1500$ MPa and losses=15 %.

8

Q.7  

Write short notes on the following:

a) Materials in PSC.

b) Concept of load balancing.

c) Spalling stresses.

5x3
End Semester Examination, Dec. 2014  
M. Tech. (Structural Engineering) - First Semester  
STRUCTURAL DYNAMICS (C-MS-102)

Time: 3 hrs  
Max Marks: 75

No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Calculate the effective stiffness of the system shown in the figure.  
(\(EI=\)constant)

\[
\text{[Figure of a beam with forces and stiffnesses indicated]}
\]

5

b) Discuss the characteristics of dynamics problem.  

4

c) What are the consequences of vibrations?  

3

d) How many types of springs are there on the basis of mechanical characteristics?  

3

Q.2  
a) Explain the D’Alembert’s principle.  

2

b) Derive the response for free vibrations under-damped SDOF system at  
\( t = 0, \ u = u_0, \ \dot{u} = v_0 \). Draw labeled response diagram.  

10

c) What is negative damping?  

3

Q.3  
a) Derive the expression for force transmitted to foundation and explain the term: transmissibility.  

10

b) In an experiment of free vibrations, it is found that maximum amplitude has reduced to 0.4 times its value in 3 complete cycles. Determine damping in system.  

5
Q.4  a) Consider a system shown in the figure. The deflection under its weight (static deflection) can be obtained by applying a force equal to mass time's accertation due to gravity in the direction of vibrations. Use Rayleigh method to calculate fundamental frequency.

![System Diagram](image)

b) What are the basic ideologies on which Holzer’s method and Stodola’s method are based? Explain in detail.

Q.5  a) How multistoreyed buildings are categorised? What are the basic assumptions in the analysis of shear buildings?

b) Type of structure is multi-storey building subjected to free vibrations, with $x_{t0} = 10\text{cm}$ to top storey. Determine response of the structure:

![Structural Diagram](image)

Make the analytical model for figure and derive the equation of motion.

Q.6  a) Derive the response for pulse loading. Draw the shock spectrum for loading in the figure.

\[
p(t) = \begin{cases} 
p_0 & 0 < t < t_d \\
0 & t < 0, t > t_d \end{cases}
\]

![Pulse Loading Diagram](image)
b) Write down the displacement function for the loading shown in the figure:

\[ p(t) = p_0 \frac{\sin \pi t}{td} \]

\[ o < t < td \]

\[ o \]

\[ t < o; t > td \]

Q.7 Derive the response expression for damped structure subjected to harmonic vibrations. Discuss the variations of dynamic amplification factor with damping ratio. Draw respective response graphs with labeling.

\[ F(t) = p_o \sin \sigma t \]

\[ m\ddot{u} + c\dot{u} + ku = p_o \sin \omega t \]
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) - First Semester
ADVANCED STRUCTURAL ANALYSIS (C-MS-103)

Time: 3 hrs
Max Marks: 75

No. of pages: 2
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) What is the static degree of indeterminacy of a rigid-joint space frame?
   b) Explain principle of virtual work.
   c) Calculate the translation stiffness of joint A in the horizontal direction.
   d) Compare force method and displacement method.
   e) What is a grid structure?

Q.2 For a simply supported beam, calculate the displacement at co-ordinates 1, 2 and 3 using Castigliano's theorem.

Q.3 Solve using moment distribution method.
Q.4 Analyse the continuous beam ABCD. The beam has an internal hinge at B.

Q.5 Develop flexibility and stiffness matrix for portal frame ABCD with reference to the co-ordinates shown below:

Q.6 Determine the degree of freedom of grid shown hence select a suitable system of co-ordinates and develop the stiffness matrix. The members are 300 mm in width and 600 mm in depth. Take $E=12 \text{ kN/mm}^2$ and $G=5 \text{ kN/mm}^2$. 
Q.7  Analysis the rigid joint space frame. The external loads aching on the frame. Compute the bending and twisting moments at the ends of BC.
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) - First Semester
ANALYSIS AND DESIGN OF TALL BUILDING STRUCTURES (C-MS-105)

Time: 3 hrs
Max Marks: 75
No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1
   a) Discuss a rigid frame.
   b) Enumerate forces acting on tall buildings.
   c) What is a composite material?
   d) Sketch a tube system.
   e) Discuss fire resistance of a structural member.
   f) Write a short note on proportionate shear wall.
   g) Effect of settlement of foundation.
   h) Limit of horizontal deflection in tall buildings.
   i) Discuss an approximate method for analysis of frame for horizontal load.
   j) Discuss method for analysis of a rigid frame system subjected to gravitational load.

1½x10

Q.2
   Explain the following:
   a) Flat slab structural system.
   b) Braced structural system.
   c) Coupled shear wall system.

5x3

Q.3
   a) Explain substitute frame method for analysis of multistoried frames due to gravitational forces with illustrations.

3
   b) Analyze the frame shown in the figure using any approximate method of analysis.
Q.4  a) Explain factors affecting growth height and structural form.

b) Explain design criteria related to loading, strength, stability and drift limitations in design of tall buildings.

Q.5  a) Explain creep, shrinkage and temperature effects on tall buildings.

b) Explain foundation settlement and soil structure interaction in design aspect of foundation for tall building.

Q.6  Design shear wall of length 6 m and thickness 230 mm subjected to the following forces:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Loading</th>
<th>Axial loads</th>
<th>Moment</th>
<th>Shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DL+IL</td>
<td>2000 kN</td>
<td>700 kN-m</td>
<td>30 kN</td>
</tr>
<tr>
<td>2</td>
<td>Seismic</td>
<td>40 kN</td>
<td>5000 kN-m</td>
<td>800 kN</td>
</tr>
</tbody>
</table>

Consider M25 grade concrete and Fe415 grade steel.

Q.7  Determine stresses at the base level for the coupled shear wall shown in the figure-1 using design curves developed using continuous connection method given in the figure-2. Also calculate maximum shear force and bending moment in any connecting beam.
b)
Q.1  a) Why OPC is called hydraulic cement?
     b) List out the compounds of cement.
     c) Draw strength versus water-cement ratio curve.
     d) Write a short note on importance of fineness of cement.
     e) Write percentage of $C_2S$ and $C_3S$ in cement compound.
     f) Explain grades of cement.
     g) List methods of measurement of workability.
     h) What do you mean by transition zone? Write a short note.
     i) Write a short note on shrinkage of concrete.
     j) Write a short note on usage of plasticizers in concrete.

Q.2  a) List out factors affecting workability of concrete.

Q.3  Design steps for mix design of M_{25} grade concrete using IS 10262-2009. Assume suitable data.

Q.4  Compare and explain performance of Portland pozzolana cement with ordinary Portland cement.

Q.5  a) What is Ferro cement? Explain its uses in practice.
     b) What is fibre reinforced concrete? Discuss its application in practice.

Q.6  List the tests conducted on hardened and green concrete and explain three tests of each category in detail.

Q.7  Explain phenomena of corrosion of rebar and discuss how can you measure corrosion in an RCC building?
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) - Third Semester
ADVANCED BRIDGE ENGINEERING (C-MS-301)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) Draw a flow diagram of development of bridges. 7
b) What are the advantages and disadvantages of continuous girder bridges over simply supported girder bridges? Explain. 8

Q.2 a) How can you calculate earth pressure on abutments? Explain in brief. 8
b) Explain at least five factors influencing the choice of bridge type and its basic features. 7

Q.3 a) What are the different types of beddings for concrete pipes in pipe culverts? Show these with neat sketches. 8
b) List the different components of a T-beam RC bridge and give brief about the design criteria of each. 7

Q.4 a) What are the general features of a substructure of a bridge? Explain with a neat sketch. 5
b) A stone masonry abutment, subjected to forces acting per unit length, is shown in the figure. Safe bearing capacity of soil is 160 kN/m². Coefficient of friction between masonry and soil is 0.55. Density of stone masonry is 24 kN/m². Compute the stresses developed at the base and check the stability of the abutment.
Q.5  
   a) What are the functions of bridge bearings? Explain.
   
   b) Design a reinforced concrete rocker bearing to transmit a support reaction of 700 kN. Adopt M-30 grade concrete and Fe-415 grade HYSD bars. Permissible bearing stress in concrete is 8 N/mm². Sketch the details of reinforcement in the bearing.

Q.6  
   a) Explain in brief about pile foundations for bridges.
   b) Draw a typical well foundation and name its different components.
   c) Explain the design feature for various components of well foundation.

Q.7  
   Write short notes on:
   a) Military bridges
   b) Box culvert
   c) Forces on piers
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) - Third Semester
THEORY OF ELASTIC STABILITY (C-MS-302)

Time: 3 hrs
Max Marks: 75

No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on the following:
   a) Critical buckling stresses on rectangular plates.
   b) Axially compressed isotropic cylinder.
   c) Post buckling analysis.
   d) Elastic instability of two degree of freedom.
   e) Cylinder under bending.
   f) Cylinder under axial compression.
   g) Stress gradient effect on thin plate moment gradient on beam.
   h) Single degree of freedom of elastic stability.

Q.2 a) Explain the theorem of analysis of truss, if the truss having two element, derive the equation for local coordinates for displacement, forces and stiffness matrices.
    b) Find out the element stiffness using finite element method. A member is inclined with 60° with the following data:
       \[ E = 30 \times 10^9 \quad \text{Psi} \quad A = 2m^2 \quad L = 80m \quad \theta = 30^\circ. \]

Q.3 a) Explain briefly ideal elastic and ideal rigid plastic behaviour model. Example of buckling of an initial straight pin ended struts of ideal rigid and elastic plastic materials.
    b) Explain concept of:
       i) Buckling of ring and arch.
       ii) Locked and unlocked stresses.

Q.4 Explain the theory and formulation of invoking the principle of virtual work to determine the non-linear governing equation of post buckling equilibrium.
equation of isotropic, elastic rectangular plate with abruptly varying thickness with two subregions 'Ω 1' and 'Ω 2' having thickness \( t_1 \) and \( t_2 \) of length 'L' and width \( b \). The buckling load factor \( \lambda \) and displacement field may be taken as \( u, v, w \) in non-linear range. Determine the critical in plane shortening \( u_{cro} \) and \( v_{cro} \).

**PART-B**

Q.5 Define the buckling co-efficient of long cylinder subjected to axial compression. Deduce the approximate buckling equation for supported isotropic circular cylinder.

**Attempt Any One**

Q.6 Compare the conventional and modified Newton Raphson’s method. State the method is accurate method compared to incremental method.

**OR**

Explain pure incremental method with displacement and load curve and methodology. How to minimize the drift off error in displacement and load in the above method? How to solve the linearised path in the load displacement curve?

Q.7 Derive equation for single degree of freedom by moment equilibrium condition and energy method with simple rigid beam length \( L \), hinged in one end and free in the other and having an angular spring attached to the hinge. The beam is loaded with the free end force \( F \) acting in the compressive axial direction of the beam.
Q.1 Write notes on:
   a) Reasons for delay of a project.
   b) Utility of transit mixer in construction.
   c) Role of a project manager.
d) Project life cycle.

Q.2 What are project management functions? Explain the various functions and draw an organization chart.

Q.3 Write notes on following:
   a) Types of contracts.
   b) Work charged establishment.
   c) Measurement and its importance.
   d) Arbitration and settlement of dispute.

Q.4 a) Explain critical path and its significance.
   b) Draw PERT and mark critical path for the following case:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Activities</th>
<th>Activity duration (in days)</th>
<th>Preceding activity</th>
<th>Succeeding activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A</td>
<td>10</td>
<td>Nil</td>
<td>B, C</td>
</tr>
<tr>
<td>2.</td>
<td>B</td>
<td>6</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>3.</td>
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<td>2</td>
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</tr>
<tr>
<td>4.</td>
<td>D</td>
<td>8</td>
<td>Nil</td>
<td>E, F</td>
</tr>
<tr>
<td>5.</td>
<td>E</td>
<td>5</td>
<td>D</td>
<td>F</td>
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<td>6.</td>
<td>F</td>
<td>2</td>
<td>D, E</td>
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</tr>
<tr>
<td>7.</td>
<td>G</td>
<td>1</td>
<td>Nil</td>
<td>H, J</td>
</tr>
<tr>
<td>8.</td>
<td>H</td>
<td>7</td>
<td>G</td>
<td>J</td>
</tr>
<tr>
<td>9.</td>
<td>J</td>
<td>1</td>
<td>H</td>
<td>Nil</td>
</tr>
</tbody>
</table>

Q.5 Write notes on:
   a) Tower crane.
   b) Piling equipments.
   c) Earth moving machines.
   d) Batching plant.

Q.6 Following is a typical detail of building foundation. Work out rate analysis for concrete, brick work and damp proof course including man-power required and quantity of materials required for a length of 15 (fifteen) metre length of a wall. Assume present day rates of man-power and materials.
Q.7 Discuss in detail the following:
   a) Arbitration and settlement of dispute in a project.
   b) Cost control and role of management.
   c) Project control processes.
   d) Equipments for compaction and stabilization.
End Semester Examination, Dec. 2014
M. Tech. (Structural Engineering) – Third Semester
ADVANCED FOUNDATION ENGINEERING (C-MS-305)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Answer in brief:
   a) Define standard penetration test. 3
   b) What are the types of borings, conducted for soil exploration? 2
   c) What are the types of shallow foundations? 2
   d) What are the advantages and disadvantages of box caissons? 3
   e) What are the types of pile foundations according to method of installation? Explain briefly. 3
   f) Define the “reinforced earth”. 2

Q.2 a) A strip footing of width 1.5 m is founded at a depth of 1 m. in cohesionless soil having $e=0.7$, $Ø=32^0$ and $G=2.64$. Determine the ultimate bearing capacity of the soil by the method of Terzaghi when ground water level is:
   i) at the base of the footing and
   ii) at the ground level.
   Assume that the soil fails by local shear failure. Consider the bearing capacity factors for unit weight and surcharge for the value of $Ø=32^0$ are 13 and 16, respectively. 10

   b) Explain the load distribution of single pile along the depth and pile tip with neat sketches. 5

Q.3 a) For a multistoried building, one has the option of placing one large diameter pile directly beneath each column or of constructing a pile cap with three smaller diameter piles underhealth each column. Which is to be preferred? Explain clearly.
b) What is “underpinning”? Point out the reasons for underpinning for any structure.

c) Describe about types of wells or caissons with neat figures.

Q.4  
a) What are types of retaining wall? Explain each of them with figures.  
b) Express the different factors of safety involved to check the stability of retaining walls. Explain clearly each of them.

Q.5  
a) What are the types of shear failures occurred under shallow foundations in sandy soils? Explain each of them.  
b) Write the design procedure for combined footing.

Q.6  
a) Describe the different in-situ field tests conducted for soil exploration for any project.  
b) What are the different type of soil samples extracted from boreholes? Discuss about the corrections applied for observed standard penetration test value (N).

Q.7  
a) Explain about compaction pile.  
b) Differentiate between SCPT and DCPT field tests conducted for soil investigation.  
c) What are the reasons involved for using the net allowable bearing pressure, $q_{na}$ in the design of footings.
End Semester Examination, Dec. 2014  
B. Tech. – First Semester  
ELEMENTS OF COMPUTERS AND PROGRAMMING (CS-101)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) (131)₈ = (?)₁₀
   b) (3AF. BC)₁₆ = (?)₂
   c) (73.52)₁₀ = (?)₅.
   d) Multiply (1111)₂ by (1101)₂
   e) Subtract (10110)₂ from (11011)₂
   f) Define number system.
   g) Differentiate between structure and union.
   h) Write two advantages of pointers.
   i) Give two limitations of flowchart.
   j) Define an array and how can we access elements of array.

Q.2 a) Explain cache memory in detail.

Q.3 a) What is a programming language? Explain different types of programming languages.

Q.4 a) Write a program to multiply any two matrices.

Q.5 a) Write a program which reverses and sums the digit of a number.
PART-B

Q.5  a) Define enumerated data types. Write a program using enumerated data types that read the attendance of students for each day of week and print the weekly list of attendance.

10
b) Write a program to compute factorial of a number using recursion.

10

Q.6  a) Write a program that reads a string and check if the string is palindrome or not.

10
b) Differentiate between arrays and strings. Explain arrays of strings in detail.

10

Q.7  a) What are the different methods of opening a file? Explain in brief.

10
b) Write a program to copy the contents of one file to another.

10
End Semester Examination, Dec. 2014
B. Tech. – First Semester
INTRODUCTION TO COMPUTER SYSTEMS (CS-102A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a computer? What are the basic features of a computer system?
b) What are RAM and ROM?
c) What is the difference between a compiler and an interpreter?
d) Define an operating system.
e) What is the difference between LAN and WAN?
f) Why do we need a firewall?
g) What do you understand by bridge?
h) Write the names of system softwares.
i) What do you mean by input devices? Name few of them.
j) Differentiate between CD and DVD.

2x10

PART-A

Q.2 a) Explain the classification of following computers:
i) Minicomputer ii) Microcomputer
iii) Mainframe iv) Supercomputer

10

b) Convert:
i) Binary \((10111011)_2 = \text{Decimal } (?)_10\)
ii) \((11001)_2 = (?)_8\)
iii) \((87)_{10} = (?)_16\)
iv) \((A2D)_{16} = (?)_10\)
v) \((10111100001)_2 = (?)_16\)

10

Q.3 a) Distinguish between:
i) Input and output unit ii) Main and secondary memory iii) CU and ALU

6

b) What do you mean by storage devices? Explain them.

8
c) What is cache memory? How does it differ from primary memory?  
6

Q.4 a) What is an assembler? What are the advantages of assembly language over its machine language?  
8
   b) Write short notes on:  
      i) Application software  
      ii) System software  
6
   c) Explain the process of booting.  
6

PART-B

Q.5 a) What do you understand by an operating system? Explain the features of an operating system.  
10
   b) Explain the architecture of WINDOWS.  
10

Q.6 a) What is network topology? Explain advantages and disadvantages of each network topology.  
10
   b) Explain the differences between wired and wireless network.  
10

Q.7 Write short notes on:  
   a) Virus  
   b) Worms  
   c) Trojan Horse  
   d) Antivirus  
5x4
End Semester Examination, Dec. 2014  
B. Tech. – First / Second Semester  
PROGRAMMING IN ‘C’ (CS-103)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  

a) What is the importance of C?  
b) Explain the difference between while and do-while.  
c) What are logical operators?  
d) With the help of example explain the use of printf and scanf.  
e) Define dynamic array.  
f) Write a program to demonstrate if else statement.  
g) Explain with example strcat(), strcmp().  
h) Define user defined functions.  
i) Write the difference between structure and union.  
j) Explain actual barometers and formal parameters.  

2x10  

PART-A

Q.2  

a) Explain the basic structure of C program. What are basic data types in C?  

10  
b) Describe switch case statement. With the help of an example.  

10  

Q.3  

a) What are arrays? Explain two dimensional arrays with example.  

10  
b) S1, S2, S3 are three string variables. Write a program to copy the contents of S1 to the variable S3. At the end print the contents of all the three variables and their lengths.  

10  

Q.4  

a) Define a structure. Explain how structure variables are declared and how a structure is initialized?  

6  
b) Explain array of structure with example.  

6
c) Write a C program to show implementation of union.  
8

**PART-B**

Q.5  

a) What are pointers? Explain accessing the address of a variable and declaration of pointer variables.  
6
b) Explain array of pointers with example.  
8
c) With the help of an example demonstrate pointer to a pointer.  
6

Q.6  

a) What is recursion? Write a program to find factorial of a number.  
10
b) What is the difference between call by value and call by reference? Explain.  
10

Q.7  

a) Explain opening and closing of files. Describe how an end-of-file condition is detected.  
10
b) Explain error handling during file operation.  
10
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
PROGRAMMING IN ‘C’ (CS-103)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the purpose of printf() and scanf() functions?
b) What is an array? How array elements are stored in memory?
c) Enlist various operators in C language.
d) What is a structure? Explain.
e) What is file? Why do we need file in C language?
f) What does main() return?
g) Differentiate between while and do-while loop.
h) List five pre-defined functions.
i) What will be the output of following program?

```
main()
{
    int a=10, b=6;
    b=(a<15)? a:b;
    printf("b=%d", b);
}
```
j) What is function prototype? Give its syntax.

2x10

PART A

Q.2  a) Write a ‘C’ program to find the roots of a quadratic equation using if-else statement.

10

b) Explain the purpose of using default in switch case structure.

5

c) Describe any two different forms of if-else statement. How do they differ? Give an example.

5

Q.3  a) Write a ‘C’ program to search an element from a one-dimensional array.

8

b) Explain and write the syntax of following string handling functions:
   i) strcat( )   ii) strlen( )   iii) strcmp( )
Also write a program that uses all these functions.

Q.4
a) Explain array of structures with an example. 10
b) What is a union? Explain with an example. 6
c) How can the size of structure be determined? 4

PART-B
Q.5
a) What are pointers? Why are they needed? Explain with an example. 10
b) What is the difference between malloc( ) and calloc( ) functions? 5
c) What is pointer expression? Explain. 5

Q.6
a) Write a ‘C’ program to concatenate two text files. 10
b) Explain the following:
   i) fopen( )  ii) fclose( )  5
c) Explain different file opening modes in C. 5

Q.7
a) Write a program, using a function prime-check ( ), to check a number for prime. The function return 1 if number is prime and 0 otherwise. 12
b) How arguments are passed in function? Explain. 4
c) Differentiate local and global variable. 4
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
INTRODUCTION TO OPEN SOURCE SOFTWARE AND OPEN
STANDARDS (CS-104)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO
questions from Part A and TWO questions from Part B. Each question carries
equal marks.

Q.1  a) What do you understand by the term: standard?
b) What are National Standard Organizations?
c) Give at least four examples of open standards.
d) Write down benefits of open source projects.
e) Give at least two examples of products supported by open de facto
standards.
f) What is GPL? Explain in brief.
g) Differentiate between the terms: copyright and copy left.
h) What is free software foundation?
i) What is the drawback of vendor’s lock-in?
j) How do standards help industry?

2x10

PART-A

Q.2  a) Explain in detail life cycle of standards with the help of diagram and
examples. 15
b) What are pros and cons to use open source standards? 5

Q.3  Write a short notes on:
a) Global standard setting organizations. 10
b) Regional standard setting organizations. 10

Q.4  a) “Standards help innovation”. What do you think about this assertion? 5
b) Write down the types of standards alongwith their attributes and importance. 15

PART-B
Q.5  
   a) Explain how one can contribute to open source projects?  
       5
   b) Write short notes on open source:  
      i) Developer  ii) Builders  iii) Testers  
      iv) Release management  15

Q.6  
   Write in brief:
   a) UNIX  b) FSF  c) GNU  d) OSI  5x4

Q.7  
   a) How does IBM contribute in open source software?  
       10
   b) Explain what are the drivers of open source softwares.  
       10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
DISCRETE STRUCTURES (CS-301)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Write the dual of each of the following:
   i)  \( A \cup B (A \cup B) = A \)
   ii)  \( (A \cap B) \cup (A^c \cap B) \cup (A \cap B^c) \cup (A^c \cap B^c) = U \)

   b) What do you understand by a function? Give an example.

   c) Verify that the proposition \( p \lor \neg (p \land q) \) is a tautology.

   d) How many lines can be drawn through 10 points on a circle?

   e) Define Ring \( (R, +, \cdot) \)?

   f) Determine the cardinality of sets:
      i) \( p = \{ n^7 : n \text{ is a positive integer} \} \)
      ii) \( Q = \{ n^{109} : n \text{ is a positive integer} \} \)

   g) Define an Euler path in a graph.

   h) Explain A.P. series with an example. Also give the formula for sum of n terms.

   i) A bag contains 8 blue and 4 red balls. Two balls are drawn at random with replacement. Find the probability of getting one blue and one red ball.


2x10

PART-A

Q.2  a) Let \( A = \{ a, b, c, d, e \} \)
     \( B = \{ a, b, d, f, g \} \)
     \( C = \{ b, c, e, h \} \)
     \( D = \{ d, e, f, g, h \} \).

     Find:
     i)  \( B \setminus (C \cup D) \)
     ii)  \( (A \cap D) \cup B \)
     iii)  \( (C - A) - D \)
     iv)  \( (A \oplus D) - B \)
     v)  \( A \oplus C \)

1x5

b) Prove that \( A \times (B \cap C) = (A \times B) \cap (A \times C) \)

5

c) Determine whether the relation \( R = \{ (a, b) \in R, a + b \text{ is even} \} \), on the set \( I_+ \) (set of +ve integers) is an equivalence relation.

4

530/4
d) Consider the function \( f, g : \mathbb{R} \to \mathbb{R} \) defined by \( f(x) = x^2 + 3x + 1 \), \( g(x) = 2x - 3 \); find the composition functions:

i) \( f \circ f \)  
ii) \( f \circ g \)  
iii) \( g \circ f \)

Q.3  

a) Construct the truth table for the following statements:

i) \( (p \to (q \to r)) \to ((p \to q) \to (p \to r)) \)  
ii) \( p \leftrightarrow (\sim p \vee \sim q) \)

b) Determine whether the following are tautology, contradiction or contingency:

i) \( (p \leftrightarrow q) \leftrightarrow ((p \land q) \lor (\sim p \land \sim q)) \)  
ii) \( ((p \to q) \to t) \leftrightarrow ((p \land \sim q) \to t) \)

Q.4  

a) A bag contains 6 white, 8 black and 10 red balls. Two balls are taken out randomly. Find probability that both the balls are either white or red.

b) In a box, there are 8 balls of which 4 are blue, 3 are red and 2 are black. These are drawn one by one. Determine all the different permutations.

PART-B  

Q.5  

a) Solve the difference equation and derive the total solution:

\[ a_r + 6a_{r-1} + 9a_{r-2} = 3 \]  
with initial conditions \( a_0 = 0 \) and \( a_1 = 1 \).

b) Solve the recurrence relation \( a_{r+2} - 2a_{r+1} + a_r = 2 \) by the method of generating function with initial conditions \( a_0 = 2 \) and \( a_1 = 1 \).

Q.6  

a) Consider an algebraic system \((G, \ast)\) where \( G \) is the set of all non-zero real numbers and \( \ast \) is a binary operation defined by \( a \ast b = \frac{ab}{4} \). Show that \((G, \ast)\) is an abelian group.

b) Define the following terms:

i) Integral domain  
ii) Sub-group  
iii) Monoid  
iv) Homomorphism  
v) Isomorphism

Q.7  

a) Pre-order : \( G, B, Q, A, C, K, F, P, D, E, R, H \)  
In-order : \( Q, B, K, C, F, A, G, P, E, D, H, R \)

i) Draw the diagram of \( T \).
ii) Find:  a) Depth ‘d’ of T  
   b) Descendents of B.
   iii) List the terminal nodes of T.

b) Define the following terms:
   i) Sub-graphs
   ii) Directed graphs

c) Find out the shortest path from a to z in the given graph:
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
DISCRETE STRUCTURES (CS-301A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Consider the sets $X = \{k, l, m, n\}$ to $Y = \{7, 8, 9, 10\}$. Let 
$$\rho = \{(k, 10), (l, 7), (m, 8), (n, 9)\}.$$ Determine whether $\rho^{-1}$ is a function.

b) Define universal of existential quantifier with the help of an example.

c) Find the probability of getting a sum of 5 or 7 in a toss of two dice.

d) Find the particular solution of the difference equation: 
$$2a_{r+1} - a_r = 12.$$ 

e) Define integral domain with an example.

f) True or False: "The spanning tree of a graph is unique". Justify your answer.

g) Define Euler path in a graph with an example.

h) State Lagrange’s Theorem.

i) How many lines can be drawn through 10 points on a circle?

j) Construct converse and inverse of the direct statement: “if $4x - 2 = 10$ then $x = 3$”.

2x10

PART-A

Q.2  a) Among the first 1000 positive integers:

i) Determine the integers which are not divisible by 5, nor by 7, nor by 9.

ii) Determine the integers divisible by 5, but not by 7, not by 9.

6

b) Let $X = \{a, b, c\}$. Define $f : x \rightarrow x$ such that $f = \{(a, b), (b, a), (c, c)\}$. Find:

i) $f^{-1}$

ii) $f^2$

iii) $f^3$

iv) $f^4$

4

c) Determine whether the relation $R = \{(a, b) \in R : a + b \text{ is even}\}$ on the set of positive integers is:

i) An equivalent relation

ii) A partial order relation

iii) Reflexive relation

iv) Symmetric relation
v) Transitive relation
vi) Anti symmetric relation

Q.3 a) Using truth table, verify the proposition \((p \land q) \land \neg(p \lor q)\) is a contradiction.

b) Prove that \(x \oplus y \equiv (x \land \neg y) \lor (\neg x \land y)\).

c) Determine whether the following is a tautology, contradiction or contingency:
   \(av \sim (b \land c) \longleftrightarrow (av \sim b) \lor c\)

Q.4 a) Prove by mathematical induction:
   \[
   \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}
   \]

b) A box 'A' contains 2 white and 4 black balls. Another box 'B' contains 5 white and 7 black balls. A ball is transferred from 'A' to 'B'. Then, a ball is transferred from 'B' to 'A'. Find the probability that it will be a white ball.

PART-B

Q.5 a) Solve the recurrence relation:
   \[a_r + a_{r-1} + a_{r-2} = 0\]
   satisfying the initial conditions \(a_0 = 0\) and \(a_1 = 2\).

b) Solve the difference equation:
   \[y_k - y_{k-1} - 6y_{k-2} = -30\]

Q.6 a) Let \((I, +)\) be a group, where \(I\) is the set of all integers and \((+\) is an addition operation. Determine whether the following subsets of G are subgroups of G.
   i) The set \(G_1\) of all odd integers.
   ii) The set \(G_2\) of all even integers.

b) Define the following terms with examples:
   i) Normal subgroup
   ii) COSETs
   iii) Rings
   iv) Isomorphism
   v) Sub monoid
c) Consider the binary operation * and \( Q \), the set of rational numbers defined by 
\[ a * b = \frac{ab}{2} \forall a, b \in Q. \] Determine whether * is:
   i) Associative
   ii) Commutative

Q.7 a) Draw a unique binary tree when the in-order and preorder traversals are given as follows:

   In order:   H   D   I   B   E   A   J   F   K   C   G   L   M
   Pre order: A   B   D   H   I   E   C   F   J   K   G   L   M

b) Find the minimum spanning tree using Prim’s algorithm.

![Minimum Spanning Tree Diagram]

6

6

c) Discuss the following terms with examples:
   i) Euler graph
   ii) Chromatic number
   iii) Complementary graph
   iv) Cut set and cut point
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
DISCRETE STRUCTURES (CS-301A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Find the probability of getting a sum of 5 or 7 in a toss of two dice.
b) Define integral domain with an example.
c) Define Euler path in a graph with an example.
d) Let A and B be sets such that \((A \cap B) \subseteq B\) and \(B \not\subseteq A\). Draw corresponding Venn diagram.
e) How many people must you have to guarantee that at least 9 of them will have birthday in the same day of the week?
f) Solve the difference equation \(2a_r - 5a_{r-1} + 2a_{r-2} = 0\) and find particular solution such that \(a_0 = 0\) and \(a_1 = 1\).
g) Define AP and GP. Also write the formula for sum of n terms in AP and GP.
h) Define cartesian product of sets and equivalence relation.
i) Define multiset and power set.
j) Define inverse and equivalence relations.

2x10

PART-A

Q.2
a) Prove that for element of a lattice.
   i) \(a \land a = a\)
   ii) \(a \lor a = a\)

b) Verify that proposition \(P \lor (p \land q)\) is a tautology.

5

5

c) Consider the following propositions \(\sim P \lor \sim q\) and \(\sim (p \land q)\). Are they equivalent?

d) Let \(f(x) = x + 1\) and \(g(x) = 2x\); find: i) \(f \circ f\) ii) \(f \circ g\) iii) \(g \circ f\)

5

5

Q.3
Determine whether the following is a tautology contingency or a contradiction:
a) \((H \rightarrow (I \land J)) \rightarrow \sim (H \rightarrow I)\)

10
b) \((p \leftrightarrow q) \rightarrow (p \land q) \lor (\neg p \land q)\)

Q.4  a) Determine the:
   i) Number of triangles.
   ii) Lines that are formed by selecting points from a set of 15 points out of which 8 are collinear.

   6

b) Find the number of permutations that can be formed from the letters of the word ELEVEN.
   i) How many of them begin and end with E?
   ii) How many of them have three E together?
   iii) How many begin with E and end with N?

   8

c) A pair of fair dice is thrown. Find the probability that sum is 10 or greater.
   i) 5 appears on the first die.
   ii) 5 appears on at least one die.

   6

PART-B

Q.5  a) Solve the recurrence relation:

\[ a_r + a_{r-1} + a_{r-2} = 0 \]

satisfying the initial conditions \(a_0 = 0\) and \(a_1 = 2\).

  10

b) Solve the difference equation:

\[ y_k - y_{k-1} - 6y_{k-2} = -30 \]

  10

Q.6  a) Define the following terms with an example:
   i) Semi group.
   ii) Abelian group.
   iii) Ring.
   iv) Integral domain.
   v) Monoid.

  2x5

b) Consider an algebraic system \((G,*)\), where \(G\) is the set of all non-zero real numbers and \(*\) is a binary operation defined by \(a \ast b = \frac{ab}{4}\). Determine whether \((G,*)\) is an abelian group.
Q.7 Determine the shortest path between the vertices a to z as shown below.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
DATA STRUCTURES AND ALGORITHMS (CS-302)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Convert the following infix expression into prefix: \((A + B) \times (C + D) / E\).
b) What is the required condition for underflow and overflow in case of a linear queue?
c) What is a free storage list? How it is maintained by the operating system?
d) Define the following term:
   i) Height of a tree
   ii) Sibling
e) What is the need of one way threading?
f) Draw a heap tree from the following sequence 23, 66, 77, 88, 1, 2, 5, 90.
g) What is a strongly connected graph?
h) What is the complexity of bubble sort and insertion sort?
i) What is the disadvantage of binary search technique?
j) Construct the binary tree corresponding to given expression \((3x - y) \times (5a + b)\).

2 \times 10

PART-A

Q.2 a) Write an algorithm to evaluate the postfix expression. Consider the following postfix expression \(P:5, 16, 2, +, \times, 12, 4, 1, -\) for the evaluation.

10

b) What is a stack? Write an algorithm to implement the operations of a stack.

6

c) Write a program to generate Fibonacci series upto \(n\) terms using recursion.

4

Q.3 a) Write an algorithm to insert and delete elements from a circular queue.

10

b) Write an algorithm to insert an element at the end of the doubly linked list. Also show it pictorially.

10
Q.4  a) What is binary search tree? Write an algorithm to delete the node from the binary search tree if the node is having one child.  

b) Write an algorithm for postorder traversal of binary tree. Construct a binary tree if the inorder traversal: 4, 10, 3, 1, 7, 11, 8, 2 
and postorder traversal: 4, 1, 3, 10, 11, 8, 2, 7 is given

PART-B

Q.5  a) Write a Warshall algorithm to find the shortest path. Consider the following graph to find shortest path using Warshall algorithm.

![Graph](image)

b) Write an algorithm for breadth first search traversal.

c) Define the following terms:
   i) Multigraph
   ii) Weighted graph
   iii) Directed graph
   iv) Self loop

Q.6  a) Write an algorithm to sort the list using bubble sort. Calculate the time complexity of bubble sort.

b) Write an algorithm for quick sort. Consider the following list to sort the elements using quick sort

32, 66, 40, 12, 18, 26, 44

Q.7  a) State and explain the advantage of Hash function. Explain the various collision resolution techniques in hashing.
b) Write a program for binary search using recursion. Consider the following list to find 57 in the list using binary search:

10, 23, 44, 50, 57, 66, 70, 80, 90, 100
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
COMPUTER ARCHITECTURE AND ORGANISATION (CS-303)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain indirect addressing mode.
b) What is micro-operation?
c) Why do we need parallelism?
d) Differentiate between sequential and combinational circuits.
e) What is an interrupt?
f) What does the following statements represent?
   i) M [AR] → R1
   ii) R2 ← M [AR]
g) Define cache hit and miss.
h) Differentiate between latch and flip-flop.
i) What do you mean by an instruction format?
j) What is pipe lining?

2x10

PART-A

Q.2
a) Draw the 3:8 line decoder with its truth table.
10
b) Explain how computer is organized structurally.
10

Q.3
a) Explain the important features of RISC based system architecture.
10
b) What are addressing modes? Clearly state how effective address is calculated in the following modes: relative, index, direct, indirect.
10

Q.4
a) Draw and explain the flow chart of an instruction cycle.
10
b) How control unit plays an important role in CPU architecture?
5
c) Explain micro instruction sequencing.
5
PART-B

Q.5  a) State and explain locality of reference principle.  
     b) Write a short note on memory expansion.  
     c) Explain direct mapped cache organization with a suitable example.

Q.6  a) Explain Flynn’s classification of computers.  
     b) What are the goals of parallelism?  
     c) How throughput can be enhanced in computer architecture?

Q.7  a) Write any five input/output instructions.  
     b) What is a micro instruction format? Explain in detail.  
     c) Explain address sequencing in control unit.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-304)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by dynamic binding? How is it useful in OOPs?
b) Define Friend function. When is a Friend function compulsory?
c) What do you mean by dynamic initialization of objects? Why do we need to do this?
d) Differentiate between overloading and overriding.
e) Explain the role of seekg(), seekp(), tellgc() and tellp() functions in the process of random access in a binary file.

4x5

PART-A

Q.2
a) What is procedure oriented programming? Differentiate between procedure oriented programming and object oriented programming.
10
b) What are access modifiers? Explain them with an example.
10

Q.3
a) Define a constructor. Explain its special characteristics. Write a program to explain the concept of copy constructor.
10
b) Explain: i) Constant member functions.
ii) Dynamic memory allocation.
10

Q.4
a) How can we overload Binary operators using Friend function?
10
b) What is a polymorphism? Explain types of polymorphism in detail. How can a function be overloaded?
10

PART-B

544/4
Q.5  a) How can we avoid duplication of inherited members that come multiple paths? Explain the concept of virtual base class with help of a program.  
    10  
    b) Explain the concept of pointer to derived class with the help of a program.  
    10  

Q.6  a) Define a file. What are the steps involved in using a file in a C++ program? Write a program to copy the contents of one file to another file.  
    14  
    b) Describe the various approaches by which we can detect the end of file condition successfully.  
    6  

Q.7  a) What is generic programming? How it is implemented in C++?  
    10  
    b) What is user defined exception? Write a program to Rethrow an exception.  
    10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-304A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) State difference between object-oriented and object-based system.
     b) How polymorphism is achieved at (a) Compile time and, (b) Run time?
     c) What is an abstract class?
     d) What are the two methods of opening a file?
     e) How dynamic memory is allocated?
     f) When is a Friend function compulsory? Give an example.
     g) What is a parameterized constructor?
     h) What are the advantages of using exception handling mechanism in a program?
     i) What is generic programming? How is it implemented in C++?
     j) When do we make a function inline? Why?

2x10

PART-A

Q.2  a) What is object-oriented programming? What are its advantages? Discuss its applications.
     8
     10
     b) What is a class? Design a class ‘Reverse string’ with a member function display() that will print the reverse of the string entered by user in another member function putstring(). Also make another member function in same class with name palindrome() which will check and prompt if the entered string is palindrome or not.
     c) What do you mean by encapsulation?

2

Q.3  a) What are static data members? State properties of a static member variable with the help of a suitable example.
     7
     b) Can a Friend function access private member of a class? Justify your answer.
     5

546/4
c) How is dynamic initialization of objects achieved? Explain with help of an example.

8

Q.4 a) What is function overloading? Explain with the help of an example.
8
b) How can we overload a unary (-) minus operator using Friend function?
8
c) State the rules for overloading operators.
4

PART-B

Q.5 a) How multiple inheritance is implemented? Explain with example.
10
b) What is a virtual base class? Explain with an example.
10

Q.6 a) What are files? How can we access a sequential file (write the program)?
8
b) What is a file mode? Describe various file mode options available.
7
c) How error is handled during file operations?
5

Q.7 Write short notes on:

a) Friend templates.
7
b) Exception handling using Try-Catch block.
8
c) Class template with multiple parameters.
5

End Semester Examination, Dec. 2014
B. Tech. – Third Semester (CSE) / Fourth Semester (IT)
DATABASE MANAGEMENT SYSTEMS (CS-305)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.
Q.1  
  a) Differentiate between object-oriented model and object-relational model. 
  b) Define external view with an example. 
  c) Differentiate between partial and total participation constraints. 
  d) Explain domain relational calculus with an example. 
  e) Define entity and referential integrity constraints. 
  f) Write advantages of index sequential file organisation. 
  g) Define distributed DBMS (DDBMS). 
  h) Discuss the two operations required in log-based recovery. 
  i) Discuss the COUNT and AVG aggregate functions of SQL. 
  j) Differentiate between 3NF and BCNF. 

2x10

PART-A

Q.2  
  a) Describe the structure of DBMS. 
  
  b) List four differences between a file processing system and a DBMS. 
  
  c) What is object oriented databases (OODB)? What are the advantages of OODBMS over RDBMS? 

6

  d) Explain hierarchical model in detail with its advantages and disadvantages. 

6

Q.3  
  a) Draw an ER diagram for hospital management. State the rules to reduce an ER diagram to database tables. Reduce the ER diagram for the hospital management into database tables. 

12

  b) Describe three level architecture of DBMS. 

8

Q.4  
  a) Consider the following relations: 
     PROJECT (Project No, Project_Name, Chief) 
     EMPLOYEE (EmpNo, EmpName) 
     ASSIGNED (Project No, EmpNo) 
  i) Get EmpNo of employees working on project Proj302. 
      2 
  ii) Get details of employees working on project Proj302. 
      4 
  iii) Obtain details of employees working on the DBMS project. 
      6 

  b) Write a short note on ‘Tuple Calculus’ 

8

PART-B
Q.5  a) Consider the following schema:
Suppliers (Sid: integer, sname: string, address: string)
Parts (Pid: integer, pname: string, color: string)
Catalog (Sid: integer, pid: integer, cost: real)
Sid is the key for suppliers, pid is key for parts; and sid and pid together form
the key of catalog.
Write an expression in SQL for each of the following queries.
i) Find the sid’s of suppliers who supply some red or green part.
ii) Find the sid’s of suppliers who supply every red part.
iii) Find the sid’s of suppliers who supply only red part.
iv) Find the sid’s of suppliers who supply some red part and some green part.

2x4

b) Consider the relation for published books:
   Book (Book_title, authorname, book_type, list price, author_office, Publisher)
   Book_title → Publisher, Book_type
   Book_type → listprice
   Authorname → author_office
i) What normal form is the relation in? Explain
ii) Apply normalization until you can’t decompose the relations further. State
    the reason behind each decomposition.
12

Q.6  Write short notes on:
a) Sequential files
   b) Hashing
   c) Multilevel indexing

Q.7  a) Explain shadow paging.
   b) Explain incorrect summary problem with an example.
   c) Explain 2-phase locking protocol in detail.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
DATABASE MANAGEMENT SYSTEM (CS-305A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is database management system? List any two applications of a DBMS.
b) Discuss any two limitation of the file-based system.
c) Explain primary key and foreign key with example.
d) What is a B+ tree index?
e) What is a data model? List the types of data model used.
f) What do you understand by a deadlock?
g) Explain the projection and selection operations in relational algebra.
h) Define instance and schema.
i) State the integrity constraints, namely entity integrity and referential integrity.
j) What is meant by functional dependency? Give example.

2x10

PART-A

Q.2 a) Discuss the functions of a DBMS in detail. Also list any two disadvantages of a DBMS.

10

b) With the help of a diagram, explain the DBMS architecture in detail.

10

Q.3 a) Draw an E-R diagram for a university database. Also explain all symbols used in an E-R diagram.

10

b) List and explain the mapping cardinalities.

4

c) What is data independence? Discuss and define its types.

6

Q.4 a) Explain the anomalies in a relational database with the help of an example. What do you understand by lossless join decomposition?
b) What is meant by normalization of data? Explain 1NF, 2NF and 3NF with an example.

**PART-B**

Q.5 Consider the following relational database. Give an expression in relational algebra to express each of the following queries:
- Employee(ename, street, city)
- Works(ename, company_name, salary)
- Company(Company_name, city)
- Manager(ename, manager_name)

a) Find the names of all employees who work for company 'ABC'.
b) Find the names of companies in the city 'Pune'.

c) Find the names, street of all employees who live in city 'Pune'.
d) Find the name, city and street of employees with salary>20,000.
e) Find the names of employees who do not work for company 'XYZ'.

Q.6 a) Compare and contrast the file organization techniques in sequential and index sequential files.

b) What is hashing? When does a collision occur? Explain collision resolving techniques in detail.

Q.7 a) What do you understand by the ACID properties of a transaction? Describe the states of a transaction, with the help of a diagram.

b) What is serializability? Explain conflict serializability and view serializability in detail.
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
DATABASE MANAGEMENT SYSTEMS (CS-305A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Differentiate between DDL and DML with an example.  
   b) Explain the basic functions of DBMS.  
   c) Differentiate between physical and logical data independence.  
   d) Explain field, record and file.  
   e) Define entity and attributes.  
   f) Differentiate between generalization and specialization.  
   g) Define composite and derived attributes.  
   h) Define deadlocks.  
   i) What is direct access file?  
   j) Define data dictionary.

   2x10

PART-A

Q.2  
   a) What are the responsibilities of a database administrator?
   7
   b) Explain 3-schema architecture of DBMS.
   8
   c) Differentiate between file processing system and database system.
   5

Q.3  
   a) Define the following terms:
      i) Superkey  
      ii) Candidate key  
      iii) Foreign key  
      iv) Primary key
      2x4
   b) Draw an ER diagram for a company database. State the rules to reduce an ER diagram to database tables. Reduce the ER diagram for the company database into database tables.
   12

Q.4  
   a) Taking an example relation, carry out the complete process of normalization on it. Hence, define various normal forms upto BCNF.
   10
   b) Write short notes on:
i) Full functional and transitive dependency
ii) Entity and referential integrity constraints

**PART-B**

Q.5  a) If \( X \) and \( Y \) are two relations as shown below:

\[
\begin{array}{c|c|c|}
| a & b & c \\
| c & a & d \\
| b & f & e \\
\end{array}
\quad
\begin{array}{c|c|c|}
| b & c & a \\
| c & d & f \\
| b & f & e \\
\end{array}
\]

\( X \)
\( Y \)

Find:

i) \( X \cup Y \)  

ii) \( X - Y \)  

iii) \( X \cap Y \)  

iv) \( X \times Y \)

b) Consider the following relations:

- S_PERSON (S_No, S_Name, COMMISSION)
- PRODUCT (P_ID, DESCRIPTION)
- SALE (DATE, CUSTOMER_NO, S_NO, P_ID, QTY)
- CUSTOMER (CUSTOMER_NO, C_NAME, C_ADDRESS)

Based on these tables, write the queries in relational algebra:

i) Get the names of the salesman who sold product 48.

ii) Get the names of those customers who bought table lamps.

Q.6  a) What is direct access file? What are its advantages and disadvantages?

b) Differentiate between sequential files and index sequential files.

Q.7  a) Explain the concept of two-phase locking.

b) Explain incorrect summary problem with an example.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
DATA STRUCTURES USING JAVA (CS-306)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define data structures.
b) Give difference between a structure and an array.
c) Write overflow and underflow conditions of a queue.
d) What is recursion?
e) What are the two steps of mathematical induction for solving a problem?
f) What is max heap?
g) What is array out of bound exception?
h) What do understand by binary tree?
i) Give the inorder traversal of given binary tree.
j) How we pass an input on command line interpreter?

2x10

PART-A

Q.2
a) Define strings. Explain with example any four operators on strings.

10

b) What is object oriented program and distinguish between the following terms:
   i) Objects and classes.
   ii) Data abstraction and data encapsulation.
   iii) Inheritance and polymorphism.
   iv) Dynamic binding and message passing.

10
Q.3 a) Define a class to represent a bank account, include the following members:

Data members:
i) Name of depositor. ii) Account number. iii) Type of account. iv) Balance in account.

Member function:
i) To deposit an amount. ii) To withdraw an amount. iii) To display the name and balance.
Write a main program to implement it.

b) Explain the various types of constructors with a programming example.

Q.4 a) Write an algorithm to delete a node in a singly linked list, if the node is present at last.

b) Write a program in Java to demonstrate:
i) Push. ii) Pop. iii) Traverse operations on stack.

Q.5 a) What are the various hash functions used to calculate the address? Explain each one with the help of a suitable example.

b) What is inheritance? Explain its various types with an example.


b) What is binary search? Explain its algorithm with a proper example. What conditions are required to apply binary search?

Q.7 a) Explain binary tree in detail. Write an algorithm for a binary tree traversal.

b) Construct a max heap for the given list of numbers: 44, 30, 50, 22, 60, 55, 77, 55. Heapify the tree also after insertion of a number, if required.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth / Seventh / Eighth Semester  
COMPUTER NETWORKS (CS-401)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) CSMA/CD  
   b) SSL  
   c) IMAP  
   d) MIME  
   e) X.25  
   f) RARP  
   g) OSPF  
   h) TROJAN  
   i) Gigabit Ethernet  
   j) ISDN

   2x10

PART-A

Q.2 a) Differentiate the following:
   i) Baseband and broadband.  
      4
   ii) Synchronous and asynchronous transmission.  
      4
   b) Explain with a neat diagram various topologies used in computer networking. Which one is the best and why?  
      6
   c) Differentiate between Bridges, Gateways and Routers.  
      6

Q.3 a) Compare and contrast the twisted pair, coaxial cable and optical fibre transmission medium.  
      10
   b) Differentiate between connectionless and connection oriented services. What are the conditions in which these types of connections are used?  
      10
Q.4  a) What are the roles played by the IGMP protocol and a wide area multicast routing protocol?  

b) Consider streaming stored video. Does it make sense to run the application over UDP or TCP? Which transport protocol does real networks use and why?  

10

PART-B

Q.5  a) Can a computer have two DNS names that fall in different top-level domains? If so, give examples. If not, explain why not?  

b) What are the types of addressing techniques used in computer networking? Explain the role of each addressing technique used in network.  

10

Q.6  a) Why is it said that FTP send control information “out of bound”? Explain the working of an FTP server.  

b) What is meant by a handshaking protocol? What is the role of socket and port in this protocol?  

10

Q.7  a) What do you understand by SNNP?  

b) What is the man-in-the-middle attack? Can this attack occur when symmetric keys are used?  

6

c) Summarize the key differences in the service provided by the authentication header (AH) protocol and the encapsulation security payload (ESP) protocol in IPsec.  

8
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
COMPUTER NETWORKS (CS-401A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) User datagram protocol
   b) Virtual circuit
   c) Token Ring
   d) B-ISDN
   e) OSPF
   f) BGP
   g) IMAP
   h) VOIP
   i) TFTP
   j) SMTP

2x10

PART-A

Q.2 a) What do you understand by a TCP/IP model? Explain the function of each layer.

10

b) Distinguish between Hubs, Switches, Bridges, Routers and Gateways.

10

Q.3 a) What do you understand by data transmission media? Compare LAN, MAN and WAN.

10

b) What is the difference between CSMA and CSMA / CD.? Explain the bluetooth layered protocol architecture.

10

Q.4 a) What do you understand by ATM cell? Compare SONET/ SDH, ATM and ISDN.

10
b) Describe the importance of frame relay in the wide area network. Compare fast ethernet and gigabit ethernet.

PART-B

Q.5 a) Explain the mobile internet protocol in details.

b) What do you understand by an IP datagram? Compare IPV4 and IPV6 in detail.

Q.6 a) What do you understand by MIME? Explain the inefficiency of TFTP in details.

b) Describe the role of HTTP. Compare IMAP and SNMP in details.

Q.7 a) What do you understand by V-LAN? Explain any three data encryption techniques with examples.

b) Explain the role of firewalls in network and firewall architecture in details.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
ANALYSIS AND DESIGN OF ALGORITHMS (CS-402)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are the properties of "Q" notation?  
b) What is a recurrence relation? Solve the following relation:  
\[ T(n) = 2T(n-1) + 1, T(1) = 1, T(2) = 3 \]
c) Show that the computing time for optimal binary search tree is \( O(n^2) \).  
d) What are the elements of dynamic programming technique?  
e) State the 0/1 knapsack problem.  
f) Create a string matching automata for the pattern \( abaab \).  
g) Define space complexity of an algorithm.  
h) State insertion sort algorithm. Give its best case and worst case time complexity.  
i) What is the relationship between P and NP classes of problems?  
j) Differentiate between linear search and binary search.

2x10

PART-A

Q.2  
a) State Master theorem. Find the time complexity for the following recurrence relation:  
\[ T(n) = 3T\left(\frac{n}{4}\right) + n^2 \]  

5

b) Write an iterative algorithm to find the factorial of a number. Also calculate its time and space complexity.  

5

c) Write the algorithm for merge sort. Discuss best-case and worst case running time. Arrange the following numbers in increasing order using merge sort:  
\( 18, 29, 68, 32, 43, 37, 87, 24, 47, 50 \)  

10

Q.3  
a) What is Rabin-Karp string matching algorithm? Discuss the time complexity of Rabin-Karp matcher. Show the comparisons the Rabin-Karp matcher makes
for pattern $P = 31415$ in the text string \( T = 2359023141526739921 \). Take \( q = 13 \).

\[ \text{10} \]
\b) Construct the string matching automation for the pattern \( P = aabab \) and illustrate its operation on the text string:
\( T = a \ aa \ baba \ aba \ aba \ baab \)

\[ \text{10} \]
\Q.4 \a) Explain Strassen’s matrix multiplication algorithm. Discuss its complexity. Can you change the same technique to get lower time complexity algorithm?
\b) What is divide and conquer strategy? Design recursive algorithm for selection sort. Explain with an example.

\[ \text{10} \]
\PART-B
\Q.5 \a) Consider five items along with their respective weights and profits:
\( W_i = (5, 10, 20, 30, 40) \)
\( P_i = (30, 20, 100, 90, 160) \)

The Knapsack has capacity \( m = 60 \). Find out the solution to fractional Knapsack problem using Greedy method.

\b) Compute minimum cost spanning tree for the graph using Prim’s algorithm.

\[ \text{10} \]
\Q.6 \a) Write and explain the algorithm to compute single source shortest paths using dynamic programming and prove that it is optimal.
\b) Determine cost of an optimal binary search tree for a set of \( n = 5 \) keys with the following probabilities:

<table>
<thead>
<tr>
<th>( i )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

562/4
Q.7  
a) Write an algorithm to determine the sum of subsets for a given sum and set of numbers. Draw the tree representation to solve the given numbers set as \( \{3,5,6,7,2\} \) with sum = 15. Derive all the subsets.

b) Write short notes on:
   i) P-problem.
   ii) NP-problem.
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
PRINCIPLES OF OPERATING SYSTEMS (CS-403)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Describe the actions taken by the operating system when a page fault occurs.
b) What is the cause of thrashing?
c) Differentiate between real time and time sharing operating systems.
d) Why are page sizes powers of two? Why is this necessary?
e) What are the differences between short-term and long-term scheduling algorithms?
f) What is Convey effect?
g) Explain indexed file allocation.
h) Explain four necessary conditions of deadlock.
i) Explain all the attributes of a file.
j) Explain critical section.

2x10

Q.2
a) Determine the number of page faults when references to pages occur in the following order: 1, 2, 4, 5, 2, 1, 2, 4. Assume that the main memory can accommodate 3 pages and the main memory already has the pages 1 and 2 with page 1 having been brought earlier than page 2. (LRU algorithm is used)

10

b) Consider a system with 80 % hit ratio, 50 nano second time to search the associative registers 750 nano second time to access memory. Find the effective access time.

5

c) Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
i) How many bits are there in the logical address?
ii) How many bits are there in the physical address?

5

Q.3
a) Which of the following instructions should be privileged (i.e. which will be executed in kernel mode) and why?
i) Set value of timer.
ii) Read the clock.
iii) Clear memory.
iv) Issue a trap instruction.
v) Turn off interrupts.
vi) Modify entries in device status table.
vii) Switch from user to kernel mode.

b) Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2, and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end?

5

c) A Shortest Job First algorithm may lead to starvation where a process with large execution time is made to wait for indefinitely long times. Suggest a modification to the SJF that overcomes this problem.

5

Q.4

a) What is the optimistic assumption made in the deadlock-detection algorithm? How could this assumption be violated?

5

b) There are four processes which are going to share nine tape drives. Their current and maximum number of allocation numbers are as follows:

<table>
<thead>
<tr>
<th>Process</th>
<th>Allocation</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>P2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>P4</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Is the system in a safe state? Why or why not?

10

c) Explain wait() and signal() operations in a semaphore?

5

PART-B

Q.5

a) What are the different types of files and explain any one the file?

10
b) Compare and contrast cyclic and acyclic graph directory structure in detail.  

10

Q.6 a) Compare LOOK and SCAN scheduling algorithm with examples.  

10

b) Explain seek time and latency time and disk bandwidth.  

5

c) Explain the Kernel I/O structure.  

5

Q.7 a) How physical and virtual memory are managed in a Linux operating system?  

10

b) Explain the architecture of windows-XP operating system.  

10
Q.1  a) Differentiate between logical and physical address spaces.
b) Differentiate between internal and external fragmentations.
c) What is Belady’s anomaly?
d) Explain process control block.
e) Explain kernel and shell.
f) What are semaphores?
g) Differentiate between multitasking and multiprogramming.
h) Explain linked file allocation method.
i) Differentiate between deadlock avoidance and deadlock prevention.
j) Define system calls.

PART-A

Q.2  a) Consider a system consisting of four resources of same type that are shared by three processes each of which needs at most two resources. Show that the system is deadlock free.

Q.3  a) What are the common functions of interrupts?
b) Consider the following set of processes, with the arrival times and the CPU burst times given in milliseconds.

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival-time</th>
<th>Burst-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>P₂</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Q.3
p_3
3
p_4
1

What is the average turnaround time and average waiting time for these processes with the preemptive shortest remaining processing time first (SRTF) algorithm? **10**

c) Explain Convey effect. **5**

Q.4
a) What are the different dynamic partitioning methods? Give examples. **10**

b) Consider a system with 75% hit ratio, 20 nano second time to search the associative registers, 800 nano second time to access memory. Find the effective access time. **5**

c) Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs. **5**

**PART-B**

Q.5
a) Explain partitioning and mounting in file management in detail. **10**

b) Compare and contrast linked file allocation with indexed file allocation in detail. **10**

Q.6
a) Explain the life cycle of an I/O request. **10**

b) Explain caching and spooling. **5**

c) Explain SSTF disk scheduling algorithm. **5**

Q.7
a) Explain the file system of a Linux operating system. **10**

b) Explain the memory management of Windows-XP operating system. **10**
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
PRINCIPLES OF OPERATING SYSTEMS (CS-403)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are systems cells and system programs?
b) Differentiate between real-time and time-sharing operating system.
c) How we can use logical and physical address in memory management?
d) Explain two-level directory in file management.
e) What is the meaning of busy-waiting in process synchronization?

4x5

PART-A

Q.2  a) What is an operating system? Describe the architecture of an operating system.10
b) What are the services provided by an operating system? 10

Q.3  a) What is PCB? Explain the queuing diagram representation of process scheduling. 10
b) What are the requirements for the solution of critical section problem? 10

Q.4  a) What is page replacement algorithm, how many page fault occurs in optional page replacement algorithm using the following reference string? (If page size is three.)
    70120304230321201701
    20

PART-B

Q.5  What are different allocation methods in files management? Explain advantages and disadvantages of each. 20
Q.6  a) What is disk scheduling? How much total head cylinders move in FCFC algorithm using the given reference. (If the clink head is initially at cylinder 65)
    98, 183, 37, 122, 14, 124, 68, 69
    b) What is distributed file systems?

Q.7  Short notes on:
    a) DMA.
    b) Kernel.
    c) Spooling system.
    d) Compound of Linux system.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
THEORY OF AUTOMATA AND COMPUTATION (CS-404)

Time: 3 hrs      
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) A DFA accepts a string w of length n, then how many minimum number of states are required to design DFA?  
b) Explain Turing machine as acceptor with examples.  
c) Explain context free grammar defects.  
d) What is the need the conversion of grammar into GNF or CNF forms.  
e) Explain recursive and recursively enumerable languages.

4x5

PART-A

Q.2  
a) Write the regular expression for the language L= \{a^n | n is divisible by 2 or 3 or n=5\}.

6  
b) Find the regular expression for the following transition diagram:

![Transition Diagram](image)

7  
c) Construct the Moore machine equivalent to the Mealy machine M defined by table:

<table>
<thead>
<tr>
<th>Present state</th>
<th>Next state</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a=0</td>
</tr>
<tr>
<td></td>
<td>State</td>
</tr>
<tr>
<td>q₁</td>
<td>q₃</td>
</tr>
<tr>
<td>q₂</td>
<td>q₁</td>
</tr>
</tbody>
</table>
Q.3  
 a) Design a DFA that accepts all strings of language \( L = \{ a^n b^m | n \text{ is divisible by 3 and } m \text{ is divisible by 5} \} \).

 b) Construct the DFA from the regular expression \( R = (ba+a)(b+a)^* \ab^* \).

 c) Construct the deterministic finite automata equivalent to \( M = (\{ q_0, q_1, q_2, q_3 \}, \{ 0, 1 \}, \delta, \{ q_3 \}) \), \( \delta \) is given in table:

<table>
<thead>
<tr>
<th>States/( \Sigma )</th>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>( q_0 )</td>
<td>( q_0, q_1 )</td>
<td>( q_0 )</td>
</tr>
<tr>
<td>( q_1 )</td>
<td>( q_2 )</td>
<td>( q_1 )</td>
</tr>
<tr>
<td>( q_2 )</td>
<td>( q_3 )</td>
<td>( q_3 )</td>
</tr>
<tr>
<td>( { q_3 } )</td>
<td>-</td>
<td>( q_2 )</td>
</tr>
</tbody>
</table>

Q.4  
 a) Show that the language \( L = \{ a^p | p \text{ is a prime number} \} \) is not regular by Pumping lemma.

 b) Prove that intersection of two regular set is regular set.

 c) Construct the minimum state automaton equivalent to the transition diagram given below:

\[ PART-B \]

Q.5  
 a) Write a grammar for the language \( L = \{ \omega \omega | \omega \in \{ a, b \} \} \).
b) Construct a grammar in GNF equivalent to the grammar $S \rightarrow AA|a,$ $A \rightarrow SS|b.$

c) Consider the grammar production rule:
$\text{stmt} \rightarrow \text{if condition then stmt else stmt;}$
$\quad \text{if condition then stmt else stmt;}$
$\quad \text{Show that grammar is ambiguous.}$

Q.6
a) Design a PDA for language $L = a^n b^m c^m d^n | m, n \geq 1.$

b) Construct the PDA from the grammar.
$S \rightarrow OS1|A, A \rightarrow 1AO|S | \epsilon.$

c) Show that intersection of two context free language may or may not be CFL.

Q.7
a) Design $TM \ M = (Q, \{0,\#,1\}, \delta, \{L, R\}, \ q_0)$ Which compute the following:

\[ (Q, \#n\#) \] \[
\overset{*}{\longrightarrow}_M \]
\[ (h, \#n\#n\#) \text{ where } h \text{ is final halting state and } n \text{ is input string.} \]

b) Prove that union of two recursive language is recursive language.

c) Explain the Turing machine as a transducer.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
THEORY OF AUTOMATA AND COMPUTATION (CS-404A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO
questions from Part A and TWO questions from Part B. Each question carries
equal marks.

Q.1 a) Suppose NFA has n number of states. Then how many equivalents DFA may
have states?
b) Explain with an example post correspondent problem.
c) What is recursive language?
d) Differentiate between a digital computer and a turing machine.
e) Explain Chomsky classification of grammar.

4x5

PART-A

Q.2 a) Design a DFA that accepts all strings over input alphabet \{a, b\} which have
number of a’s divisible by 3 and number of b’s divisible by 4.

10

b) Write a regular expression for the language \(L = \{a^n b^m | \text{where } (n+m) \text{ is odd}\}.

3

c) Construct a regular expression corresponding to state diagram given in the
figure:

![State Diagram](image)

7

Q.3 a) Construct the Moore machine equivalent to the Mealy machine M defined by
table1:

<table>
<thead>
<tr>
<th>Present state</th>
<th>Next state</th>
</tr>
</thead>
</table>

574/4
b) Find a DFA equivalent to $M = \{q_0, q_1, q_2, \delta, a, b, \epsilon, \{q_2\}\}$; $\delta$ is given in table 2:

<table>
<thead>
<tr>
<th>State</th>
<th>Input a</th>
<th>Input b</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rightarrow q_0$</td>
<td>$q_0$, $q_1$</td>
<td>$q_2$</td>
</tr>
<tr>
<td>$q_1$</td>
<td>$q_0$</td>
<td>$q_1$</td>
</tr>
<tr>
<td>$q_2$</td>
<td>-</td>
<td>$q_0$, $q_1$</td>
</tr>
</tbody>
</table>

7

c) Show that if $M_e$ be a Mealy machine, then there is a Moore machine $M_o$ equivalent to $M_e$. 

5

Q.4
a) Prove that union and complement of two regular sets are regular sets.

b) Clarify the statement. “Pumping lemma is used to show that a language is a regular language”. And show that the language $L=\{a^n b^n | n \geq 1\}$ is not regular language.

PART-B

Q.5
a) Write a grammar for the language $L=\{a^n b^n c^n | n \geq 1\}$.

b) Construct a grammar in GNF equivalent to the grammar:

$E \rightarrow E + T | T ; \ T \rightarrow T * F | F ; \ F \rightarrow (E) | id$, where starting symbol is $E$, terminals $\{+, *, (,), id\}$ and $V_N = \{E, T, F\}$.

7

Check that the grammar for the string $id + id * id$ is ambiguous or not.

Q.6
a) Design a PDA for the language $L=\{a^m b^n c^{m+n} | \text{ where } m, n \geq 1\}$.

b) Construct the PDA from the grammar:
S → aSc | aAc; A → bA | b.

c) Show that union of two CFL is a closed CFL.

Q.7  
a) Design a Turing machine that accepts all even number of either a’s or b’s and both a’s and b’s.

b) What will happen when excluding blanks from input tape of TM?

c) If a language $L$ and its complement $\overline{L}$ are both RE, then $L$ is recursive. Explain with an example.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth / Fifth Semester  
CYBER SECURITY (CS-405)  

Time: 3 hrs  
Max Marks: 50  

No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain briefly each of the following basic network utilities.  
IP config, Ping, Tracert.  
b) How can you determine the class of an IP address?  
Change the following addresses from dotted decimal notation to binary notation.  
122.60.255.0  
10.20.66.4

PART-A  
Q.2 a) What is the need of information security?  
2  
b) Explain session Hijacking and DNS poisoning.  
8

Q.3 a) List down the various types of internet frauds.  
3  
b) Explain the auction fraud attacks. How can you protect against these attacks?  
7

Q.4 a) Explain the active Scanning’s techniques.  
5  
b) What do you mean by cross site scripting? Explain.  
5

PART-B  
Q.5 Explain the following terms:  
a) Document trail  
b) Secure the evidence  
c) FBI forensics guidelines

10
Q.6 Give a description of the advantages of cyber laws. 

10

Q.7 Explain the following terms briefly:
   a) Hackers
   b) Script kiddies
   c) Sneakers
   d) Phreakers
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
INFORMATION STORAGE AND MANAGEMENT (CS-501)  

Time: 3 hrs  
Max Marks: 100  

No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Describe in brief the following:
   a) What are the key elements in managing a data centre?
   b) What does PCI stand for? Explain its functionality.
   c) Differentiate between software RAID and hardware RAID.
   d) Explain the different types of archive solutions available.
   e) What is network virtualization? State its advantages.
   f) Differentiate between NFS and CIFS in network attached storage (NAS).
   g) Define replication. What is synchronous replication?
   h) Explain in brief the key components of information security framework.
   i) Differentiate between RPO and RTO?
   j) How availability management is done in storage infrastructure?

2x10

PART A

Q.2 a) What is a data centre? Explain the core elements of a data centre. 
   10  
   b) What are the key challenges in managing information? Explain the characteristics of information lifecycle management (ILM). 
   10

Q.3 a) Explain the disk drive components in detail. 
   10  
   b) What are the components of RAID array? Describe the following RAID levels:
      i) RAID-1 
      ii) RAID-1+0 
      iii) RAID-6 
   10

Q.4 a) What is SAN? Explain the components of SAN in detail. 
   10  
   b) Write short notes on:
      i) SCSI architecture
ii) NAS I/O operations

**PART-B**

Q.5  
   a) Describe backup operation. Explain different types of backups.  
      **10**
   b) Discuss host-based local replication techniques.  
      **10**

Q.6  
   a) What are the key storage management activities?  
      **10**
   b) Write short notes on:
      i) SMI and CIM
      ii) Problem reporting  
      **5x2**

Q.7  
   a) What is a risk triad? Explain its components in detail.  
      **10**
   b) Describe securing backup, recovery and archive (BURA) and its various threats.  
      **10**
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
COMPUTER GRAPHICS (CS-502)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by horizontal and vertical retrace.
b) What is staircase effect?
c) Explain reflection of an object about any arbitrary line \( y = mx + c \).
d) Write matrix representations of 2-D rotations of an object about a fixed point \( P(h, k) \).
e) Define the terms window and viewport.
f) What do you mean by projection?
g) Define cabinet and cavalier projections.
h) What is interpolation? How is it different from approximations?
i) What do you mean by diffuse reflection?
j) What do you mean by clipping? Explain with an example.

\[2 \times 10\]

**PART-A**

Q.2
a) Derive an expression to calculate intermediate pixel location between two given endpoints of a line segment using Bresenham’s algorithm. Use this algorithm to find out the pixel locations of a line from \((1, 1)\) to \((8, 5)\) on a master system. 15
b) Derive an expression to plot a circle using polar coordinates. 5

Q.3
a) Find the matrix that represents rotation of an object by 45° about the origin? What are the new coordinates of the point \((2, -4)\) after rotation? 10
b) Discuss boundary fill and flood fill algorithms in detail. 10

Q.4
a) Explain the term: window-to-viewport mapping. 5
b) Discuss 2-D viewing pipeline. 5
c) What do you mean by line clipping? Explain Cohen Sutherland line clipping algorithm with the help of a suitable example.

10

**PART-B**

Q.5  
a) Differentiate between perspective and parallel projections.

10  
b) What are axonometric projections? Discuss.

5  
c) What are cabinet and cavalier projections? Which of them is more realistic and why?

5

Q.6  
a) What are B-spline curves? Explain in detail the representation of B-spline curves and their properties.

10  
b) What is Hermite blending function?

5  
c) What are cubic splines? How we can represent cubic splines?

5

Q.7  
a) Discuss Warnock’s area subdivision algorithm for visible surface determination with the help of an example.

8  
b) Discuss Gouraud and Phong shading models

12
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
COMPUTER GRAPHICS (CS-502 / CS-502A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain terms: pixel and resolution.
    b) Explain role of display processor in Raster scan system.
    c) Plot straight line from (5, 10) to (8, 16) using simple DDA method.
    d) Write pseudo code for boundary fill algorithm.
    e) Write matrix for translation of 2D objects.
    f) Differentiate between multi-view and axonometric projections.
    g) Differentiate between interpolation and approximation splines.
    h) Explain 8-point symmetry of a circle.
    i) What is frame buffer? Identify its contents.
    j) What is staircase effect?

2x10

PART-A

Q.2 a) Differentiate between raster and random scan methods.

7

b) Find out the pixel location approximating the second octant of circle having centre (0, 0) and radius 8 using midpoint circle drawing method.

10

c) What is computer graphics? What are its applications?

3

Q.3 a) Explain scanline algorithm for polygon filling in detail.

10

b) Perform 45° rotation of a triangle A(0, 0), B(1, 1), C(5, 2):
   i) About the origin.
   ii) About point P(-1, -1).

10

Q.4 a) Explain window to viewport mapping in the form of composite transformation matrix.

8
b) What is clipping? Discuss Cohen-Sutherland line clipping algorithm in detail.  

12

**PART-B**

Q.5 a) What is 3-dimensional rotation transformation? Explain.  

5  

b) What are projections? Explain and compare its types in detail?  

15

Q.6 a) What is a spline? What are the major differences between Bezier curve and β-spline curve?  

10  

b) Explain how do you represent a curve using Hermite interpolation method?  

10

Q.7 a) Differentiate between image space and object space methods for hidden surface removal. Which is easier to implement and why?  

8  

b) Describe Z-Buffer algorithm for hidden surface removal.  

8  

c) Discuss shadows and transparency.  

4

**End Semester Examination, Dec. 2014**

B. Tech. – Fifth Semester  

COMPONENT BASED PROGRAMMING TECHNOLOGY (CS-503)

Time: 3 hrs  

Max Marks: 100

No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1 a) What is “fallthrough” in switch statement?  

b) Name the languages supported by .Net framework.  

c) What do you understand by component based programming technology?  

d) What is a Hashtable?  

e) What are jagged arrays?
f) What is a managed code? 
g) What is connection oriented data access model? 
h) Name any eight controls in windows application. 
i) Explain the origin of .Net technology. 
j) Write the output for the following: 
   i) String S1="lean"; 
      S1=S1.Insert (3, "r");
   ii) String S2="Delhi";
       String S3=S2.Substring (4); 
       What will be the values for S1 and S3? 

2x10

PART-A

Q.2  a) What is stack collection class? How will you implement push() and pop() operations of stack in C#? 

5 
b) What do you understand by property and indexes in C#? Explain the differences between them with a suitable example. 

15

Q.3  a) What is boxing and unboxing? Explain it with the help of a program. 

10 
b) Explain mutable and immutable strings with the help of an example. 

10

Q.4  a) What is CLR? Explain the flowchart of CLR for executing a program in C#. 

10 
b) Explain the architecture of .Net framework with a neat diagram. 

10

PART-B

Q.5  a) What are MDI forms? Explain the creation of parent-form, child-form and arranging of child form with a suitable example. 

10 
b) Using windows forms, how will you implement simple calculator having functionality of sum, multiply, division and subtraction. 

10

Q.6  a) What is security in web applications? Explain the concept of code-based and roll-based security in detail. 

15 
b) Explain the concept of assemblies. 

5
Q.7  

a) What are advantages of connectionless data models?  

b) What is data binding? Explain the types of data binding with the help of an example.  

c) Why do we use data grid control? Explain in brief its methods and properties.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
WEB TECHNOLOGY AND CYBER SECURITY (CS-504)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is web-browser?
b) What are plug-ins?
c) What is the function of frame tag?
d) Differentiate between cyber-crime and cyber-forensics.
e) Define cookies.
f) What is client-side scripting?
g) Define cyber-security.
h) What is the role of web server on Internet?
i) Write a short note on CGI.
j) What are the features of XML?

2x10

PART-A

Q.2 a) Discuss e-mail architecture in brief along with its main components.

b) Explain the various modes of connecting to Internet.

Q.3 a) What is XML schema? Explain the object model of XML with an example.

b) Explain the anchor tag with syntax. How is a hyperlink created for a document?

c) Differentiate between absolute link and relative link with an example.

Q.4 a) What is JavaScript? How is variable declared in the JavaScript? Write a script for it; also discuss the advantages of JavaScript.

b) Write the script for the following events:
   i) onSubmit()
   ii) onClick()}
iv) onFocus()

PART-B

Q.5  a) What is servelet? Explain the life cycle of a servelet.  
     7
  b) Differentiate between PWS and TIS servers.  
     7
  c) Write short note on ASP technology.  
     6

Q.6  a) Explain the procedure for finding evidence on PC during cyber crime.  
     8
  b) What is cyber crime? Explain the general guidelines related to cyber crime.  
     8
  c) Explain the document trial procedure.  
     4

Q.7  a) Explain the process of SQL script injection with example. Also write the syntax of SQL script injection problem.  
     10
  b) Explain the coverage and scope of cyber laws.  
     7
  c) How cyber crime can be reduced and managed?  
     3
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
COMPILER DESIGN (CS-701)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Discuss the merits and demerits of single and multipass compilers.
    b) Construct DAG for the following basic block:
       
       \[
       d = b \ast c
       \]
       
       \[
       e = a + b
       \]
       
       \[
       b = b \ast c
       \]
       
       \[
       a = e - d
       \]
    c) What are error recovery actions in a lexical analyzer?
    d) Explain loop optimization technique.
    e) What are the characteristics of good programming language?

Q.2  a) What is an activation record? Explain the purpose of different fields in an activation record.
     10
    b) Explain different parameter transmission schemes.
     10

Q.3  a) Explain the role of lexical analyzer with its implementation.
     10
    b) Construct NFA and minimized DFA for \( (0^* / 1^*)^* 0 \) using \( E \)-closure mechanism.
     10

Q.4  a) Check whether the following grammar is LL (1) or not:
     \[
     S \rightarrow i E \ast S \ast / a \\
     S^1 \rightarrow eS \ast E \\
     E \rightarrow b
     \]
     10
    b) Given the following grammar construct SLR passing table:
PART-B

Q.5  a) Construct a syntax directed translation scheme that translates arithmetic expressions from infix into postfix notation. Show the application of the scheme to the expression.

\[ 3 \times 4 + 5 \times 2 \]

b) What are the various types of intermediate code representations?

Q.6  Why is symbol table used by a compiler? Give a possible format of symbol table records used by a compiler and state why you would use either an array or hash table or any other data structure to keep these records.

Q.7  a) What do the register descriptors contain? How are these useful in code generation?

b) What are basic blocks and flow graph identify the basic blocks and flow graph for the following three address code:

\[
PROD = 0 \\
I = 1 \\
T_1 = 4 \times I \\
T_2 = addr (A) - 4 \\
T_3 = T_2 [T_1 ] \\
T_4 = addr (B) - 4 \\
T_5 = T_4 [T_1 ] \\
T_6 = T_3 \times T_5 \\
PROD = PROD + T_6 \\
I = I + 1 \\
if \ I \leq 20 \ goto \ (3)
\]
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
SOFTWARE DEVELOPMENT PROCESSES (CS-702)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write in brief:
   a) State the different phase of structuring a project along the time dimension.
   b) Why do we need modeling?
   c) Explain the concept of inheritance using example.
   d) What is multiplicity of a relationship?
   e) Define a node.
   f) What are the application domains of UML?
   g) What is a scenario?
   h) State the various notations used to specify an object.
   i) Why do we need to document iterations?
   j) Discuss the implementation view of 4+1 architecture.

   2x10

PART-A

Q.2 a) Compare the traditional and object oriented methodologies. What are advantages of the latter over the former? 10
   b) Differentiate between aggregation and association using suitable examples. 5
   c) Write in brief about the capabilities and usage of UML. 5

Q.3 a) Explain object-oriented software development process cost process domain. 5
   b) Draw and explain a use case diagram for “Online shopping system”. 10
   c) What are the components of an activity diagram? 5

Q.4 a) What are the major types of classes identified in UML class diagram? 5
b) Draw a class diagram for student registration system.  

10

c) Write in brief about generation and reflexive relation. Explain using a suitable example. 

5

**PART-B**

Q.5  
a) Draw a collaboration diagram for “online railway reservation system”.  

10

b) Write notes on: 
   i) Association classes.
   ii) Modeling dynamic behaviour.
   iii) Creating attributes and operations.
   iv) Representing behaviour and structure.  

2½x4

Q.6  
a) Why do we need to homogenize the model? Discuss the various methods used.  

10

b) Discuss the process and deployment view of 4+1 architecture.  

10

Q.7  
a) What is a design class? Explain.  

10

b) What decisions do we need to take before designing a relationship?  

10
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh / Eighth Semester
SYSTEM PROGRAMMING AND SYSTEM ADMINISTRATION (CS-703)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain filters with examples.
b) What is the concept of linking?
c) Why do we use an interpreter?
d) How is the process of swapping carried out in memory?
e) Write process-related commands in UNIX.
f) Write a note on demand paging.
g) What are debug monitors?
h) Explain binding.
i) What are standard files in UNIX?
j) Draw SIC /XE architecture.

2x10

PART-A

Q.2 a) Explain basic features of macros. How can we call a macro within a macro?

10

b) Explain with example the macro expansion with arguments as well as with certain conditions.

10

Q.3 Define an assembler. Explain in detail the designing of an assembler as pass1 and pass2.

20

Q.4 a) Define loaders. Why do we use them? Explain any three loading schemes.

12

b) Discuss MASM assembler macro processor.

8

PART-B
Q.5  a) Explain in detail UNIX architecture.  

b) Differentiate between:
   i) Absolute and relative path names.
   ii) System software and application software.  

c) Define and explain INODES.  

d) How does a system administrator manage the users? Explain.

Q.6  Write short notes on any four of the following:
   a) Text editors.
   b) Overlays.
   c) Vi editor.
   d) I/O devices and drivers.
   e) Virus control management.  

Q.7  Give the syntax and example for any ten of the following commands:
   a) Ls
   b) cat
   c) mv
   d) gtip
   e) chmod
   f) grep
   g) df
   h) tar
   i) cmp
   j) cd
   k) tty
   l) ulimit
   m) Shutdown
   n) su
   o) diff
End Semester Examination, Dec. 2014  
B. Tech. – Sixth / Seventh Semester  
NETWORK SECURITY AND MANAGEMENT (CS-721)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What do you understand by MIME?  
b) What are the three classes of intruders?  
c) Briefly describe the design goals of a firewall.  
d) What is the difference between cryptography and cryptanalysis?  
e) What are the properties a digital signature should have?  
f) What do you understand by DSL?  
g) Differentiate between virus and worm.  
h) What is authentication header (AH) in IPsec?  
i) Why does PGP generate a signature before applying compression?  
j) What do you understand by masquerade attacks?

2x10

PART-A

Q.2  
a) What is the difference between polyalphabetic cipher and monoalphabetic cipher?  
4  
b) Explain the transposition techniques in detail.  
6  
c) Explain the OSI security architecture in detail.  
10

Q.3  
a) What is the purpose of S-boxes in DES?  
4  
b) Explain triple DES in detail.  
12  
c) What is the difference between stream cipher and block cipher?  
4

Q.4  
a) Explain in detail RSA algorithm with the help of an example.  
10
b) What is key management? Explain Diffie-Hellman-key exchange

PART-B

Q.5 a) What characteristics are needed in a secure hash function?

b) What basic arithmetical and logical functions are used in SHA?

c) Explain the architecture of secure socket layer.

Q.6 a) What are the two common techniques used to protect a password file?

b) Explain the different types of firewalls.

c) During its lifetime, a typical virus goes through four phases. What are these four phases? Explain.

Q.7 Write short notes on any two:

a) ATM
b) SNMP
c) TMN management layers.

10x2
Q.1  a) State the benefits of early testing.
b) ‘Testing is the process of executing a program with the intent of finding errors’. Comment on this statement.
c) Define the following terms:
   i) Failure.
   ii) Fault.
   iii) Error.
   iv) Test case.
d) What are the tasks of problem tracking system?
e) Differentiate between:
   i) Manual testing and automated testing.
   ii) Static and dynamic testing.

Q.2  a) How does testing lead to quality software? What is a software error? What are the categories of software errors?

b) A program reads three numbers, A, B, and C, with a range [1, 50] and prints the largest number. Design test cases for this program using equivalence class testing technique.

c) Consider the following program segment:
main()
{
    Int n=5, index=2;
    While (index<=n-1)
    {
        If(n% index==0)
        {
            Printf("Not prime");
        }
    }
}
Break;
}
Index++;
}
If (index==n)
Printf("prime");
}
i) Draw the DD graph for program.
ii) Calculate cyclomatic complexity using all methods.
iii) List all independent paths.
iv) Design test cases for each independent path.

Q.3  a) ‘Development team can make an error in any phase of SDLC’. Explain the statement with the help of life-cycle of bug. What are various states a bug can attain? Explain them.

b) Define the term: Problem reports. How does one write a report effectively? What should be the content of problem reports?

Q.4  a) What is a problem tracking system? What are its objectives? What are the tasks of systems in problems tracking? Explain.

b) Write short notes on:
   i) Users of tracking system.

PART-B

Q.5  a) What is a test plan? Explain how a test plan can be a product as well as a tool.

b) State and explain the characteristics that are possessed by a good test case.

c) Write short notes on:
   i) Equivalence classes.
   ii) Visible state transitions.

Q.6  a) Explain various fundamental testing tools by giving the significance of each.
b) What do you understand by term automated testing? Write a short note on testing tool named load runner.

Q.7  a) Explain the activities that are involved in software quality assurance.

b) What are the quality standards that are used to measure and manage software quality?
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh / Eighth Semester
ARTIFICIAL INTELLIGENCE (CS-801)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Define AI.  
   b) What is PROLOG?  
   c) Explain a script.  
   d) Compare depth first search and breadth first search.  
   e) What is heuristic?  
   f) What is a closed queue in A* algorithm?  
   g) Define constraint satisfaction.  
   h) What is a monotonic system?  
   i) Define a frame.  
   j) Name different types of agents.

2x10

PART-A

Q.2  
   a) Explain the history of AI in detail.  
      10
   b) Write a LISP program for Fibonacci series.  
      10

Q.3  
   a) Discuss the problem characteristics in detail with an example.  
      10
   b) What is a production system?  
      4
   c) Explain the control strategies.  
      6

Q.4  
   a) Make semantic net for the following:
      i) All the batters like the pitches.  
         5
      ii) The dog bit the mail carrier.  
         5
   b) Discuss the script of a restaurant.  
      10
PART-B

Q.5 Write short notes on:
   a) Bay’s theorem.  
      b) Fuzzy based reasoning system. 
      c) Probability based reasoning. 

Q.6 a) What is an expert system? Explain its architecture.  
      b) Define an agent. Explain goal based agent in detail. 

Q.7 a) What is a game tree? Discuss the alpha-beta pruning algorithm.  
      b) Briefly describe the different stages of natural language processing.  
      c) Give the applications of robotics.
Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1  
a) Describe the Turing test and the criticisms associated with it.  

3  
b) Describe the syntax and working of the following LISP commands:  
   i) CAR  ii) CDR  iii) CONCAT  

3  
c) Describe the CUT and FAIL predicates on PROLOG.  

3  
d) Explain Alpha-Beta pruning with reference to gaming in AI.  

3  
e) Differentiate between procedural and declarative knowledge.  

3  
f) Explain Monotonic and non-monotonic reasoning.  

3  
g) Elaborate any two applications of AI.  

2

**PART-A**

Q.2  
a) Describe Hill climbing as a heuristic search procedure. What are the problems in Hill climbing and how are they solved? How is steepest ascent Hill climbing different from Hill climbing?  

10  
b) Write a program in PROLOG such that it reverses the elements of an input list.  

10

Q.3  
a) What are the various approaches to knowledge representation? Describe the issues in knowledge representation.  

10  
b) Differentiate between forward and backward reasoning.  

10

Q.4  
a) Create semantic Nets for the following:
i) Whales are mammals. They live in water. Typically water animals have gills for breathing but whales have lungs.

ii) Emus are birds. Typically birds fly and have wings but emus run.

iii) Harry is taller than Ronald.

b) Create conceptual dependency structures for the following:
   i) Ram gave the book to Mary.
   ii) The frog is speaking in the woods.

c) Create a frame to represent the following:
   Mammals are animals with hair on their bodies and breathe air. Humans are mammals with two legs. An adult male is a human being with average height 5.8 feet. Cricket players are adult males with average height 5.10 feet. They can be either batsmen or bowlers. Dhoni is a batsman and Harbhajan Singh is a bowler.

**PART-B**

Q.5 a) What is reasoning? Explain how certainty factors can be used in reasoning with an example.

b) Explain the Bayes theorem.

Q.6 a) What are expert systems? Describe the structure and application of expert systems.

b) What are intelligent agents? Describe the types of intelligent agents.

Q.7 a) What is game playing? Describe the Min-Max search procedures with the help of an example.

b) What is natural language processing? Explain the various techniques for NLP.
Q.1  a) What is artificial intelligence?  
b) Differentiate between blind search and heuristic search.  
c) Define Modus Ponens rule in propositional logic.  
d) Define basic agent programs.  
e) How AI is used in robotics?  
f) Explain Dempster-Shafer theory.  
g) How can we avoid ridge and plateau in hill climbing?  
h) What are the factors that a rational agent should depend on at any given time?  
i) Define conditional probability.  
j) What do you mean by declarative knowledge?  

2x10

PART-A

Q.2  a) Write a program for merging of two lists using prolog.  

10

b) Explain any two AI problems in detail.  

10

Q.3  a) Define production system and explain the various characteristics of production system.  

10

b) Describe the following: 
   i) Constraint satisfaction. 
   ii) Mean-end analysis.  

5x2

Q.4  a) Assume the following facts:  
   i) Steve only likes easy courses.  
   ii) Science courses are hard.  
   iii) All the courses in the basketweaving department are easy.
iv) BK301 is a basketweaving course. Use resolution to answer the following: “What course would Steve like”?  

b) Describe semantic nets and frames with suitable examples.  

10

PART-B

Q.5 a) Differentiate monotonic and non-monotonic reasoning.  

5

b) Write short notes on:  
i) Bayesion network  

8

ii) Reasoning using certainty factors.  

7

Q.6 a) Define agent and explain goal-based agent in detail with a diagram.  

10

b) Explain: i) Inference engine  

5x2

ii) Knowledge acquisition facilities

Q.7 a) Explain various natural language processing steps.  

10

b) Describe the min-max search algorithm.  

10
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
DISTRIBUTED OPERATING SYSTEMS (CS-825)  

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Concurrency transparency is a desirable goal for distributed systems. Do centralized systems have this property?  
b) Explain critical path in RPC.  
c) What is the difference between connection oriented and connectionless communication protocol?  
d) In the approach to cache consistency using leases, it is really essential that the clocks are synchronized? If not, what is it that is required?  
e) Is optimistic concurrency control more or less restrictive than using timestamps? Why?  
f) Distinguish between file server and file services.  
g) During the discussion of memory consistency models we often refer to the contract between the software and memory. Why is such a contract needed?  
h) Define Munin. Give the classes of variables that it supports.  
i) Why deadlock avoidance is never used in distributed systems?  
j) Mention the primary goals of MACH.

2x10

PART-A

Q.2  
a) Discuss software concepts for the multiprocessors and multicomputers. Also discuss which kind of software goes with which kind of hardware.  
10  
b) Define group communication. What are possible approaches to manage group membership? Explain.  
4  
c) What is an orphan? What can be done about orphans? Give four solutions proposed by Nelson.  
6

Q.3  
a) Give an algorithm proposed by Lamport for assigning times to events with the help of an example.  
5  
b) What is bully election algorithm? Explain with the help of an example.  
5
c) Discuss deadlocks in distributed systems. Explain deadlock detection and prevention algorithms.  

**Q.4**

a) Communication in real-time distributed system is different from communication in other distributed systems. Discuss.  

b) How threads package can be implemented? Explain implementing threads in user space.  

c) Discuss major design issues for processor-allocation algorithms.  

**PART-B**

**Q.5**

a) Explain Naming-Transparency and two-level naming in distributed system.  

b) Explain semantics of file sharing in a distributed system.  

**Q.6**

a) Explain how page replacement and synchronization take place in page-based distributed shared memory.  

b) Name and explain various consistency models that are used to achieve consistency in distributed shared memory.  

**Q.7**

a) Explain the five principle abstractions that MACH kernel manages.  

b) Write short notes on:  

i) Memory management in MACH  

ii) Process management in MACH  

5×2
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
DISTRIBUTED OPERATING SYSTEMS (CS-825)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you mean by parameter marshalling in a client server model?
   b) Briefly discuss the design issues of distributed operating systems.
   c) Discuss clock synchronization in distributed systems.
   d) What are the various trends in distributed systems to deal with threads?
   e) Differentiate the strict and weak consistency models.

4x5

PART-A

Q.2 a) Define distributed operating systems. Discuss all the hardware and software concepts in distributed systems.

12

b) Explain RPC (Remote procedure call) in detail, with suitable examples and diagrams.

8

Q.3 a) Explain the mutual exclusion algorithms that are widely used to ensure synchronization in distributed systems.

12

b) How distributed deadlock detection is dealt with in distributed operating systems?

8

Q.4 a) Discuss the system models to allocate the processes and processors in a distributed system.

15

b) Enumerate the various issues in real time distributed systems.

5

PART-B

Q.5 a) Explain the design and implementation issues of a distributed file system.

15
b) Comment on the trend generally followed in a distributed file system.  

Q.6 Explain page based distributed shared memory in detail.  

Q.7 Write short notes on *any two*: 
   a) Process management in MACH. 
   b) Goals of distributed operating systems. 
   c) Bully algorithm. 
   d) Lamport’s algorithm for synchronization.  

10x2
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – First Semester
FUNDAMENTALS OF COMPUTERS AND PROGRAMMING-I (CS-I-101)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Differentiate between RAM and ROM. 3
b) Define a flow chart. 3
c) Write any three UNIX commands with their syntax and examples. 3
d) Add(10110101101)₂ and (10101111)₂. 3
e) Design an algorithm to swap content of two variables. 4
f) Differentiate between high level language and low level language. 4

PART-A

Q.2  
a) Explain a basic computer system with the necessary diagram. 10
b) Write about different types of memory in detail. 10

Q.3  
a) Explain binary, octal and hexadecimal number system with an example. 10
b) Do as directed:
i) (101110111101)₂=(?)₁₀.
ii) (909)₁₀=(?)₂
iii) Add(1000111)₂ to (10001)₂.
iv) (285)₁₀=(?)₂.
v) (10100110)₂=(?)₈. 10

Q.4  
Differentiate between the following:
a) Compiler and interpreter.
b) Single user and multi-user systems.
c) Second and fourth generation of computers.

20

PART-B

Q.5  
a) What is an operating system and explain its functions?  
10  
b) Compare DOS and UNIX operating system.  
10

Q.6  
a) Draw various flow chart symbols and write their uses.  
10  
b) Define an algorithm. What are the essential features of an algorithm?  
10

Q.7  
a) Write note on various operators used in C language.  
10  
b) Write a C program to compute factorial of a given number.  
10
FUNDAMENTALS OF COMPUTERS AND PROGRAMMING-II (CS-I-201)

End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Second Semester

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following questions:
   a) Write notes on entry control loop and exit control loop.
   b) How you define a structure and access its member?
   c) Differentiate between array and string.
   d) Write a note on concept of stream.
   e) What are the features of C++ language?

4x5

PART-A

Q.2 a) Define an array. How it is declared? Show with example?
   10
   b) What is recursion? How it is different from a loop?
   10

Q.3 a) Write a program that calculates roots of a quadratic equation.
   10
   b) Write a note on static, global and local variables.
   10

Q.4 a) Explain any five string manipulation function with syntax.
   10
   b) Write a note on various file opening modes.
   10

PART-B

Q.5 a) Write a program to access an array with pointer.
   10
   b) What are the different function calling methods?
   10
Q.6  
a) Write a program to count the occurrence of letter 'X' in a text file.  
\hspace{2cm} \textbf{10} 
b) Differentiate between binary and text file.  
\hspace{2cm} \textbf{10} 

Q.7  
a) Compare C with C++ language.  
\hspace{2cm} \textbf{10} 
b) What is inheritance? Show with an example.  
\hspace{2cm} \textbf{10}
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Second Semester  
FUNDAMENTALS OF COMPUTERS AND PROGRAMMING (CS-I-202)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer following questions.  
a) Write note on different types of errors in C.  
b) Differentiate between while and do…..while loop.  
c) Write code to show if…..else construct.  
d) Write an algorithm to select largest among three numbers.  
e) Distinguish between structure and array.  

PART-A

Q.2  
a) What is a flow chart? Explain various flow chart symbols.  
10  
b) Write a program to calculate factorial of a given number.  
10  

Q.3  
a) List out and explain different operators used in C language.  
10  
b) Write a program to demonstrate switch statements.  
10  

Q.4  
a) What are the different function parameter passing methods?  
10  
b) Write a note on concept of local, global and static variable.  
10

PART-B

Q.5  
a) Define an array. How it is declared? Show with examples.  
10  
b) Write a program to add two matrices using array.  
10  

Q.6  
a) Write note on ‘*’ and ‘&’ operator.  
10
b) What is pointer? How you use a pointer to access a variable?

Q.7  a) Write a program read data of 10 students using following structure.

<table>
<thead>
<tr>
<th>STU_ROLL_NO</th>
<th>STU_CGPA</th>
</tr>
</thead>
</table>

b) What do you understand by an array of structure?
End Semester Examination, Dec. 2014
B. Tech. (Integrated) – Fourth Semester (ECE)
COMPUTER PROGRAMMING AND APPLICATIONS (CS-I-409)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) How do we create database file?
b) What are the various operators in C?
c) What is the difference between while and do-while loop?
d) Explain the term commercial data processing.
e) Explain the term CAM.
f) Define ‘Break’ statements.
g) Explain the ‘Nested-if-else’ statements with the help of a flowchart.
h) Define the ‘Variables’ in C.
i) Explain the term ‘Keywords’ in C.
j) Explain the term ‘Arrays’ in C.

2x10

PART-A

Q.2 Write short notes on:
a) DDL commands in SQL.
b) DML commands in SQL.
c) Need for information storage and retrieval.
d) Keys in SQL.

5x4

Q.3 a) What is an unformatted I/O function? Explain the two types of formatted I/O functions.

10

b) Write short notes on:
i) Binary operators
ii) Unary operators.

5

5

Q.4 a) Write a program to input any ten numbers and find out the largest and smallest number from these numbers.

10
b) Write a program to convert centigrade comparative to Farehenheit temperature.  5

(c) Explain the term Multi-dimensional arrays.  5

**PART-B**

Q.5  Write short notes on:

a) CAE  10

b) CAI  10

Q.6  a) Write short on ‘engineering computation’.  10

b) What are the various types of computer applications?  10

Q.7  Write the applications in the area of electronics and communication engineering.  20
End Semester Examination, Dec. 2014
B. Tech. (Integrated) - Fifth Semester
MAINTENANCE OF COMPUTER SYSTEMS (CS-I-509)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a colour graphic adopter? How it works?
b) What is the technology involved in a printer controller?
c) Explain SCSI. Draw a diagram.
d) Give four advantages of pen drives.
e) What are the functions of motherboard?
f) Write four advantages of WAN and their three applications.
g) What is the technology involved in CRT display devices?
h) Give at least four difficulties that will arise if we do not have a motherboard in a system.

PART-A

Q.2 a) Draw a block diagram of a CRT display device. Explain each component.

10

b) How is monochrome graphic adopter different from color graphic adopter? Draw diagram. Give at least four improvements in which a color graphic adopter can further be improved.

10

Q.3 a) Explain the construction and working of inkjet printers.

10

b) What are scanners? Draw block diagram of a scanner. How is digitizer different from scanner? Give at least five reasons.

10

Q.4 a) Explain in brief different types of buses. Why control buses are needed?

10

b) Explain in detail the working of COMI and COM 2 ports. Why are ports needed?

10

PART-B
Q.5  
a) Explain the working of floppy disk controller. Draw diagram. How can be the floppy disk capacity improved?  
b) What are five common faults with hard disk drive? What are five common faults with floppy disk drive?  

Q.6  
a) Draw the block-diagram of a motherboard. Explain its different parts. Give at least five advantages of using a motherboard.  
b) Give steps of installations of a windows operating system.  

Q.7  
a) What are routers? What are its types? How do routers control the congestion in any network?  
b) Compare and contrast, working, applications, advantages and disadvantages of Hubs, Bridges and Switches.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - First Semester
ADVANCED ANALYSIS AND DESIGN OF ALGORITHMS (CS-M-101)

Time: 3 hrs
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is time complexity? Explain the step count method using a suitable example.

5

b) Prove: \(16n^2 + 5n + 3 = \Omega(n^2)\)

3

c) Show the sequence of following data at different stages of quick sort. What is time-complexity of quick-sort? Explain.

8 1 2 5 9 4 12

7

Q.2  a) What is a binomial tree? Explain its properties.

4

b) Write and explain the algorithm to find minimum key in a binomial heap.

4

c) Write and show the working of Dijkstra’s algorithm in the following graph:

7

Q.3  a) Describe the concept of dynamic approach by finding a largest common sub-sequence.

8


7
Q.4  a) How sum of subset problem can be solved using backtracking approach? Explain.  
     b) Explain the concept of branch and bound approach using a suitable example.

Q.5  a) Write and explain the algorithm to find out the largest among n elements in 
     O(1) time using $n^2$ processors.  
     b) What is traveling salesman problem? Explain.

Q.6  a) Explain depth first search algorithm to traverse a graph. Illustrate with an 
     example. Also give its advantages.  
     b) Let $X_1 = 2, 5, 8, 11, 13, 16, 21, 25$  
     $X_2 = 4, 9, 12, 18, 23, 27, 31, 34$. Show how the odd-even merge algorithm can be used to merge these two sorted sequences.

Q.7  a) Explain Strassen’s algorithm for multiplication of two matrices and determine 
     its time complexity.  
     b) Explain how Huffman codes are generated using dynamic programming? 
     Determine the Huffman code for the alphabets: 
     $a, b, c, d, e, f, g$ with frequencies: 22, 16, 30, 8, 5, 9, respectively.

Q.8  Explain the following: 
     a) NP-Completeness and reducibility.  
     b) Graph colouring problem.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - First Semester
ADVANCED COMPUTER NETWORKS (CS-M-102)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1
a) Explain various network devices in detail. 5
b) Explain distance vector routing algorithm. 10

Q.2
a) Discuss MAC layer and its frame format. 5
b) Discuss physical specification of GB Ethernet and its application with its layered protocol architecture. 10

Q.3
a) Discuss mobile IP in detail. 5
b) Discuss various IP protocols with their address format. 10

Q.4
a) Discuss steps used in socket programming in detail. 5
b) Explain wireless TCP. 5

c) Discuss algorithm for congestion control in the network. 5x3

Q.5
a) How does ATM work? Why ATM-based network are preferred to their STM counterpart? 6
b) Explain LAN emulation. 5

c) Discuss virtual circuits. 4

Q.6
a) How does GPRS architecture differ from GSM? Discuss the difference between them in detail. 5
b) Why is a digital network preferred over an analogue one? In cellular networks, how the same channel can be used by simultaneous users. 623/4
c) Discuss wireless LAN.

Q.7 Discuss in detail:
   a) HTTP
   b) DNS
   c) Voice over IP

Q.8 a) Discuss switching techniques.
     b) Explain routing information protocol with an example.
     c) Discuss B-ISDN in detail.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - First Semester
ADVANCED OPERATING SYSTEMS (CS-M-103)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is an advanced operating system? List various design approaches for advanced operating systems.  

b) Discuss the issues and design of distributed computing environment.  

Q.2  a) Explain a basic RPC operation. Which parameter passing scheme is used in RPC?  

b) Explain the critical path followed in RPC.  

Q.3  a) What are the various design issues related to thread packages? Discuss.  

b) Explain how a group of related, heavily interacting processors are scheduled.  

Q.4  a) Explain in details the working and issues related to bus-based microprocessor.  

b) Explain why systems having distributed shared memory using caching prefer to use write Invalidate in place of write-update.  

Q.5  a) What are logical clocks? Explain the Berkeley algorithm for clock synchronization.  

b) Suggest the various methods used for deadlock prevention.  

Q.6  a) What is the utility of access matrix model? Discuss its implementation.
b) List and explain various components of distributed computing environment.

Q.7  a) How are failures handled in case of message passing system? Explain.

b) What are the various processor allocation models used in a distributed system?

Q.8  a) Discuss the various caching techniques used to perform caching.

b) Discuss the Bully algorithm used for a distributed system.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - First Semester
ADVANCED MATHEMATICAL TECHNIQUES (CS-M-104)

Time: 3 hrs
Max Marks: 75

No. of pages: 3

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
   a) By the help of a suitable example, explain $\alpha$-cut of a fuzzy set? For any fuzzy sets $A$ and $B$ defined on a real line, show that:
   \[(A \cap B)^\alpha = A^\alpha \cap B^\alpha, \forall \alpha \in [0, 1]\]
   
   b) Let $A(x) = \begin{cases} 0, & x < 1 \& x > 6 \\ \frac{(x-1)}{2}, & 1 \leq x \leq 3 \\ \frac{(6-x)}{3}, & 3 \leq x \leq 6 \end{cases}$ and $B(x) = \begin{cases} 0, & x < 2 \& x > 11 \\ \frac{(x-2)}{4}, & 2 \leq x \leq 6 \\ \frac{(11-x)}{5}, & 6 \leq x \leq 11 \end{cases}$

   i) Find $A+B$

   ii) Solve the fuzzy equation $AX = B$, where $X$ is the universal fuzzy set.

Q.2  
   a) Define fuzzy prepositions. How these prepositions are formulated?

   b) Using the rule: If $x$ is $A$, then $y$ is $B$, where:
   
   $A = 0.6/_{x_1} + 0.5/_{x_2} + 0.4/_{x_3} + 0.6/_{x_4}$
   
   $B = 0.4/_{y_1} + 0.2/_{y_2} + 0.5/_{y_3} + 0.3/_{y_4}$

   and the fact
   $A' = 0.7/_{x_1} + 0.8/_{x_2} + 0.4/_{x_3} + 0.5/_{x_4}$

   Find $B'$.

Q.3  
   A pharmaceutical company has 100 kg of $A$, 180 kg of $B$ and 120 kg of $C$ ingredients available per month. Company can use these materials to make three basic pharmaceutical products namely 5–10–15, 5–5–10 and 20–5–10, where the numbers in each case represent the percentage of the weight of $A$, $B$
and C respectively in each of the products. The cost of these raw materials is as follows:

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Cost per kg (in Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>80</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
</tr>
<tr>
<td>C</td>
<td>50</td>
</tr>
</tbody>
</table>

Selling prices of these products are Rs. 40.5, Rs. 43 and Rs. 45 per kg, respectively. There is a capacity restriction of the company for the product 5–10–5, so that company cannot produce more than 30 kg per month. Determine how much of each of the products company should produce in order to maximize its monthly profit.

Q.4 Use dynamic programming to solve the following problem:

\[ \text{Minimize} \ (z) = y_1^2 + y_2^2 + y_3^2 \]

subject to the constraints

\[ y_1 + y_2 + y_3 = 10 \quad \text{and} \quad y_1, y_2, y_3 \geq 0 \]

Q.5 a) For the single server, finite (or limited) queuing system, find:

i) Average number of customers in the system

ii) Average queue length

b) Arrival at telephone both are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone call is assumed to be distributed exponentially with mean 3 minutes.

i) What is the probability that a person arriving at the booth will have to wait?

ii) What is the average length of the queue that forms from time to time?

iii) What is the probability that it will take him more than 10 minutes altogether to wait for the phone and complete his call?

Q.6 a) Five jobs are performed, first on machine M₁ and then on machine M₂. The time taken (in hours), by each job on each machine is given below:

<table>
<thead>
<tr>
<th>Job</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time on machine M₁</td>
<td>12</td>
<td>4</td>
<td>20</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Time on machine M₂</td>
<td>6</td>
<td>14</td>
<td>16</td>
<td>18</td>
<td>10</td>
</tr>
</tbody>
</table>
b) Using graphical method, find the minimum elapsed total time sequence of 2 jobs and 5 machines, when we are given the following information:

<table>
<thead>
<tr>
<th></th>
<th>Sequence</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Job 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time (in hours)</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td><strong>Job 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time (in hours)</td>
<td></td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

7

Q.7 A small project is composed of 7 activities whose time estimates are listed in the table below:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated duration (Weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Optimistic</td>
</tr>
<tr>
<td>1-2</td>
<td>1</td>
</tr>
<tr>
<td>1-3</td>
<td>1</td>
</tr>
<tr>
<td>1-4</td>
<td>2</td>
</tr>
<tr>
<td>2-5</td>
<td>1</td>
</tr>
<tr>
<td>3-5</td>
<td>2</td>
</tr>
<tr>
<td>4-6</td>
<td>2</td>
</tr>
<tr>
<td>5-6</td>
<td>3</td>
</tr>
</tbody>
</table>

Activities are indentified by their beginning (i) and ending (f) node numbers.

a) Draw the project network
b) Find the expected duration and variance for each activity? What is the expected project length?
c) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed atleast 4 weeks earlier than the expected time.
d) If the project due date is 19 weeks, what is the probability of not meeting the date?

Given:

<table>
<thead>
<tr>
<th>Z</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>0.3085</td>
</tr>
<tr>
<td>0.67</td>
<td>0.2514</td>
</tr>
<tr>
<td>1.00</td>
<td>0.1587</td>
</tr>
<tr>
<td>1.33</td>
<td>0.0918</td>
</tr>
</tbody>
</table>

Q.8 a) A bakery keeps stock of a popular brand of a cake. Past experience shows the daily demand pattern for the item with associated probabilities as given below:
<table>
<thead>
<tr>
<th>Daily demand (number):</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.01</td>
<td>0.20</td>
<td>0.15</td>
<td>0.50</td>
<td>0.12</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Use the following sequence of random numbers to simulate the demand for next 10 days.
Random numbers: 25, 39, 35, 76, 12, 05, 73, 89, 19, 49
Also, estimate the daily average demand for the cakes on the basis of simulated data.

10
b) Why is a computer necessary in conducting a real-world simulation?
5
End Semester Examination, Dec. 2014  
M. Tech. (CSE) - First Semester  
OBJECT ORIENTED MODELLING AND DESIGN (CS-M-105)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Explain derived object, derived attribute and derived association with an example.  
8  
b) Prepare data dictionary for an ATM banking system.  
7

Q.2  
Write short notes on:  
a) Homomorphism  
b) Qualified association  
c) Collaboration diagram  
5x3

Q.3  
a) Describe forward and reverse engineering in case of activity diagrams and class diagrams.  
8  
b) What are enumerations? How are they different from a specialized class? Explain with the help of an example.  
7

Q.4  
a) Prepare an activity diagram for computing a restaurant bill.  
7  
b) Define components. Explain different types of components.  
8

Q.5  
a) You are interacting with an online travel agent. Prepare a usecase diagram using generalization and include relationships.  
7  
b) What is a state chart diagram? Explain it by considering all the components.  
8
Q.6  
   a) Prepare a class diagram for a library book checkout system that shows the late charges for an overdue book as a derived attribute.  
   b) What are basic building blocks of UML? Explain each with a suitable example.

Q.7  
   a) Explain the difference between extend and include relationship by taking a suitable example.  
   b) Differentiate between:  
      i) Overloading and overriding  
      ii) Abstract class and concrete class

Q.8  
   a) Describe in brief unified software development lifecycle.  
   b) What is state chart diagram? Explain it by considering all the components.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - Second Semester
NETWORK ADMINISTRATION AND SECURITY (CS-M-202)

Time: 3 hrs
Max Marks: 75
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) Distinguish among vulnerability, threat and control. 5
     b) Explain different types of attackers and attack process. 5
     c) How can we achieve the user authentication by using the biometrics system? 5

Q.2 a) Explain the rogue device detection in detail with the help of an example. 6
     b) What is your stance on L2 security issues? 9

Q.3 a) What are the main differences between the network level and application level regarding information security? 6
     b) Docs implementing antivirus on your mail server eliminate the need of antivirus on your hosts. How can we provide the e-mail security in distributed environment? 9

Q.4 a) What do you mean by DNS spoofing attacks? How can we protect DNS server from this attack? 7
     b) Discuss the scenario where preference is given to the use of HTTP over HTTPs. Does it impact the security design? 8

Q.5 a) Why are you able to run transport mode IPsec when you deploy GRE+IPsec? 7
     b) Explain different types of IPsec and VPN in detail. 8

Q.6 a) Explain various network management tools used to provide the security. 6
b) Explain the terms, SNMP, FTP, Netflow.

Q.7
a) Explain the intrusion detection in detail.

b) Explain how one can track a fake-email.

Q.8 Discuss:
  a) ICMP design considerations.
  b) Network security management.
  c) Forensic analysis techniques.
End Semester Examination, Dec. 2014
M. Tech. (CSE) – Second Semester
ADVANCED DATABASE MANAGEMENT SYSTEMS (CS-M-203)

Time: 3 hrs
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is multi-valued dependency and join dependency? Suppose that we decompose the schema \( R=(A, B, C, D, E) \) into \( R_1(A, B, C) \) and \( R_2(A, D, E) \). Show that this decomposition is a good decomposition or not, if the following set of functional dependencies holds: \( A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A \).

b) Given the following relations:
   - Vehicle(reg_no, make, colour)
   - Person(eno, name, address)
   - Owner(eno, reg_no)
For the query
Select eno, name, reg_no.
From Person, Owner
Where person.eno = Owner eno and person.name = ‘Hari’
i) Draw the initial query tree.
ii) Optimise the query and draw the optimised query tree.

Q.2  a) What is conflict serializability? Consider the precedence graph of the following figure. Is the corresponding schedule conflict serializable? Explain your answer.

b) What is two phase locking protocol? Consider the following two transactions:
   T31: read(A);
   read(B);
   If A=0 then B:=B+1;
write(B).

T32:
read(B);
read(A);
if B=0 then A:=A+1;
write(A).

Add lock and unlock instructions to transactions T31 and T32, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

Q.3

a) Consider the bank database:
   Branch (branch name, branch city, assets)
   Customer (Customer name, customer street, customer city)
   Loan (loan number, branch name, amount)
   Borrower (customer name, loan number)
   Account (account number, branch name, balance)
   Depositor (Customer name, account number)

Write SQL expression for each of the following queries:
   i) Find all borrowers who have not taken a total loan value greater than $20,000.

   ii) Find the names, street and city information of all customers who either hold an account or have borrowed a loan or both.

   iii) Find the names of all depositors who have an account with a value greater than $6,000 at the “Uptown” branch.

b) Distinguish between specialization and generalization taking suitable examples.

Q.4

a) Consider the relations:
   Employee(name, address, salary, plant-number)
   Machine(Machine-number, type, plant-number)

Assume that the employee relation is fragmented horizontally by plant-number, and that each fragment is stores locally at its corresponding plant site. Assume that the machine relation is stored in its entirety at the Armonk site. Describe a good strategy for processing each of the following queries:
   i) Find all employees at the plant that contains machine number 1130.

   ii) Find all employees at plants that contain machines whose type is “milling machine”.

   636/4
iii) Find all machines at the Almaden plant.

iv) Find employee \textbf{theta join} machine.

b) What are parallel databases? How is parallel query evaluation done?

Q.5  a) What are various components of Oracle architecture? Explain.

b) Explain data dictionary. How are tablespaces and data files managed in Oracle?

Q.6  a) Discuss the different issues involved in tuning database performance.

b) How resize of SGA structure is done in Oracle database?

c) What are the various diagnostic and tuning tools available in oracle?

Q.7  a) Explain the process of deadlock prevention, detection and recovery in database systems.

b) What is a distributed database? What are the various ways of storing data in distributed database systems? Explain.

Q.8  Write short notes on:

a) Aggregation.

b) Log based recovery.

c) Integrity constraints.
End Semester Examination, Dec. 2014
M. Tech. (CSE) - Third Semester
SOFTWARE ENGINEERING AND TESTING (CS-M-301)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) Discuss project management issues with scheduling and milestone determination.
     b) Discuss software development life cycle with aspects of estimation and scheduling.

Q.2 a) Briefly explain quality standards and CMM levels.
     b) What are the components of software quality assurance?

Q.3 a) What is a life cycle of bug?
     b) Explain V and V model and different between verification and validations.

Q.4 a) Differentiate between static and dynamic testing.
     b) Explain system testing in detail.
     c) What are strategic testing issues?

Q.5 a) What is cause-effect graph technique? Discuss with an example.
     b) Discuss cyclomatic complexity of the greatest of 3 numbers programs.
     c) Explain data flow testing.

Q.6 Consider the problem of triangle to find whether it is isosceles, scalene or equilateral. Considering three sides a, b, and c such that 1<a<100, 1<b<100, 1<c<100. Design test cases for this problem using BVC and equivalence class partition.
Q.7  a) What is object oriented paradigm? Explain in detail.  
     b) Discuss levels of object oriented testing in detail. 

Q.8  Write short notes on: 
     a) Goals of software testing. 
     b) Interclass testing. 
     c) Advantages of static testing. 

5X3
Q.1  a) Define business intelligence. Explain need of business intelligence for an enterprise.  
     b) Describe the business intelligence framework.

Q.2  a) What is semi-structured data? Explain characteristics of semi structured data. List sources of semi structured data. 
     b) Define unstructured data. Explain the problems faced by an organization to manage growth of unstructured data.

Q.3  a) Explain the difference between roll-up and drill-down operations by taking a suitable example.  
     b) Differentiate between OLAP and OLTP.  
     c) List the applications where you feel data of an OLTP should be warehoused. Justify your answer.

Q.4  a) Differentiate between fact and dimension tables.  
     b) Compare OLTP database and OLAP database. 
     c) What is a data model? List various data models.

Q.5  a) Define the term data warehouse. Differentiate between two different approaches for building a data warehouse.
b) Explain schema integration and instance integration with a suitable example.
7

Q.6  
a) Explain the requirements of dimensional modeling with an example.
5  
b) Explain factless fact with an example.
5  
c) Differentiate between slowly changing and rapidly changing dimensions.
5

Q.7  
a) Explain various dimensional models.
9  
b) Explain four components of metric data.
6

Q.8  
a) What is a dashboard? Explain importance of a dashboard for an enterprise.
7  
b) What is a balance scorecard? Explain four perspectives of a balance scorecard.
8
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRONICS ENGINEERING (EC-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between conductor and a semiconductor.
     b) Define an intrinsic semiconductor.
     c) How can one increase the conductivity of a semiconductor?
     d) Draw the V-I characteristics of Zener diode.
     e) Draw op-amp as a summing amplifier.
     f) What is a voltage multiplier?
     g) What is a counter?
     h) Derive the relation between $\alpha$ and $\beta$.
     i) Convert $(A72E.36)_{16} = (\_\_)_{10}$.
     j) List applications of an LED.

2x10

PART-A

Q.2  a) Explain the working of P-n junction diode at:
     i) No bias.  ii) Forward bias.  iii) Reverse bias.  10
     b) Explain the working of:
        i) Schottky diode.  ii) Photodiode.  5x2

Q.3  a) Explain the working of a half-wave rectifier with a neat diagram and list all its parameters (current and voltage).  10
     b) Explain the working of clipping and clamping circuits.  10

Q.4  a) Explain the static characteristics of a transistor in common emitter configuration.  10
b) Explain the working of a transistor as an oscillator and amplifier.  

10

**PART-B**

Q.5  

a) Draw the block diagram of an op-amp and list its ideal characteristics.  

10  

b) Explain the working of an op-amp as a:  

i) Differentiator.  

ii) Subtractor.  

5x2

Q.6  

a) Convert:  

i) \( (247)_{10} = (\ )_8 \)  

ii) \( (1001102.11)_2 = (\ )_8 \)  

iii) \( (671.179)_{16} = (\ )_2 \)  

iv) \( (0.577024)_{10} = (\ )_{16} \)  

v) \( (0.65625)_{10} = (\ )_2 \)  

2x5  

b) What are basic logic gates? Explain the concept of a universal gate. Draw an Ex-OR-gate by using only four NAND gates.  

10

Q.7  

a) Draw and explain the working of R-2R ladder type D/A converter.  

10  

b) Differentiate between a microprocessor and a microcontroller and list their applications.  

10
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRONICS ENGINEERING (EC-101A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define diffusion and space charge capacitance.
b) Draw the V-I characteristics of an ideal diode.
c) Define peak inverse voltage. Write PIV for half wave rectifier.
d) Why silicon is preferred over germanium?
e) Define slew rate and what is its significance?
f) Derive relation between $\alpha$ and $\beta$.
g) Differentiate between latch and a flip-flop.
h) Prove that $(A + B) (A + C) (B + C) = AB + AC + BC$.
i) Differentiate between combinational and sequential circuits with examples.
j) Differentiate between Unipolar and Bipolar transistors.

Q.2 a) Explain the working of schottky diode along with its application. Why it is called as a hot carrier diode?

b) What is breakdown in case of a diode? Explain various mechanism of breakdown with neat diagram.

Q.3 a) Explain the working principle of emitter follower. Why it is called so?

b) Explain the basic working principle of a transistor as an amplifier.

c) Draw and explain the static characteristics of transistor in common emitter configuration.

Q.4 a) What is a flip flop? Draw and explain the working of JK flip flop along with its truth table.
b) What are universal gates? Construct an ex-or gate using only NOR gates.

c) Convert the following:
   i) \((AFBE.01B)_{16} = ( )_8\)
   ii) \((3456.761)_{10} = ( )_{10}\)
   iii) \((110110001.101)_{2} = ( )_{16}\)
   iv) \((897.5)_{10} = ( )_{2}\)

**PART-B**

Q.5  
   a) Draw the block diagram of op-amp and list its ideal characteristics.
   b) Explain the working of an op-amp as:
      i) Integrator.
      ii) Summing amplifier.

Q.6  
   a) Explain the working of successive approximation type A/D converter.
   b) List specification of D/A converter. Explain the working of binary weighted R-2R ladder D/A converter.

Q.7  
   a) Draw and explain the architecture of 8085 microprocessor.
   b) Differentiate between microprocessor and micro controller.
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRONICS ENGINEERING (EC-101A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are conductors, insulators and semiconductors?
    b) Define drift and diffusion currents.
    c) Draw circuit diagram of center tapped full wave rectifier showing input and output waveforms.
    d) What is doping and why do we do it?
    e) Define ripple factor.
    f) Define virtual ground.
    g) Differentiate between FET and BJT.
    h) Convert: \( (6473.12)_{10} = (\text{ })_{10} \)
    i) Differentiate between latch and flip-flop.
    j) Write the relation between \( \alpha \) and \( \beta \).

2x10

PART-A

Q.2  a) Explain with neat characteristics curve of the p-n junction diode under:
    i) Unbiased condition.
    ii) Forward bias condition.
    iii) Reverse bias condition.

10

b) What is a rectifier? Explain the working of half-wave rectifier alongwith neat waveforms.

10

Q.3  a) Draw and explain the static characteristics of the transistor in common emitter configuration.

10

b) Explain the construction of n-channel JFET and its operation.

10

Q.4  a) What is the difference between combinational and sequential circuits? Draw and explain the working of J-K flip flop.

8
b) Convert the following:
   i) \((A13B)_{16} = (\quad)_{10}\)
   ii) \((7358.9)_{10} = (\quad)_{r}\)

2x2

c) Prove the following:
   i) \(AB + CD = AB \cdot CD\)
   ii) \((A + B)(B + C)(C + A) = AB + BC + CA\)

4x2

**PART-B**

Q.5 a) Draw the circuit diagram of an op-amp used as non-inverting amplifier and derive the expression for its voltage.

8

b) Draw the circuit of an op-amp as an integrator and derive the output expression.

12

Q.6 a) What is an ADC? Explain the working of parallel comparator ADC.

10

b) What do you mean by R-2R ladder DAC? Explain its working.

10

Q.7 Write short notes on *any two*:
   a) Comparison of microprocessor and microcontroller.
   b) 8085 Microprocessor.
   c) op-amp as a differentiator
   d) Bridge rectifier.

10x2
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ELECTRONIC DEVICES AND CIRCUITS (EC-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define electronics.
     b) What is the parameter that indicates whether breakdown mechanism in a diode is avalanche or Zener?.
     c) What is channel length modulation?
     d) Which is the faster device BJT or MOSFET and why?
     e) State an application of tunnel diode and varactor diode.
     f) Draw the characteristic of ideal diode.
     g) Define tilt and sag.
     h) Write Barkhausen’s criteria of oscillations.
     i) Is it possible to fabricate LED using silicon? Justify your answer.
     j) Derive relation between $\alpha$ and $\beta$.

2x10

PART-A

Q.2  a) How potential barrier is formed in PN junction diode? Also describe switching time of PN diode.
     10
     b) Explain construction, working, characteristics and application of varactor diode.

10

Q.3  a) Explain BJT as a switch.
     b) Design the bias network for amplifier in the figure to establish a current $I_E=1mA$ using power supply $V_{cc}=12\,$V, given that $V_B=4\,$V, drop across the collector resistor is $4\,$V and $\beta=100$.

6
Q.4 Describe the expression for mid frequency, low frequency and high frequency gain of RC coupled amplifier with common emitter configuration.

PART-B

Q.5 a) Enumerate the advantages and disadvantages of class A and class D amplifiers.

6

b) Explain the working of push-pull amplifier (Class B). What is cross-over distortion?

14

Q.6 a) Demonstrate with suitable expression, the four properties – gain desensitivity, bandwidth extension, noise reduction and non-linear reduction of negative feedback amplifier.

12

b) What is the feedback topology used in a transconductance amplifier? Calculate $Z_i$ and $Z_o$ for this topology.

8

Q.7 a) Draw and explain the working of a Colpitt’s oscillator. Derive an expression for its frequency of oscillation.

10

b) Explain the working of phase shift oscillator with a circuit diagram.

10
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
DIGITAL ELECTRONICS (EC-302 / EC-302A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten questions:
a) What is positive logic system?
b) Convert \((0.6875)_10\) into octal.
c) Find the distance between BCD digits 0110 and 0111.
d) Give the difference between decoder and demultiplexer.
e) Draw block diagram of \(n\) bit comparator.
f) Define figure of merit of a digital IC.
g) Differentiate between combinational and sequential circuits.
h) List three differences between asynchronous and synchronous sequential circuits.
i) List four processes of conversion of analog to digital signal.
j) Define resolution and linearity of D/A converter.
k) What is the significance of resolution in A-D converter?

2x10

PART-A

Q.2 a) Minimize the four variable logic function using K-map:
\[ f(A, B, C, D) = \sum m(0,1,2,3,5,7,8,9,11,14) \]

b) Construct Hamming code for BCD number 0110. Use even parity.

c) Represent decimal number \((27)_{10}\) in binary form using:
   i) Binary code
   ii) BCD
   iii) Excess 3
   iv) Gray
   v) Octal
   vi) Hex

Q.3 a) Design a 32:1 multiplexer using 16:1 mux and one OR gate.

b) With the help of a block diagram and truth table, draw a decimal to BCD encoder.
c) Explain a programmable logic array with the help of a diagram.

Q.4 Write short notes on any two:
   a) NMOS Nand and NOR gate.
   b) Resistor transistor logic.
   c) Standard TTL Nand gate.

**PART-B**

Q.5 a) Explain the working of master slave flip flop.
   b) Draw the excitation table of SR flip flop and D flip flop.
   c) Explain in detail a four bit bidirectional shift register.

Q.6 a) Design a three bit synchronous counter using JK flip flops.
   b) Design a sequence generator to generate a sequence ...1101011....... .

Q.7 a) Explain R-2R ladder digital to analog converter in detail.
   b) With the help of a diagram explain successive approximation analog to digital converter.

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**End Semester Examination, Dec. 2014**

B. Tech. – Third Semester

**SIGNALS AND SYSTEMS (EC-303)**

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain unit impulse signal.
b) Test periodicity for \( x(t) = \sin 15\pi t \).
c) What are Dirichlet’s conditions?
d) Find Fourier transform of \( x(t) = e^{-|t|} \)
e) What is the ROC for Laplace transform?
f) Find L.T. of \( x(t) = t^3 + 3t^2 - 6t + 4 \)
g) Find Z.T. of \( x[n] = [1, 2, -1] \)
h) State and prove frequency differentiation property of Z.T.
i) Write an expression for finding conditional probability.
j) What is an Ergodic process?

\[ 2 \times 10 \]

**PART-A**

Q.2  
\begin{align*}
\text{a)} & \quad \text{Classify signals using suitable examples.} & \text{10} \\
\text{b)} & \quad \text{Find the energy and power of } x(t) = e^{-3|t|} & \text{5} \\
\text{c)} & \quad \text{Test linearity for } x(t) = \frac{d}{dt} y(t) + y(t) + 4. & \text{5}
\end{align*}

Q.3  
Find the trigonometric Fourier series expansion for half-wave rectified sine wave.  
\[ 20 \]

Q.4  
\begin{align*}
\text{a)} & \quad \text{State and prove time shifting and time scaling property of Laplace transform.} & \text{10} \\
\text{b)} & \quad \text{Find inverse Laplace of: } x(s) = \frac{3s + 2}{(s+1)(s+3)} & \text{10}
\end{align*}

**PART-B**

Q.5  
\begin{align*}
\text{a)} & \quad \text{Find Z.T. of } x(n) = n^2 \cdot u(n) & \text{10} \\
\text{b)} & \quad \text{Find inverse Z.T. of } x(z) = \frac{1}{(1 + z^{-1})(1 - z^{-1})^2} & \text{10}
\end{align*}

Q.6  
\begin{align*}
\text{a)} & \quad \text{Explain central limit theorem.} & \text{10} \\
\text{b)} & \quad \text{Consider the probability density function } f(x) = a e^{-|x|}, \text{ where } x \text{ is a random variable } -\infty < x < \infty. \text{ Find:} \\
\text{i)} & \quad \text{Relation between } a \text{ and } b.
\end{align*}
ii) Probability that outcome of $x$ lies between 1 and 2.

Q. 7  

a) Define cross correlation function for two random processes $X(t)$ and $Y(t)$. Prove that $R_{xy}(\tau) = R_{yx}(-\tau)$

b) Give properties of auto correlation function.
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
ELECTROMAGNETIC FIELD AND WAVES (EC-304 / EC-304A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Determine the divergence of vector field given by \( \vec{A} = x^2 yz \hat{a}_x + xz \hat{a}_z \).
b) States Columbs law.
c) A point charge \( Q_1 = 2mC \) is located in free space at \( P_1(-3, 7, -4) \) while \( Q_2 = 5mC \) is located at \( P_2(2, 4, -1) \). Find the force acting on charge \( Q_2 \) due to \( Q_1 \).
d) State Ampere’s circuital law.
e) Prove with usual notations that \( \nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \).
f) What do you understand by the term: depth of penetration?
g) A low loss transmission line of 100 ohm characteristic impedance is connected to a load of 200 ohm. Calculate the voltage reflection coefficient.
h) What is mutual inductance?
i) Write a short note on del operator \( (\nabla) \).
j) Three point charges \( Q_1 = 10nC, Q_2 = 20nC, Q_3 = -5nC \) are enclosed by surface \( S \). How much flux crosses \( S \)?

2x10

PART-A

Q.2 a) Two point charges of equal mass \( m \), and charge \( Q \) are suspended at a common point by two threads of negligible mass and length \( \ell \). Show that at equilibrium the inclination angle \( \alpha \) of each thread to the vertical is given by:
\[
Q^2 = 16\pi \epsilon_0 mg \ell^2 \sin^2 \alpha \tan \alpha
\]
If \( \alpha \) is very small, show that \( \alpha = 3 \sqrt{\frac{Q^2}{16\pi \epsilon_0 mg \ell^2}} \).

10
b) State Gauss’s law and prove that \( \nabla \cdot \vec{D} = \rho_v \) where \( \vec{D} \) is the electric flux density vector and \( \rho_v \) is the volume charge density.

10
Q.3  
a) Show that the flux density $\mathbf{B}$ at a distance $R$ from a thin linear conductor of infinite length with constant current $I$ is given by $\mathbf{B} = \left( \frac{\mu I}{2\pi R} \right)$.

b) Explain the terms: energy density and energy stored in a magnetic field.

Q.4  
a) Verify that the vector field given by $\mathbf{A} = yz \hat{a}_x + zx \hat{a}_y + xy \hat{a}_z$ is irrotational and solenoidal.

b) Express the vector $\mathbf{B} = \frac{10}{r} \hat{a}_r + r \cos \theta \hat{a}_\phi + \hat{a}_\phi$ in Cartesian coordinates.

---

**PART-B**

Q.5  
a) State and prove Poynting’s theorem.

b) Write a note on the inconsistency of Ampere’s law.

Q.6  
a) Discuss the propagation of plane electromagnetic wave in a perfect dielectric.

b) Calculate the skin depth in copper at 10 GHz. Assume conductivity of copper $\sigma = 5.8 \times 10^7 \text{ mhos/m}$ and permeability equal to that of free space.

Q.7  
a) Derive an expression for the input impedance of a transmission line terminated with any load impedance $z_R$.

b) What are standing waves? Define voltage reflection coefficient and voltage standing wave ratio of a transmission line.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ELECTROMAGNETIC FIELD AND WAVES (EC-304A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) State Gauss’s Divergence theorem.
b) Given \( \mathbf{A} = x^2 \hat{i} + (x - y) \hat{k} \). Find curl \( \mathbf{A} \).
c) State Coulomb’s law of electrostatics.
d) Obtain the relation between \( \mathbf{E} \) and \( \mathbf{V} \).
e) Define electric field intensity and electric flux density.
f) What is magnetic vector potential?
g) State Biot-Savart’s law.
h) Explain transmission line as a distributed circuit.
i) Define surface impedance.
j) Write down Maxwell’s equations for static fields.

2x10

PART-A

Q.2
a) Write a note on Cylindrical and spherical co-ordinate systems.
10
b) State and prove stokes theorem.
10

Q.3
a) Find the electrostatic potential \( \mathbf{V} \) at any point \( P \) due to an electric dipole and hence find electric field intensity \( \mathbf{E} \).
10
b) State and prove uniqueness theorem.
10

Q.4
Write short on any four.
i) Ampere’s force law.
ii) Magnetic boundary conditions.
iii) Ampere’s circuital law and its applications.
iv) Self and mutual inductances.
v) Energy density in magnetic fields.
5x4
**PART-B**

Q.5  a) What is poynting theorem? Derive an expression for the poynting vector. 

10

b) Write short notes on Faraday’s law and equation of continuity for time varying fields.

10

Q.6  a) For free space, show that intrinsic impedance:

\[ \eta_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}}. \]

10

b) Write short note on wave propagation in a good conductor and good dielectric. 10

Q.7  a) Derive an expression for input impedance of a transmission line terminated in load impedance \( Z_R \).

10

b) A transmission line has the following line constants:

\[ R = 10.4 \, \Omega \]
\[ L = 3.66 \, mH \]
\[ C = 0.00835 \, \mu F \]
\[ G = 0.08 \, \mu ohm^{-1} \]

Calculate characteristic impedance \( Z_0, \alpha, B \) and \( \beta \) at \( w = 5000 \) radians/s.

10
End Semester Examination, Dec. 2014
B. Tech. – Fourth / Fifth Semester
MICROPROCESSORS AND INTERFACING (EC-401 / EC-401A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw the control word of 8259 PIC.
b) What is a microprocessor?
c) What is the difference between 8085 \( \mu \) p and 8086 \( \mu \) p? Write at least 4 points.
d) What is the difference between MOV and MVI? 
e) What is the function of instruction queue in 8086?
f) Write the features of mode 0 in 8255.
g) What are the modes of operations used in 8253? 
h) If DS address is 4100 H, offset is 0002 H, calculate physical address.
i) What is the difference between block transfer mode and cycle steal mode?
j) Write the addressing modes of the following instructions of 8085:
   i) XCHG
   ii) LHLD 2050 H
   iii) JNC 2000 H
   iv) XRI 02 H

PART-A

Q.2 a) Explain the function of the following pins:
   i) ALE  ii) READY  iii) HOLD  iv) RSET
   IN  v) \( S_0 \) and \( S_1 \).
   5
b) Draw and explain the architecture of 8085.
   10
c) Write an assembly language program to find the largest number of two numbers. The numbers are stored at memory locations 2050 and 2051, respectively. The result is to be stored at memory location 2060.
   5

Q.3 a) Explain INTO, INTI, INT2 and INT3 of 8086.

2x10
b) Draw and explain the function of the pins of the minimum mode configuration of 8086.

c) Explain in detail with example of PSW of 8086.

d) Define pipelining.

Q.4
a) Write a program using 8086 to copy 12 bytes of data from source to destination.

b) Explain in detail with example of all types of addressing modes of 8086.

c) Explain the functions of the following instructions:
   i) SHL AX, CL
   ii) ROL AL, l
   iii) CLD
   iv) MOVSW
   v) LOOPE

PART-B

Q.5
a) Differentiate between memory mapped I/O and I/O mapped I/O.

b) Draw and explain the block diagram of 8259 PIC.

c) Draw the control word for BSR and I/O mode of 8255.

Q.6
a) Set PC2, PC4 and PC6 and reset them after a delay of 100 ms. Assume address for control register as 87 H.

b) Explain mode 1 of 8255 for input and output configuration by giving status of its control word, control signals and timing diagram.

Q.7
a) Draw the block diagram of 8237 DMA controller.

b) Draw ICW1, ICW2, ICW3, ICW4. OCW1, OCW2, OCW3.

c) Draw the control word of 8253 and explain square wave generator with a timing diagram.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
MICROPROCESSORS AND INTERFACING (EC-401 / EC-401A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) What is the role of HL register pair in 8085?
   b) What is the difference between instructions SUB and CMP in 8085?
   c) What will be the status of carry flag and accumulator after execution of following sequence of instructions?
      STC
      CMC
      MVI A, 88H
      RLC
   d) Explain the function of BHE and LOCK signals of 8086.
   e) Name the segment registers of 8086.
   f) Assume (CL) = 02H, (AX) =2345H. Determine the new contents of AX and carry flag after execution of SAL AX, CL.
   g) How many address lines are required to access 8K memory?
   h) Write control word for 8255 for BSR mode to set bits PC1, PC5 and PC6.
   i) Explain the format of control word register of 8253.
   j) What is DMA operation?
   k) What do you understand by the term paging?
   l) Write assembly language instructions to load 50H at memory location 3000H, add it with the contents of memory location 3100H and store the result at memory location 3200H.

   2x10

PART-A

Q.2 a) State the function performed and addressing mode used for the following instructions of 8085:
   i) LXI B, 5410H
   ii) DAD B
   iii) SUI 04H
   iv) STA 2645H
   v) LHLD 1550H

   3x5
b) Write assembly language program to divide a hex number stored at location 2448H by 2 and store the result at location 2451H.

Q.3  

a) Explain the Min and Max mode of 8086.

b) Draw the functional block diagram of 8086 and briefly explain the function of each block.

c) How physical address is generated in 8086? Explain with example.

Q.4  

a) Explain direct addressing, indirect addressing and register relative addressing modes of 8086 by giving suitable examples.

b) Describe the functions performed by the following instructions of 8056:
   i) AAA
   ii) STD
   iii) RCL AX, CL

c) Write any four assemblers directives used for 8086 and explain their functions.

PART-B

Q.5  

a) Draw the generalized block diagram of internal structure of RAM. Illustrate its interfacing with a microprocessor. Explain the purpose of each and every signal used therein for interfacing.

b) What various methods are used for address decoding in memory interfacing. Explain any one with an example.

c) Compare memory mapped I/O and peripheral mapped I/O address schemes.

Q.6  

a) Explain the programmed I/O data transfer scheme used for transferring the data between I/O device and microprocessors.

b) Draw the functional block diagram of PPI 8255 and explain the function of its each block.
c) Illustrate the control word format and control signals of PPI 8255 for its mode 2 operation with port A as bidirectional and port B in mode 1.

Q.7  

a) Explain the various operation modes of a PIC 8259.

b) Write short notes on:
   i) Protected and virtual operating modes.
   ii) DMA controller 8237.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
MICROPROCESSORS AND INTERFACING (EC-401 / EC-401A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  Answer any ten:
   a) Give the format of flag register of 8085. Explain each flag.
   b) Why AD0-AD7 lines are multiplexed?
   c) What will be the status of SP, B and C registers after execution of the following instructions:
      LXI SP, 2000H  
      LXID, 0305H  
      LXIB, 9037H  
      PUSH D  
      POP B  
   d) Suppose DS=0200H, BX=0300H, DI=0400H. Determine physical address for the following instruction:
      i) MOV AH, [3456]  
      ii) MOV [D1], AH  
   e) What do you understand by vector interrupts?
   f) Find first address of 8 kB memory chip if its last address is 9FFFH.
   g) Explain control word register of 8253.
   h) Explain the functions of QSO, QS, and signals of 8086.
   i) Give the format of OCW1 of PIC 8259.
   j) What do you understand by divide by zero interrupt of 8086?
   k) List the different data transfer schemes between Z10 device and microprocessor.
   l) Explain the following terms:
      i) Cycle stealing.  
      ii) Burst mode.  

2x10

PART-A

Q.2  a) Draw the functional block diagram of 8085 M.P. and explain the function of IR, instruction decoder, HL pair.  

10

b) Describe any three addressing modes of 8035 with suitable examples.  

6
c) Explain the function performed by the following instructions:
   i) OUT 30H
   ii) STAX B
Q.3 a) Explain minimum and maximum mode configuration in 8086.
   b) Describe the functions performed by the following signals of 8086:
      i) TEST
      ii) DTI\(\bar{R}\)
      iii) RAEDY
      iv) LOCK
      v) BHE
Q.4 a) Write down any three assembler directives and explain their functions.
   b) What are the advantages of using memory segmentation?
   c) Explain the following instructions:
      i) SCASB
      ii) XLAT
      iii) DIVCL
      iv) RCL
      v) STD
   PART-B
Q.5 a) What are the different methods used for address decoding? Explain them.
   b) Interface 4k x 8 RAM, 8K x 8 ROM with 8085. Draw memory MAP. Explain the purpose of every signal used in interfacing.
Q.6 a) Explain interrupt drives data transfer and programmed data transfer schemes.
   b) Draw the block diagram of 8255 programmable peripheral interface and explain the CWR format for BSR and I/O configuration.
Q.7 a) Explain the following modes of 8253:
      i) Interrupt on terminal count.
      ii) Square wave generator.
   b) Explain the function of IMR, ISR and cascade buffer of PIC 8259.
   c) Explain the function of the following registers of 8237:
      i) Request register.
ii) Status register.
Q.1  
a) What is Fourier series as a complex exponential?  
b) What is the difference between time domain representation and frequency domain representation of signals?  
c) What are advantages of modulation?  
d) What is Hilbert transform? Give its applications.  
e) The signal to noise ratio at the input of an amplifier is 40 dB. If the noise figure of an amplifier is 20 dB, calculate the signal to noise ratio (in dB) at the amplifier output.  
f) What do you mean by shot noise?  
g) A receiver has a noise power bandwidth of 12 kHz. A resistor which matches with the receiver input impedance is connected across the antenna terminals. What is the noise power contributed by this resistor in the receiver bandwidth? Assume temperature to be 30° C.  
h) A 400 W carrier is modulated to a depth of 75%. Find the total power in the amplitude modulated wave. Assume the modulating signal to be a sinusoidal one.  
i) A carrier wave is represented by the expression $V_c(t) = 10 \sin \omega t$. Draw the waveform of an AM wave for $m=0.5$.  
j) What is wideband FM? Where it is used?

2x10

PART-A

Q.2  
a) Obtain the Fourier series of the sawtooth wave form.
b) State and prove any 5 properties of Fourier transform.

Q.3  a) Derive an expression for noise factor of amplifier in cascade (Friiss formula).

b) An amplifier circuit having a noise figure of 9 dB and power gain of 25 dB is followed by a mixer having a noise figure of 16 dB. Calculate the overall noise figure of the combination.

Q.4  a) Explain any one method of SSB generation and write the advantages of SSB over DSB-FC signal. Give the reason why SSB is not used for broadcasting?

b) In an AM system, the modulating signal is sinusoidal with frequency $f_m \ Hz$. If 80% modulation is used, then find the ratio of total side-band power in the modulation signal, to the total power.

**PART-B**

Q.5  a) Explain the indirect method of FM generation.

b) An FM wave is given by: $S(t) = 20\sin (6\times10^3 t + 7\sin1250t)$ .
   Determine:
   i) The carries and modulating frequencies, the modulation index and the maximum deviation.
   ii) Power dissipated by this FM wave in a 100 ohm resistor.

Q.6  a) Draw the block diagram of super heterodyne receiver and explain each block. Write the advantages of super heterodyne receiver.

b) Explain the concept of double spotting in a super heterodyne receiver.
c) For a receiver with IF and RF frequencies of 455 kHz and 900 kHz, respectively determine the following:
   i) Local oscillator frequency
   ii) Image frequency
   iii) Image frequency rejection ratio for a pre-selector Q of 80.

Q.7 a) Explain the noise in an AM receiver and give the figure of merit of the AM receiver.

   10

b) Explain the pre-emphasis and de-emphasis in FM.

   5

c) Assuming sinusoidal modulation, prove that in an AM system with envelope detection, the output signal to noise ratio (SNR) is given by

\[
\left( \frac{S}{N} \right)_0 = \frac{m^2}{2 + m^2} \gamma \]

where \( m \) is modulation index for AM and \( \gamma = \frac{S_i}{nf_m} \).
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
ANALOG ELECTRONIC CIRCUITS (EC-403)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define CMRR and slew rate.
b) What is a current mirror?  
c) Draw the circuit of a voltage follower.  
d) What is the principle of OTA?  
e) Write advantages of IC voltage regulator.  
f) Why 555 timers are called so?  
g) Differentiate between active and passive filters.  
h) Why distortion occurs in triangular waveform generator at low frequency?  
i) What is Barkhausen criterion of oscillation?  
j) What do you mean by quality factor?  
2x10

PART-A

Q.2  
a) With the help of circuit diagram and waveforms, explain the operation of an emitter coupled differential amplifier in differential node.  
10  
b) Draw the basic block diagram of an operational amplifier. Explain all the blocks and list the ideal characteristics of an op-amp.  
10

Q.3  
a) What are controlled sources in an op-amp? Explain the working of:  
i) Voltage controlled voltage source  
ii) Voltage controlled current source  
10  
b) Explain the working of an operational amplifier as a differentiator with input and output waveform.  
10

Q.4  
a) What is a multivibrator? Explain the working of astable multivibrator with proper waveform.  
10
b) List applications of Schmitt trigger circuit. 5

c) Draw and explain the working of precision rectifier in brief. 5

**Part-B**

Q.5  a) Draw the circuit diagram of Sallen-Key low pass filter and analyse various parameters for low pass unity gain Sallen-Key filter. 10

b) What is a bandpass filter? Calculate its transfer function using single op-amp. 10

Q.6  a) Explain digitally controlled frequency synthesizer. 10

b) Explain the working of crystal controlled oscillator with the help of a circuit diagram. 10

Q.7  a) What are op-amp regulators? Explain the working of an op-amp series voltage regulator. 10

b) Explain SMPS with the help of a circuit diagram. 10
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
ANALOG ELECTRONIC CIRCUITS (EC-403)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between active and passive filter.
b) Define gain bandwidth product for op-amp.
c) Define capture range of PLL.
d) Define active load.
e) Define slew rate and CMRR.
f) Draw voltage to current converter.
g) List characteristics of power supply.
h) Why $R_i = \infty$ and $R_o = 0$ in case of ideal op-amp?
i) Differentiate between comparator and Schmitt trigger.
j) What is a peak detector?

2x10

PART-A

Q.2 a) Draw and explain each block of an operational amplifier.

10

b) Explain the concept of virtual ground.

5

c) Realize a circuit to obtain $V_{out} = 2V_1 + 3V_2 + 4V_3$ using op-amp. Use minimum value of resistance as 10 k.

5

Q.3 Explain the working of op-amp as:

a) Instrumentation amplifier.
b) Current to voltage converter.
c) Voltage follower.
d) Integrator.

5x4

Q.4 a) Explain the working of Schmitt trigger.

10
b) Explain the working of precision full wave rectifier.

PART-B

Q.5  a) Explain the working of wein bridge oscillator with the help of op-amp. Derive an expression for its frequency.

b) Explain Sallen-key unity gain filter.

Q.6  a) Draw the block diagram and pin configuration of 555 timers. List the modes of operation and explain any one mode of operation.

b) Explain the working of twin T-oscillator.

Q.7  Write short notes on any two:

a) PLL.
b) SMPS.
c) Op-amp as voltage regulator.
d) Multi op-amp function generator.

10x2
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
COMMUNICATION ENGINEERING-I (EC-404)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define a signal. What are different types of signals?
   b) What is the difference between baseband and passband signals?
   c) The carrier signal performs certain functions in radio communication. What are they?
   d) State and prove time scaling property of Fourier transform.
   e) What are the advantages of vestigial side band over SSB?
   f) What do you mean by coherent detection?
   g) The modulating frequency in frequency modulation is increased from 10kHz to 20kHz. What will be the effect on bandwidth?
   h) What are the limitations of TRF receivers?
   i) Define the term: tracking.
   j) Define flicker noise.

   2x10

PART-A

Q.2 a) What are elements of a communication system? Explain their fundamental limitations.

   10

   b) What are the advantages of digital communication system over analog communication systems?

   10

Q.3 a) Find the Fourier series expansion of full-wave rectified sine wave.

   10

   b) State and prove the following properties of Fourier transform:
      i) Conjugate function
      ii) Time differentiation theorem
      iii) Frequency convolution theorem

   10

Q.4 a) Derive the expression for power in AM.

   10
b) Describe the square law method of generating AM signal and envelope detector for demodulation.

**PART-B**

Q.5  
10

a) Explain in detail, direct method for FM generation. What are its drawbacks?

b) Explain the operation of a ratio detector.

Q.6  
10

a) Draw the block diagram of a superheterodyne receiver and explain each block in brief.

b) What is intermediate frequency? What is the criteria for selecting intermediate frequency?

5

c) What is AGC? How AGC is obtained in a practical diode detector? Explain with a neat diagram.

Q.7  
5

a) Explain the following terms:
   i) Noise figure
   ii) S/N ratio
   iii) Noise temperature
   Derive an expression of noise temperature in terms of noise figure.

5x3

b) What are the causes and effects of thermal noise?
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
COMMUNICATION ENGINEERING-I (EC-404)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the need for modulation?
     b) Explain discrete time signals and classify them.
     c) State Dirichlet’s conditions for Fourier series.
     d) State Parseval’s power theorem.
     e) What is the significance of DSB-SC modulation?
     f) Write an expression for total power in AM wave.
     g) A 15 kHz audio signal is frequency modulated with modulation index $\beta = 5$. Calculate the transmission bandwidth of FM signal.
     h) Discuss the role of mixer in super heterodyne receiver.
     i) Define the term premphasis and deemphasis in FM receiver.
     j) What do you mean by equivalent noise bandwidth?

$2\times10$

2x10

PART-A

Q.2  a) Define a signal. Explain different types of signals. Gives examples of each.

$12$

b) Explain the difference between the following systems:
   i) Causal and non-causal system.
   ii) Linear and non-linear system.

$8$

Q.3  a) State and prove differentiation property of a Fourier transform.

$5$

b) Find the Fourier series expansion of half-wave rectified sine wave.

$15$

Q.4  a) With a neat block diagram, explain the balanced modulator method of generating a DSBSC wave.

$10$
b) Describe envelop detector method for demodulation of AM waves. 

10

**PART-B**

Q.5  
 a) Differentiate between narrow band and wideband FM.  
  6 
 b) What are the advantages and disadvantages of FM?  
  6 
 c) Compare AM with FM.  
  8 

Q.6  
 a) Describe turned radio frequency receiver. What are its drawbacks?  
  10 
 b) Explain FM receiver with a suitable block diagram.  
  10 

Q.7  
 a) Define noise. Explain its various types.  
  10 
 b) What is noise equivalent bandwidth? Derive an expression for noise equivalent bandwidth.  
  6 
 c) Derive an expression for voltage model of a noisy resistor.  
  4
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
ANTENNA AND WAVE PROPAGATION (EC-501 / EC-501A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define characteristic impedance. What is its value for free space?  
b) Define magnetic vector potential.  
c) Write expression for total power radiated by a short electric dipole.  
d) Differentiate between radian and steradian.  
e) What do you mean by principal plane pattern?  
f) What is the relationship between effective aperture and directivity?  
g) Why is Loop antenna called magnetic dipole?  
h) Mention two limitation of lens antenna.  
i) What is the necessary condition for a uniform linear array to be broad side array?  
j) Define the term ‘skip distance’.  

PART-A  

Q.2  
a) What is the radiation resistance of an antenna? Show that the radiation resistance of a half wave dipole is 73 ohms.  

Q.3  
a) An antenna has a radiation resistance of 72 ohms and a loss resistance of 10 ohms. Calculate efficiency of the antenna.  
b) Find the maximum aperture of an antenna, when its operating wavelength is 2 m and directivity of 100.  
c) Derive a relationship between directivity and maximum aperture of an antenna.
Q.4  a) What is the operating principle of log periodic dipole antenna? What is its gain? What are its characteristics and applications?  
   
 b) Explain the construction and working principle of biconical antenna. Explain its characteristics.  

Q.5  a) Derive the following expression for refractive index of ionosphere  
\[ \mu = \sqrt{1 - \frac{81N}{f^2}} \]  

 b) Discuss in detail, phenomenon of sky wave propagation.  

Q.6  a) State and explain the principle of pattern multiplication. Use this principle to find the radiation pattern of four isotopic elements, fed in phase and \( \frac{\lambda}{2} \) apart.  

 b) What is a grating lobe? Briefly explain how it can be avoided in a uniform broadside array?  

 c) What is an array factor?  

Q.7  a) Describe the direct comparison method for measurement of gain in antenna.  

 b) What is noise figure of an antenna? Explain the technique for its measurement in detail.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
DIGITAL SIGNAL PROCESSING (EC-502 / EC-502A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Calculate Z.T. of \( x[n] = 3 \delta(n) + 2 \delta(n-1) + 5 \delta(n+2) \).
    b) Plot the signal \( y[n] = 4[-n + 2] \).
    c) Find linear convolution between:
       \( x_1[n] = [1,1,1] \) and \( x_2[n] = [2,2] \).
    d) State and prove time shifting property of DTFT.
    e) Draw stage wise flow graph of radix z DIT FFT algorithm for \( N = 4 \).
    f) What is meant by finite word length effect?
    g) What is Gibb's phenomenon?
    h) Write expression for Hanning window function.
    i) Draw mapping between \( s \) plane and \( z \) plane.
    j) Write mapping formula for impulse invariant method to design IIR filter.

2x10

PART-A

Q.2  a) Find \( x(n) \) if \( x(z) = \frac{z + 2}{2z^2 - 7z + 3} \) when ROC is:
    i) \( |z| > 3 \)
    ii) \( |z| < \frac{1}{2} \)

10

b) Find the output of a system whose input and impulse responses are given as:
   \( x(n) = \{1,2,3,1\} \) and \( h[n] = \{1,1,1\} \).

5

c) Find Z.T. of \( x(n) = a^{|n|} \).

5

Q.3  a) Find DFT of \( x(n) = [0,1,2,3] \) Take \( N = 8 \).

8

b) DFT of a discrete sequence is:
   \( X(k) = [6,0,-2,0] \). Find \( x(n) \).

8

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c) Find DTFT of \( x(n) = 2^n.4[-n] \)

Q.4
a) Find circular convolution between:
\( x[n] = [1,2,1,2] \) and \( y[n] = [3,2,1,4] \)

b) Find DFT using DIF FFT algorithm for:
\( x[n] = \left[ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 1, 0 \right] \).

PART-B
Q.5
a) A LPF is to be designed with the following desired frequency response:
\[
H_d[e^{j\omega}] = \begin{cases} 
  e^{-j2\omega} & -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\
  0 & \frac{\pi}{4} < |\omega| \leq \pi 
\end{cases}
\]
Find filter coefficients \( h_d(n) \), if the window function is
\( \omega(n) = \begin{cases} 
  1 & 0 \leq n \leq 4 \\
  0 & \text{otherwise}
\end{cases} \)
Also find the frequency response \( H[e^{j\omega}] \).

b) Explain the magnitude and phase response of digital filters and the necessary condition to prove that phase of FIR filter is linear.

Q.6
a) What is bilinear transformation? Explain frequency working.

b) Differentiate between Butterworth and Chebyshev filters.

Q.7
a) Explain how to alter sampling rate by a fraction.

b) Explain the need and use of multirate DSP.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
DIGITAL SYSTEM DESIGN (EC-503 / EC-503A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is VHDL? Why is it used?
b) Define data types. List various data types used in VHDL.
c) What are concurrent signal assignment statements?
d) Why are generics required in VHDL?
e) Write the components declaration for structural model of de-multiplexer.
f) What is the significance of preset and clear input in a flip-flop?
g) Write the VHDL statement to make the flip-flop as:
   i) Positive edge triggered.
   ii) Negative edge triggered.
h) How many address and data lines are required for a memory of 2048 bytes?
i) Define PLD. List various types of PLDs.
j) What is a macro-cell? Where is it used?

2x10

PART-A

Q.2
a) What is operator overloading? Using the concept of operator overloading describe how can the binary numbers be added using arithmetic operator.

10

b) Draw the driver for signal z. The assignment statement for signal z are given below:
z<=after 5 ns; 21 after 9 ns, 6 after 19 ns;
z<=reject 4ns inertial 6 after 12 ns; 20 after 19 ns;

5

c) What is a signal driver? When is it created and when is it appended?

5

Q.3
a) Explain the subprogram overloading and describe various ways through which a particular subprogram is called among the overloaded subprograms.

15

b) What is the difference between named association mapping and positional mapping? Give an example.

5
Q.4  
a) Write VHDL code of 1:4 de-multiplexer using behavioral modeling.  
   10
b) Write VHDL code of full subtractor using structural modeling.  
   10

   **PART-B**

Q.5  
a) Write VHDL code for 4-bit down counter.  
   10
b) Write VHDL code in structural modeling of 4 bit P150 register.  
   10

Q.6  
a) Implement 16-bit ALU using VHDL model.  
   10
b) Explain architecture of a simple microcomputer system.  
   10

Q.7  
a) Implement the following Boolean functions using an appropriate PCA:  
   \[ F_1(A, B, C) = \Sigma \bar{m}(0, 4, 7) \]
   \[ F_2(A, B, C) = \Sigma \bar{m}(4, 6) \]  
   10
b) Why is GAL used? Explain the architecture of GAL in detail.  
   10
End Semester Examination, Dec. 2014
B. Tech. – Fourth / Fifth Semester
COMMUNICATION ENGINEERING (EC-504)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO
questions from Part A and TWO questions from Part B. Each question carries
equal marks.

Q.1 a) State sampling theorem. If \( x(t) = \cos \frac{2\pi t}{T} \cdot \sin \frac{4\pi t}{T} \) is to be sampled, what is the
maximum sampling interval.
b) In a PCM system, the signal to noise ratio is to be held to a minimum of 40
dB. Determine the number of quantization levels needed.
c) Explain binary PSK modulation scheme.
d) Define Baud rate and bit rate. Compare both with suitable example.
e) Give the signal space characterization of QPSK signal.
f) Mention the significance of spread spectrum modulation.
g) What is an optimum filter? Write the expression for probability of error for an
optimum filter.
h) List the characteristics of PN sequence.
i) Calculate the capacity of AWGN channel with a bandwidth of 1 MHz and an
S/N ratio of 40 dB.
j) A source X generates one of five equally likely messages every microsecond.
Calculate the information rate of this source.

2x10

PART-A

Q.2 a) What is pulse modulation? Explain different types of PTM techniques.

7

b) Derive the expression for signal to quantization noise ratio for a PCM system
that employs linear quantization technique. Assume that the input to the PCM
system is a sinusoidal signal.

6

c) Explain delta modulation. How can we overcome slope overload error?

7

Q.3 a) Explain the working of QPSK. List its advantages and disadvantages.

10
b) Write a short note on: GMSK technique.  

Q.4 a) What is matched filter? Derive an expression for probability of error of a matched filter.  

b) Explain coherent and non-coherent reception of an FSK signal.  

PART-B

Q.5 a) Derive the expression for probability of error for an FSK signal using signal space representation.  

b) A binary data is transmitted using ASK over AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1 mV. Noise power spectral density is $N_0/2 = 10^{-15}$ W/Hz. Find the average probability of error if detector is coherent. Take $\text{erfc}(5) \approx 3 \times 10^{-6}$.  

Q.6 a) Define entropy. Derive the relation: $H(XY) = H(X) + H(Y/X)$. Show that if $X$ and $Y$ are statistically independent, then $H(Y/X) = H(Y)$.  

b) A source $X$ has five symbols $x_1$, $x_2$, $x_3$, $x_4$ and $x_5$ with $P(x_1) = 0.4$, $P(x_2) = 0.19$, $P(x_3) = 0.16$, $P(x_4) = 0.15$ and $P(x_5) = 0.1$. Construct a Shannon Fano code for $X$ and calculate the efficiency of the code. Repeat for the Huffman code and compare the results.  

c) Consider a binary memoryless source $X$ with two symbols $x_1$ and $x_2$. Show that $H(x)$ is maximum when both $x_1$ and $x_2$ are equiprobable.  

Q.7 a) Explain the concept of CDMA. What are its advantages?  

b) Describe in detail, acquisition and tracking of frequency hopped signal.  

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End Semester Examination, Dec. 2014
B. Tech. – Fourth / Fifth Semester
COMMUNICATION ENGG-II (EC-505 / EC-508)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is a sample and hold circuit?
b) How do you generate PPM from PWM?
c) Find out the minimum bandwidth required to pass a 20 kbps binary signal using amplitude shift keying. What is the band rate of the channel?
d) What is companding? How does it reduce SNR in a PCM system?
e) What is a matched filter? Write the formula for probability of error of the matched filter.
f) A message source generates one of four messages randomly every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.1. Each emitted message is independent of the other messages in the sequence.
   i) What is the source entropy?
   ii) What is the rate of information generated by this source (in bits per sec)?
g) A random variable has an exponential PDF given by \( f(x) = 2ae^{-3bx} \), where a and b are constants. Find the relation between a and b.
h) What do you mean by ergodic process? Compare it with wide sense stationary process.
i) What is auto-correlation function? Prove that autocorrelation function has maximum value at zero time lag.
j) A random variable \( x \) is uniformly distributed between a and b. Find its mean.

2x10

PART-A

Q.2
a) Explain pulse code modulation in detail. A signal \( x(t) \) is uniformly distributed in the range \( \pm A \). Calculate signal to noise ratio for pulse code modulation of this signal.
b) Explain delta modulation. Derive the condition for no slope overload distortion in delta modulation system.

10

Q.3 a) Explain coherent PSK receiver. Obtain an expression for probability of error for PSK with coherent receiver.

10

b) A binary data is transmitted using ASK over AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1 mV. Noise power spectral density is \( \frac{N_0}{2} = 10^{-15} W/Hz \). Find the average probability of error if detector is coherent. Take \( \text{erfc}(5) \approx 3 \times 10^{-6} \).

5
c) Explain MSK in detail.

5

Q.4 What is an optimum filter? Derive an expression for transfer function and probability of error for an optimum filter.

20

PART-B

Q.5 a) Messages \( Q_1, \ Q_2, \ Q_3, \ldots, Q_m \) have probabilities \( P_1, P_2, P_3, \ldots, P_m \) of occurring.
   i) Write an expression for entropy, \( H \)
   ii) If \( M=3 \), prove that maximum entropy, \( H_{\text{max}} = \log_2 3 \).

5

b) State and prove Shannon Hartley theorem. A communication system has \( \frac{S}{N} = 31 \) and \( BW = 3 kHz \). Find the allowable percentage reduction in signal power if \( BW \) is increased to 4 kHz.

10

c) Find the code efficiency for six messages with probabilities 0.25, 0.12, 0.15, 0.08, 0.30, 0.10. Use Huffman coding.

5

Q.6 a) The joint PDF \( f_{xy}(x, y) \) of two continuous random variables is given by
   \[ f_{xy}(x, y) = xy e^{-x^2} e^{-y^2/2} u(x)u(y). \]
   i) Find \( f_x(x) \) and \( f_y(y) \).
   ii) Are \( x \) and \( y \) independent?

7
b) State and explain central limit theorem.

c) Consider the relation, \( y = x^2 \). Find the pdf of \( y \) in terms of pdf of \( x \).

Q.7  

a) What is power spectral density? State its properties. Determine the power spectral density and the mean square value of a random process \( x(t) = A \cos(\omega t + \phi) \) where \( \phi \) is a random variable uniformly distributed over \((0, 2\pi)\).

b) Let \( x(t) \) and \( y(t) \) be defined by:

\[
x(t) = A \cos \omega t + B \sin \omega t \\
y(t) = B \cos \omega t - A \sin \omega t
\]

where \( \omega \) is a constant and \( A \) and \( B \) are independent random variables, both having zero mean and variance \( \sigma^2 \). Find the cross correlation of \( x(t) \) and \( y(t) \).
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
WIRELESS COMMUNICATION (EC-506)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) 1G system relies on which multiple access technology.  
b) What is path loss exponent?  
c) Define co-channel re-use ratio.  
d) In flat fading what is the relationship between signal bandwidth Bs and coherence channel bandwidth Bc.  
e) Differentiate between FDD and TDD.  
f) What is vocoder?  
g) What is spread spectrum multiple access?  
h) What are various propagation mechanisms?  
i) What is the frequency band of GSM system and bluetooth technology?  
j) What is bluetooth technology?

2x10

PART-A

Q.2  
a) With the help of a diagram explain paging system.  
10  
b) Give comparative study of common wireless communication systems.  
10

Q.3  
a) Explain free space path loss model. At what rate the received power strength decays per decade change in operation distance between transition and receiver.  
10  
b) Explain fading effects due to doppler spread.  
10

Q.4  
a) What 2G standard? Explain signal processing in a GSM system.  
10  
b) Write a brief on 3G, 4G and LTE.  
10


**PART-B**

Q.5  
  a) What is equalization? Explain linear equalizer.  
      10  
  b) What is diversity technique? Why do we need it? Explain time diversity.  
      10  

Q.6  
  a) Assume distance between co-channel cell is 'D' and radius of hexagonal cell is 'R'. Derive an expression for the worst case signal to interference ratio (S/I).  
      10  
  b) Explain the concept of cell splitting.  
      10  

Q.7  
  a) Explain the difference between FDMA, TDMA and CDMA.  
      10  
  b) Write a brief on ALOHA with needful derivation.  
      10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
COMMUNICATION ENGINEERING-II (EC-508)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) State sampling theorem. If \( x(t) = \cos 200t \sin 400t \) is to be sampled, what is the maximum sampling interval.

b) Six message signals each of bandwidth 5 kHz are TDM and transmitted. Determine the signalling rate and channel bandwidth of the PAM/TDM channel.

c) Compare FSK and PSK.

d) Explain slope overload error and granular noise with respect to delta modulation.

e) What is an optimum filter? Write an expression for probability of error of optimum filter.

f) For a lossless channel show that:

\[ H(X / X) = 0 \]

g) The pdf of random variable \( X \) is given by:

\[ f_x(x) = ae^{-|x|} \]

Find the relation between \( a \) and \( b \).

h) Let \( x \) be a random variable uniformly distributed over \([a, b]\). Find the mean of \( x \).

i) What is autocorrelation function, \( R_{xx}(\tau) \). Show that \( R_{xx}(\tau) = R_{xx}(-\tau) \)?

j) Explain the term-cross spectral density.

\( 2\times10 \)

**PART-A**

Q.2  

a) Find out the following for an audio signal with bandwidth of 20 kHz and digitally encoded using PCM.

i) Nyquist rate.

ii) If the Nyquist samples are quantized into 256 levels, determine the number of binary digits required to encode the quantized samples.

iii) Determine the maximum bandwidth required to transmit the encoded signal.
b) Why companding is needed? Discuss the various laws of companding.

6

c) Explain DPCM in detail. What is the need of predictor in DPCM?

8

Q.3  
a) Explain M-ary PSK. Give the performance comparison of BPSK and QPSK.

10

b) Derive an expression for bit error probability for quadrature PSK receiver and draw block diagrams for modulator and demodulator.

10

Q.4  
What is a matched filter? Derive an expression for the impulse response of a matched filter.

20

PART-B

Q.5  
a) Define mutual information. Prove that \( I(XY) = H(X) + H(X/Y) \).

5

b) An analog signal having 4 KHz bandwidth is sampled at 1.25 times the Nyquist rate and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

i) What is the information rate of this source?

ii) Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 kHz and an S/N ratio of 20 dB.

iii) Find the S/N ratio required for error-free transmission for part ii).

9

c) A source \( X \) has five symbols \( x_1, x_2, x_3, x_4, \) and \( x_5 \) with respective probabilities 0.2, 0.15, 0.05, 0.1 and 0.5.

i) Construct a Shannon Fano code for \( X \) and calculate the code efficiency.

ii) Repeat (i) for the Huffman code.

6

Q.6  
a) The joint pdf of \( X \) and \( Y \) is given by:

\[
 f_{XY}(x, y) = \frac{1}{4} e^{-|x|+|y|}
\]

i) Find the marginal pdfs \( f_x(x) \) and \( f_y(y) \).

ii) Are \( X \) and \( Y \) independent?

5

b) Find the covariance of \( X \) and \( Y \) if:

i) They are independent.
ii) \( y \) is related to \( x \) by \( y = ax + b \).

c) State and explain central limit theorem.

Q.7  
a) What is power spectral density? State and prove its properties.

b) Consider a random process \( X(t) \) given by:
\[
X(t) = A \cos(\omega t + \Omega)
\]
Where \( A \) and \( \omega \) are constants and \( \Omega \) is uniform random variable over \([-\pi, \pi]\). Show that \( X(t) \) is a wide sense stationary process.

c) A WSS random process \( X(t) \) is applied to the input of an LTI system with impulse response \( h(t) = 3e^{-2t}u(t) \). Find the mean value of the output \( y(t) \) of the system if \( E[x(t)] = 2 \).
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
MICROWAVE ENGINEERING (EC-701 / EC-701A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain why TEM mode is not supported in a rectangular waveguide.
    b) Define terms: phase, velocity and cut-off wavelength.
    c) What is a Magic Tee? Why is it named so? Write its characteristics.
    d) What is bunching process in a klystron tube?
    e) For a cavity resonator, explain the terms unloaded 'Q', critically coupled 'Q' and over coupled 'Q'.

    5x4

PART-A

Q.2 a) What are micro wave frequencies? What are their frequency bands as designated by IEEE?

    10
    b) What are the major applications of microwaves?

    10

Q.3 a) Draw a comparison between rectangular and circular wave guides based on propagation characteristics.

    10
    b) An air filled rectangular waveguide has dimensions 6 cm x 4 cm. It propagates a signal at 5 GHz frequency. What will be its cut-off frequency for TM11 mode? Determine its phase constant also.

    10

Q.4 a) Describe in detail, operation of a 2-hole directional coupler. Calculate the coupling factor, if power in primary waveguide is 72 mW and power delivered is 8 mW.

    10
    b) Explain any two of the following:

        i) Circulator
        ii) Rat race junction
        iii) Attenuators

    5x2
PART-B

Q.5  a) How amplification takes place in a TWT? Discuss the beam wave interaction in this device. What is the use of slow wave structure in TWT?  
   10  
b) Distinguish between velocity and current modulation. Explain the functioning of a two-cavity klystron.  
   10  

Q.6  Write short notes on any two:  
   a) PIN diode  
   b) Tunnel diode  
   c) IMPATT diode  
   10x2  

Q.7  a) What is VSWR? Explain any one method to measure VSWR for microwaves.  
   10  
b) What are the limitations of RADAR range equation? What is the utility of this equation for operator or designer of radar?  
   10
End Semester Examination, Dec. 2014
B. Tech. – Fifth/Sixth/Seventh/Eighth Semester
MICROCONTROLLERS AND APPLICATIONS (EC-702)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Show the contents of PSW register after the execution of the following instructions:
    CLR C
    MOV A, #0E9H
    SUBB A, #0DEH
    b) What is the purpose of TRI bit in TCON register?
    c) Write the instruction to enable serial port interrupt.
    d) Write the instruction to read the contents of external data memory location 1FDEH.
    e) Explain the purpose of TB8 bit in SCON register.
    f) Write a program to keep monitoring P1.2 until it becomes high.
    g) Explain the difference between carry flag and overflow flag.
    h) Write a program to multiply the contents of R5 and R7 registers.
    i) What is the function of GATE bit in TMOD register?
    j) Write the instructions to read the contents of R2 in register bank I into the accumulator.

2x10

PART-A

Q.2  a) Draw the Pin diagram of 8051 microcontroller and explain the function of various pins.

12

b) Explain the following instructions with examples:
   MUL
   POP
   RET
   CLR

8
Q.3  
   a) Write a program to take 10 bytes of data from RAM locations 40H to 49H, add 05H to each of them, and then save the result in RAM locations 60H to 69H.  
   b) In a semester, a student has to take six courses. The marks of the student are stored in RAM locations 50H onwards. Find the average marks and output it on Port1.  

Q.4  
   a) Write a delay subroutine to provide delay of 10 ms for 8051 microcontroller assuming XTAL=12 MHz.  
   b) Explain mode 2 operation of timer.  
   c) Explain TMOD register of 8051 timer.  

**PART-B**  
Q.5  
   a) Explain mode 1 operation of serial port.  
   b) Write a note on serial port baud rates.  
   c) Explain SCON register of 8051 serial port.  

Q.6  
   a) Design a temperature controller to keep a building at 20°C ± 1°C using 8051 external interrupts.  
   b) Write a program to generate 10 kHz square wave on P2.3 using 8051 interrupts.  
   c) Explain IE register for 8051 microcontroller.  

Q.7  
   a) Interface 8255 PPI chip with an 8051 microcontroller.  
   b) Interface 8k external data memory and 16k external program code memory with an 8051 microcontroller.
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
WIRELESS AND MOBILE COMMUNICATION (EC-704)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the role of PSTN in the paging system?
b) List various modes of propagation and define any one.
c) Define multipath spread and coherence time.
d) Write an expression for Doppler frequency shift in terms of angle between direction of travel of mobile and direction of arrival of EM wave and also for maximum doppler frequency shift.
e) What are the specifications of common air interface in i) GSM ii) EDGE?
f) Define hard and soft hand off techniques.
g) Define co-channel re-use ratio and write the expression of the same.
h) What is intelligent cell concept?
i) What is spread spectrum modulation technique? List any two.
j) A total of 30 MHz of bandwidth is allocated to user which uses two 10 KHz simplex channels to provide full duplex communication. Calculate the number of channels available per cell if the system uses a 4-cell cellular system.

2x10

PART-A

Q.2 Derive an expression for the received signal $P_r(d)$ for two ray propagation model or ground reflection model, where $d$ is the distance of separation between the transmitter and receiver.

20

Q.3 a) In a digital cellular system, explain how call is initiated by a mobile user with the help of a neat block diagram.

10

b) Explain the working of wide area paging system.

10

Q.4 a) What are different types of GSM channels? List them all and explain dedicated control channels.

10

b) Write brief notes on:
i) 3G-W-CDMA (UMTS)
ii) GPRS

**PART-B**

Q.5  a) Discuss co-channel interference and system capacity in a 7-cell cellular system (worst case scenario).

b) How would one improve coverage and capacity in a cellular system?

Q.6  a) Explain the need of speech coding and list various characteristics of speech signals.

b) Explain the features of an FDMA system.

c) In a normal GSM time slot consists of six trailing bits, 8.25 guard bits, 26 training bits and two traffic bursts of 58 bits of data; find the frame efficiency.

Q.7  a) Discuss DS-SS technique with the help of a diagram.

b) What is the need of equalization in a communication system? Explain the block diagram of a simplified communication system using an adaptive equalizer at the receiver.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
RADAR ENGINEERING (EC-721)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1  
(a) Why is a large size antenna preferred in a radar?  
(b) What will be the range resolution of a radar having a pulse width of \(2\mu\text{sec}\)?  
(c) What is a matched fitter?  
(d) Will the maximum unambiguous range of a radar increase, if p.r.f. is increased?  
(e) Calculate the maximum unambiguous range of a radar having pulse repetition period of \(500\mu\text{sec}\).  
(f) What are limitations of a CW radar?  
(g) What is the significance of range tracking?  
(h) What will be Doppler frequency produced by an aircraft flying at a constant radial distance, circling around a radar?  
(i) Does blind speed of an MTI radar depend on frequency of operation of the radar?  
(j) Discuss any two remedies to overcome blind speed problem.

2x10

**PART-A**

Q.2  
(a) Briefly explain the operation of a pulse radar with the help of a block diagram.

10

(b) What are frequency bands used in a radar? What are major applications of radar?

10

Q.3  
(a) Calculate maximum range of a radar operating at 3 cm wave length, radiating peak power of 500 kW. Minimum detectable signal of receive is \(10^{-12}\text{W}\), capture area of antenna is \(5\text{ m}^2\) and radar cross section area of target is \(20\text{ m}^2\).
b) What is threshold detection concept used in radar? Briefly explain. What is false alarm? How does its setting affect the radar performance?

Q.4

a) What are the limitations of a simple CW radar? Explain in detail the operation of multiple frequency CW radar.

b) With the help of a block diagram, describe the operation of a FMCW radar. What are its applications?

PART-B

Q.5

a) What is a mono-pulse tracking radar? How does it operate? What are its features? Comment on its accuracy.

b) What are the techniques used for tracking in angles? Describe salient features of each. What is range tracking?

Q.6

a) Calculate first three blind speeds for an MTI radar operating at $\lambda = 10\, cm$ and p.r.f = 2000 Hz.

b) What are the limitations of an MTI radar using delay line canceller? Draw clutter spectrum and output response of a delay line canceller and briefly discuss techniques used to reduce the clutter residue.

Q.7

a) What is a radar duplexer? What are its types? With a neat diagram, explain the operation of a balanced duplexer.

b) Write short notes on any two:
   i) Radar displays
   ii) SONAR
   iii) Noise figure
   iv) Range ambiguities

5x2
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
RADAR ENGINEERING (EC-721)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are the factors on which maximum range given by a radar depends?  
b) What are the methods to reduce clutter residue in MTI radar?  
c) What will be the pulse width of a radar required to give range resolution of 40 m?  
d) An aircraft is circling around a radar station at a constant distance. Will it be detected by MTI radar?  
e) What are second times around echoes?  
f) If a radar has average power of 20 W, duty cycle of 0.2, what will be its peak power.  
g) What will be maximum unambiguous range given by a radar radiating 1000 pulses per second?  
h) Define doppler frequency.  
i) What do you understand by a tracking radar?  
j) p.r.f. of a radar is reduced. What will be its effect on maximum unambiguous range?

2x10

PART-A

Q.2  
a) Derive an expression for radar range equation, starting from fundamentals. What are its various forms?  
10

b) Briefly discuss the following:  
   i) Multiple time around echoes.  
   ii) Range resolution and angular resolution.
5x2

Q.3  
a) What are major applications of radar? Discuss in details.  
10

b) Two aircraft are flying at same radial range of 30 km and same elevation angle. The aircraft are separated in azimuth by a distance of 1 km. Determine what will be maximum permissible beam-width (HPBW) for the radar, if the two aircraft are to resolved in azimuth?

10
Q.4  
a) Derive an expression for doppler frequency. What are its applications?  

10  
b) With a block diagram, explain the operation of a CW radar. Briefly discuss its limitations.  

10  

PART-B  

Q.5  
a) What is range tracking? What is its significance in radar? Explain the process of range tracking in detail.  

10  
b) What are basic types of tracking radar? Briefly explain salient features of each type.  

10  

Q.6  
a) Two MTI radar systems are operating at the same p.r.f., but different operating frequencies. Blind speeds of these radars are such that second blind speed of first radar is equal to fourth blind speed of second radar. Find the ratio of their operating frequencies.  

10  
b) With the help of a block diagram, discuss the operation of MTI radar, which user power amplifier as transmitter.  

10  

Q.7  
Write short notes on any two:  
a) Synthetic aperture radar.  
b) Radar duplexers.  
c) Radar receivers.  
d) Noise figure.  

10x2
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
ELECTRONIC SYSTEM DESIGN (EC-722)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Represent a decimal number (457)\textsubscript{10} in
   i) Octal
   ii) Hex code
   iii) BCD code
   iv) Excess-3 code
b) Design a circuit diagram of XNOR gate using CMOS logic.
c) How MOSFET can work as a switch?
d) Implement and design 8:1 MUX using 4:1 MUX.
e) What is race around condition? How we can remove it?
f) Subtract 49 from 14 using 2’s complement arithmetic.
g) Explain the propagation delay.
h) Solve the following equation using Boolean algebra.
   \[ AB + A(B+C) + B(B+C) = B + AC \]
i) Explain the tristate bus system.
j) Implement the given function using NOR gate:
   \[ f = (x_1 + x_2 + \bar{x}_3)(\bar{x}_1 + x_2 + \bar{x}_3)(\bar{x}_1 + x_2 + x_3) \]

\[ 2 \times 10 \]

PART-A

Q.2 a) What is digital hardware? Explain the development process of digital hardware. 10
b) Design the simplest circuit that has three inputs \(x, y, z\) which produces an output value of one whenever exactly one or two of input variables have the value one; otherwise the output has to be zero. 6
c) Find the minimum cost SOP and POS forms for function:
   \[ f(x_1, x_2, x_3) = \bar{x}_1 M (0, 2, 3, 5, 6) \]

4

Q.3 a) Use functional decomposition to find best implementation of function
   \[ f(x_1, x_2, x_3, x_4, x_5) = \sum m(0, 3, 6, 10, 11, 12, 13, 18, 19, 20, 21, 26, 27, 28, 29) \]. How does your implementation compare with lowest cost SOP implementation? Give the cost. 15
b) Derive a CMOS complex gate for logic function \( f(x_1, x_2, x_3, x_4) = \sum m(0,1,2,5,9,10,13,14) \).

Q.4 a) Synthesize a MUX using Shannon’s expansion.

b) Design a 4:1 MUX using transmission gates.

c) Design a 3 bit arithmetic comparison circuit.

PART-B

Q.5 a) Design a module 12 up/down counter.

b) Show how a JK flip-flop can be constructed using D flip-flop.

Q.6 a) Derive the state diagram for an FSN that has an input w and output z. The machine has to generate \( z=1 \) when the previous 4 values of \( w \) were 1001 or 1111, otherwise \( z=0 \). Overlapping input patterns are allowed. An example of desired behavior is

\[
\begin{align*}
w: & 0 1 0 1 1 1 1 0 0 1 1 0 0 1 1 1 1 1 \\
z: & 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 1 1
\end{align*}
\]

b) Explain partitioning minimization procedure for given state table:

<table>
<thead>
<tr>
<th>Present State</th>
<th>Next State w=0</th>
<th>Next State w=1</th>
<th>Output z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>D</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>F</td>
<td>E</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>B</td>
<td>G</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>F</td>
<td>C</td>
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</tr>
<tr>
<td>F</td>
<td>E</td>
<td>D</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>F</td>
<td>G</td>
<td>0</td>
</tr>
</tbody>
</table>

Q.7 Write short notes on \textit{any two}:

a) State reduction.

b) Cycles and races

c) Hazards.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
OPTICAL COMMUNICATION (EC-723)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Mention any two applications of optical fibres.
     b) What are plastic clad fibres?
     c) Define critical angle.
     d) What is the principle of working of LED?
     e) Determine the velocity of light in a medium whose refractive index is 1.33.
     f) What is pulse broadening? Explain briefly.
     g) What are photo transistors?
     h) Define quantum efficiency of LASERS.
     i) What are heterostructures?
     j) Define population inversion.

Q.2  a) Draw a block diagram of optical fibre communication system.

Q.3  a) A single mode fibre is made with a core diameter of 10 μm and is coupled to a laser diode which produces 13 μm light. If the core glass has a refractive index of 1.55. Find:
     i) Cladding refractive index
     ii) Fiber acceptance angle.

Q.4  a) Derive an expression for internal quantum efficiency of LED.
b) Describe briefly any of the LED structures. Support your answer a with neat diagram.

**PART-B**

Q.5  
a) Briefly explain the working of quantum well lasers.  

b) Compare the characteristics of LEDs and LASERS.  

c) State and explain basic principle of laser action in semiconductors.  

Q.6  
a) Discuss the principle of action of P/N photodiodes.  

b) Write short notes on:  
   i) Noise in photodiodes  
   ii) Responsivity of photodiodes  

Q.7  
a) Discuss various modulation methods used in optical fibre systems.  

b) Discuss the optical transmitter circuit and its components in link designing.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
OPTICAL COMMUNICATION (EC-723A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Why is electrical transmission preferred over optical transmission?
   b) List any four advantages of optical communication.
   c) What is optical frequency range?
   d) Which of the two light sources are more suitable for high data rate transmission and why?
   e) What do you understand by the term: recombination in LEDs?
   f) State Bragg’s law.
   g) Define scattering. What are its types?
   h) Mention any four characteristics of good optical source.
   i) Discuss briefly types of connectors.
   j) What are photo transistors?

2x10

PART-A

Q.2 a) Explain the block diagram for a digital link of optical fibre communication.
   10
   b) Compare optical fibre with other transmission Medias.
   10

Q.3 a) Explain different types of optical fibres based on refractive index variation.
   7
   b) Discuss number of modes.
   7
   c) Discuss manufacturing materials used for optical fibres.
   6

Q.4 a) Derive an expression for internal and external quantum efficiency of light emitting diodes.
   10
   b) Draw the schematic representation of surface emitting LEDs and explain its operation.
   10

707/4
PART-B

Q.5 a) State and explain the basic principle of laser action in semi-conductors. 

b) Explain the quantum well lasers in detail.

Q.6 a) A P-n photodiode has a quantum efficiency of 50% at a wavelength of 0.9 nm. Calculate the following:
   i) The received optical power if the mean photo current is 10.6 A.
   ii) The corresponding number of received photons at this wavelength.

b) Discuss in detail PIN photodiode. How does it differ from the avalanche photodiode?

Q.7 Write short notes on:
   a) Intensity modulation
   b) System design considerations
   c) Fibre couples and connectors
   d) Multiplexing in optical fibre communication systems.

5x4
End Semester Examination, Dec. 2014  
B. Tech. – Sixth / Seventh / Eighth Semester  
VLSI DESIGN (EC-724)  

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define monolithic integrated circuit technology.  
b) Define Moore’s law.  
c) Differentiate between dry and wet oxidation techniques.  
d) What is the difference between isotropic and anisotropic etching?  
e) What is the difference between depletion and enhancement MOSFET?  
f) What is drain punch through effect? Why does it occur in a MOSFET?  
g) What are static and dynamic power dissipation?  
h) Why is CMOS based implementation advantageous over nMOS based implementation?  
i) Implement 2:1 multiplexer using the transmission gate.  
j) What is the difference between PLA and PAL?  

2x10

PART-A  

Q.2  
a) Describe various design steps followed for the implementation of an integrated circuit.  

10

b) Compare bipolar and MOS technology.  

5

c) List various integration technologies based on number of transistors.  

5

Q.3  
a) Explain the principle phenomenon and the process of Chzochralski technique for the formation of single crystal silicon.  

10

b) Describe the n-well fabrication process for CMOS inverter.  

10

Q.4  
a) Explain energy band diagrams of MOS system for various voltages applied.  

10

709/4
b) Describe current equations of MOSFET for saturation and non-saturation region of operation. Also draw VI characteristics.  

**PART-B**

Q.5  
**a)** Determine pull-up to pull-down ratio of an MOS inverter directly driven by another nMOS inverter.  

8  
**b)** What is latch up? Why does it prevail in CMOS inverter implemented with n-well or p-well process? Also list its remedies.  

8  
**c)** Draw and explain the VI characteristics of n-MOS inverter with enhancement transistor as load.  

4  

Q.6  
**a)** Implement XOR gate using the CMOS technology and draw its stick diagram.  

10  
**b)** Implement the D-flip-flop circuit using CMOS technology.  

10  

Q.7  
**a)** Implement full adder circuit using PLA.  

8  
**b)** Differentiate between the static and dynamic RAM.  

2  
**c)** Explain FPGA in detail.  

10
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
ADVANCE TELEVISION ENGINEERING (EC-801A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you understand by the term pixels?
b) Define flicker. How can it be reduced?
c) Define D.C. level and pedestal height.
d) What are active lines? How many lines get missed during each vertical field scan?
e) What is Grassman’s law?
f) Explain additive mixing with help of Venn diagram.
g) Calculate the interface error for a system in which the second field is delayed by $16 \mu s$.
h) What is EHT supply?
i) Define crossover point in picture tubes.
j) Discuss screen phosphor briefly.

2x10

PART-A

Q.2 a) Draw the block diagram of TV receiver system.

b) What are time durations of horizontal trace, horizontal-retrace, vertical trace, vertical retrace?

c) Explain vertical sync details and mention the two shortcomings of vertical pulses with necessary solutions.

2x10

Q.3 a) A 200W carrier signal is modulated to a depth of 50%. Calculate the total power in the modulated wave.

b) Why is VSB preferred over SSB in TV systems?
c) Show that in 625 B system, a total channel bandwidth of 70MHz would be necessary when VSB transmission is adopted.

10

Q.4  a) Explain the construction and working of monochrome picture tube.

10

b) What is the significance of deflection yoke? How does deflection angle affect the length of picture tube?

10

PART-B

Q.5  a) Why is ‘G-Y’ signal not transmitted along with ‘R-Y’ and ‘B-Y’?

10

b) Explain ‘precision-in-line’ TV display picture tube.

10

Q.6  a) Describe briefly the image rejection ratio and factors by which intermediate frequency generated could be affected.

10

b) What is vestigial side band connection?

10

Q.7  Explain any two:

a) Remote control.
b) HDTV.
c) CCTV.

10x2
End Semester Examination, Dec. 2014  
B. Tech. –Seventh Semester  
DATA COMMUNICATION (EC-802)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Give two points of difference between analog and digital transmission. 
b) Draw bipolar AMI and Manchester pattern for following data signals:  
i) 11010 ii) 11101 
c) What is line configuration? Give an example. 
d) Define various types of interleaving. 
e) Expand the abbreviations:  
i) SONET ii) VOIP iii) ADSL iv) HDTV  
f) Give two examples each of asynchronous and synchronous protocols with reference to data link control. 
g) Draw the frame format of control field for an I frame. 
h) For a 6-bit data calculate the number of Hamming bits required in Hamming code.  
i) Give two points of difference between TDM and FDM. 
j) What is CTS?

2x10

PART-A

Q.2  
a) What are transmission impairments? Explain in detail its various types.  
10 
b) Explain in detail various types of transmission media.  
10

Q.3  
Explain in detail the various line encoding techniques to convert digital data into digital signal with examples.  
20

Q.4  
a) What is forward and backward error correction? Explain  
10 
b) Explain parallel interface in detail.  
10

PART-B

713/4
Q.5  a) Explain X MODEM protocol

b) Write notes on:
   i) Stop and Wait ARQ
   ii) Various stations and link configurations in HDLC.

Q.6  a) Explain AT&T FDM Hierarchy.

b) What is a digital carrier system? Explain in detail about the T_1 carrier system.

Q.7  Write short notes on:
   b) ISDN

   a) SDH

   c) VOD
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
DATA COMMUNICATION (EC-703)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Give two points of difference between bit rate and baud rate.
b) Draw NRZ-L and differential Manchester pattern for the following data signals:
   i) 10010.
   ii) 11010
c) What is link configuration? Give an example.
d) What are various functions of combo chips?
e) Expand the abbreviations: SONET, VOIP, ADSL and HDTV.
f) Give two characteristics of DTE – DCE interface.
g) Draw the frame format of control field for an S frame.
h) For a 10 bit data, calculate the number of Hamming bits required in Hamming code.
i) Give two points of difference between TDM and FDM.
j) What is RTS?

2x10

PART-A

Q.2 a) Draw a detailed block diagram of a data communication system and explain each block.

10
b) What are the various standard organizations of data communication? Explain in detail.

10

Q.3 Explain in detail the various line encoding techniques to convert digital data into digital signal with examples.

20

Q.4 a) What are the various error detection techniques? Explain any two.

10
b) Draw the pin diagram of RS-232 and explain the pins.  

10

**PART-B**

Q.5  a) Write notes on:
    i) GO BACK N ARQ.
    ii) Data transfer modes in HDLC.  
    10

b) Explain X MODEM protocol.  

10

Q.6  a) Explain AT and T FDM hierarchy.  
    10

b) What is a digital carrier system? Explain in detail about the Ti carrier system.  
    10

Q.7  Write short notes on:

a) ISDN.  
    8

b) DSL.  
    6

c) SDH.  
    6
End Semester Examination, Dec. 2014  
B. Tech. – Eighth Semester  
SATELLITE COMMUNICATION (EC-821)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is CDMA? In which case it is superior to TDMA?  
b) What is meant by look angles? Explain them with reference to a geostationary satellite and the earth station.  
c) Draw block diagram of various elements of a satellite communication system.  
d) Differentiate between noise temperature and noise figure.  
e) Explain tracking and positioning.  
f) Differentiate between active and passive satellites.  
g) What do you mean by point ahead angle?  
h) State Kepler’s laws of orbital motion.  
i) What are direct and retrograde orbits?  
j) What is the difference between modem and codec?  

2x10

PART-A

Q.2  
a) What is meant by satellite stabilization? Explain the importance of stabilization. Also explain the spin stabilization and three axes body stabilization of a satellite.  

10  

b) How can one determine the earth coverage and slant range for geostationary satellite? What are the maximum values of the two parameters?  

10

Q.3  
a) List the frequency band designations in common use for satellite services. What is the basis on which the satellite frequencies are selected? Justify why uplink frequency has to be greater than downlink frequencies?  

10  

b) A satellite at a distance of 40,000 km from a point on the earths surface radiates a power of 2 W from an antenna with a gain of 17 dB in the direction of observer. Find the flux density at the receiving point, and the power received by an antenna with an effective area of 10m². If the operating
Q.4 a) Explain as to how does the solar eclipse affect the working of a communication satellite. Mention the duration and the month when the eclipse effects are maximum.

10

b) What are the orbital parameters required to determine a satellite orbit? Name and explain them.

10

PART-B

Q.5 a) Explain the concept of frequency reuse and how it can be implemented in satellite communication.

5

b) What is loading factor and how does it affect the FM/FDM signal transmission.

5

c) What is meant by burst time plan? Explain its structure and importance. What are the methods to control the burst time plan?

10

Q.6 a) Explain optical satellite cross-link. How do different noises affect the working of the link? Derive an expression for resulting downlink signal after the uplink, cross-link and downlink transmission have taken place.

10

b) A satellite TV signal occupies the full 36 MHz transponder bandwidth and is desired to provide a (C/N) ratio 22 dB at the earth station. If a downlink frequency of 4 GHz is employed and other losses amount to 3.4 dB, what must be the G/T of the earth station if EIRP is 37 dBW. The path length may be assumed to be 40000 km (Boltzmann’s constant $k = 1.38 \times 10^{-23} \text{ J} / \text{ K}$).

10

Q.7 Write short notes on any four:

a) TDMA

b) Energy disposal in FM/FDM systems

c) VSAT

d) DBS

e) INMARSAT

f) Defense satellite

5x4
Q.1 a) What is a satellite and how does a communication satellite differ from a communication relay?
b) List various frequency bands being used in satellite communication.
c) State Kepler’s laws of planetary motion.
d) A satellite is rotating in an elliptical orbit with a perigee of 1000 km and an apogee of 4000 km. Calculate its orbital period. Take mean earth radius =6400 km.
e) What are the factors that effect the uplink design and the downlink design in geostationary satellite communication?
f) A satellite located at 40,000 km from earth operates at a frequency of 11 GHz and an EIRP of 21 dBW. If the receiving antenna has a gain of 50.5 dB, find the received power.
g) What is system noise temperature for a satellite earth station working on 4 GHz, the typical values for gains and noise temperatures are $T_{in}=50 \text{ K}$, $T_{RF}=50 \text{ K}$, $T_{m}=500 \text{ K}$, $T_{IF}=1000 \text{ K}$, $G_{RF}=23 \text{ dB}$, $G_{m}=0 \text{ dB}$ and $G_{IF}=30 \text{ dB}$? Calculate the system noise temperature.
h) What do you mean by single channel per carrier (SCPC) signaling? What are its advantages?
i) Distinguish between pre assigned and demand assigned multiple access techniques.
j) Write in brief about VSAT.

PART-A

Q.2 a) Draw a block diagram of a satellite communication system and explain it in details.

b) List various advantages and disadvantages of satellite communication.
c) Explain various satellite sub-systems, highlighting their important functions and characteristics.

Q.3  a) What is meant by look angles? Explain them with reference to a geostationary satellite and the earth station.

b) Explain in detail orbital effects in communication systems performance.

Q.4  a) How is the uplink design different than the downlink design? Under what conditions a complete satellite link becomes downlink limited?

b) Explain the following terms w.r.t. satellite communication:
   i) EIRP.
   ii) Free space loss.
   iii) Figure of merit or G/T ratio.

   c) A satellite at a distance of 40,000 km from a point on the earth’s surface radiates a power of 10 W from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density at the receiving point, and the power received by an antenna at this point with an effective area of 10 m².

PART-B

Q.5  a) Compare the performance of FM/FDM SCPC and CSSB systems. For a SCPC-FM-FDMA system having S/N =33 dB and a test tone deviation $\Delta f=9.1$ kHz, calculate the bandwidth (For a speech signal the lowest frequency is 300 Hz and the highest frequency in fm =3.4 kHz). Also calculate the C/N ratio of this SCPC system.

b) What are the various methods of digital modulation techniques and which one is mostly used in digital satellite communication? Explain with reasons.

Q.6  a) Explain the TDMA burst structure. What are the overheads in TDMA frame? How the TDMA frame efficiency is affected by such overheads?

b) What is CDMA? In What way is it superior to TDMA? Mention the potential application of CDMA.

Q.7  Write short notes on:
a) GPS.

b) MSAT.

c) Earth exploration satellite.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
EMBEDDED SYSTEM DESIGN (EC-822)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the functions of GIE and PEIE bits of INTCON register in PIC?
b) Explain each bit of status register in PIC.
c) Write the code to make into as an edge triggered interrupt.
d) Show the contents of PSW register after execution of following instructions:
   MOV A, # OBEH
   ADD A, # 28H
   e) Find the contents of TMOD register to configure timer-1 in mode-2 and timer-0 in mode-1.
f) What do you understand by an embedded system? What are its applications in real life?
g) Determine the value of A, B and C (three scalars of timer 2) to obtain interrupts every 2 ms for 4 MHz crystal.
h) What is the function of INTR pin in ADC?
i) Explain the function of ‘RS’ and ‘E’ pins in LCD.
j) What are the development tools for an embedded system design?

2x10

PART-A

Q.2 Write short notes on:
   a) Microcontroller’s memory types. 7
   b) Microcontroller features. 7
   c) Harvard vs Princeton architecture. 6

Q.3 a) Assume RAM locations 40 H-44 H have five 8-bit values. Write a program to add there five numbers and store the result in location 50 H and 51 H. 50 H should have lower byte of the result.
   b) Write the push instructions to push the contents of registers R1, R2, R3, and R4 if register bank-2 is the active register bank.

   10
   4
c) Explain the following instructions with examples:
   i) MOVX A, @DPTR
   ii) CJNE A, #40H, NEXT
   iii) DA A

Q.4  
a) Explain IE and IP registers.  

b) Two switches are connected to pins P 3.2 and P 3.3. When a switch is pressed, the corresponding line goes low. Write a program to:
   i) Turn on all the LEDs connected to port-0 if first switch is pressed.
   ii) Turn on all the LEDs connected to port-2 if second switch is pressed.

   **PART-B**

Q.5  
a) Draw and explain CPU architecture and pipelining of PIC microcontroller.

b) Explain addressing modes of PIC microcontroller.

c) Explain the following instructions with examples:
   i) incfsz f, F(w)
   ii) retfie

Q.6  
a) Explain timer-2 scalar initialization.

b) Explain o/p port expansion in detail.

Q.7  
a) Draw and explain interfacing of 8 kB ROM with 8051 microcontroller.

b) Design a system to interface DAC with microcontroller.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
EMBEDDED SYSTEM DESIGN (EC-822A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Enlist various flags in PSW register.
b) What is the difference between microprocessor and microcontroller?
c) Differentiate between CISC and RISC.
d) Show the status of CY, AC and P flag after addition of 25 H and 63 H.
e) Differentiate between RET and RETI instruction.
f) What is instruction pipelining in PIC?
g) What is INTSERVICE?
h) What do you mean by watchdog timer reset?
i) What are functions of GIE and PEIE in an INTCON register?
j) What do you mean by pre-scaling of PIC timers?

2x10

PART-A

Q.2
a) What do you mean by microcontroller’s memory types?
8
b) Differentiate between Harvard and von-Neumann architecture.
8
c) Discuss the criterion for selecting microcontroller device.
4

Q.3
a) What is addressing mode? Discuss all addressing modes in context of 8051 microcontroller with examples.
8
b) Explain the function of following pins:
ALE, PSEN.
4
c) Write a program to see if the accumulator contains an even number. If so, divide it by 2, else make it even and then divide it by 2. Store the result in R₄ of register bank 1.
8
Q.4  a) Explain various modes of operation of timer in an 8051 microcontroller.  

10  

b) Write a program to generate a square wave of 100 kHz at pin P3.0 using timer and interrupt. Assume crystal frequency to be 12 MHz.

10

PART-B

Q.5  a) Explain various addressing modes in a PIC microcontroller.

7  

b) Explain CPU registers used in a PIC microcontroller in detail.

7  

c) Explain following instructions in PIC with examples:

retfie, movwf  f,    incfsz  f, w

6

Q.6  a) Explain interrupt logic in PIC microcontroller. How INTSERVICE (interrupt service routine) is initialized? Discuss with examples.

10  

b) Explain program memory considerations for PIC microcontroller. What is the role of program counter in accessing program memory?

10

Q.7  Write notes on any two:

a) Keypad interfacing with 8051 microcontroller.

b) Mouse wheel turning.

c) PWM motor control.

10x2
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
MOBILE COMPUTING (EC-823)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define multiple access technique. List any two spread spectrum multiple access techniques.
b) What do you understand by co-channel interference? How are interference and radio capacity of mobile cellular radio system related?
c) What do you understand by MANET? List any two scenarios where MANET can be used.
d) What do you understand by replication and why do you need it in a distributed file system?
e) What are tunnel and tunneling?
f) What does TCP/IP and WDP stand for? Does WDP offer reliable or unreliable service?
g) List various techniques of IP-Micro-Mobility support.
h) List various classes of transaction service in WAP 1.X. Does class ‘O’ offer reliable or unreliable service?
i) What is group-casing and uni-casting?
j) List four enhancements of TCP for supporting mobile communication.

2x10

PART-A

Q.2 Discuss the features of FDMA and TDMA channels along with their advantages and disadvantages.

20

Q.3
a) Discuss the various techniques of agent discovery.

10

b) What is WATM? Discuss the various requirements for management of hand over.

10

Q.4
a) Briefly discuss the architecture of WAP 1.X with the help of diagram.

10
b) With the help of a diagram, discuss mobile-TCP.

**PART-B**

Q.5  
a) What do you understand by digital video broadcasting and write its goals? 
   2
b) Explain the functions of various components of digital video broadcasting architecture.  
   10

c) Explain high band width internet access using digital video broadcasting.  
   8

Q.6  
Briefly discuss the destination sequence vector and dynamic source routing algorithms and their merits and demerits.  
   20

Q.7  
Write short notes on any two:
   a) Kangaroo and Joey transaction.
   b) What is reverse-tunneling and why it is needed?
   c) Explain the three states of client CODA file system.
   d) Push architecture.  
   10x2
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
ADVANCED MICROPROCESSOR AND MICROCONTROLLER (EC-824)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain an interrupt controller register.
b) Explain the functions of \( LCS, VCS \) and \( MCS \) pins of an 80186 microprocessor.
c) Describe the functions of PG in control register of an 80386 microprocessor.
d) What do you mean by paging system?
e) Name the control signal of an 80386 microprocessor.
f) What is the purpose of \( FLUSH \) pin in an 80486 microprocessor?
g) Explain the CPU features of an 80196 microcontroller.
h) List the maskable and non-maskable interrupts in an 80196 microcontroller.
i) What is the difference between pre-auto indexing and post-auto indexing?
j) What is the difference between the real mode and protected mode memory addressing?

2x10

PART-A

Q.2 a) Explain the architecture of 80286. Also explain the difference between 80186 and 80286.

12

b) How many external interrupt inputs can be handled by an 80186 microprocessor and what is the function of an interrupt controller?

8

Q.3 a) Explain how an 80386 microprocessor addresses a memory segment in a protected mode using a selector and a descriptor.

10

b) Name the methods used for synchronization of an 80386 microprocessor and external memory. Explain any one of them.

10

Q.4 a) Explain the functions of following pins:
i) **FLUSH**  
ii) **BLAST**  
iii) CLK  
iv) DP0 – DP3  

b) What would be the starting and ending address of any segment if the base address is 1000,0000 and limit is 001FFH and:  
i) G=0  
ii) G=1  

c) What is the function of parity checker/generator?  

**PART-B**  

Q.5  
a) Draw and explain the internal CPU hardware in 80196 family.  

b) Draw a memory map of 80196 KC version for 64 kB contiguous address space.  

Q.6  
a) Describe the types of instruction sets in an 80196 microcontroller.  

b) What is the purpose of PWM unit in an 80196 microcontroller?  

c) Describe functioning of HSO and HIS units in an 80196 microcontroller.  

Q.7  
a) Describe and compare the thumb instruction subset of ARM. How does interworking between the two instructions take place?  

b) List load and store instructions separately in 32-bit ARM instruction set.
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
ADVANCED MICROPROCESSOR AND MICROCONTROLLER (EC-824A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the relevance of AV bit in a descriptor?
b) What hardware enhancements are added to the 80186 as compared to 8086?
c) Why is 80186 often called embedded controller? Explain.
d) What is purpose of paging unit in 80386?
e) What do you understand by multitasking?
f) What is super scalar architecture?
g) Describe the two additional features of 80486 which are not there in 80386?
h) What is the purpose of PWM unit in an 80196 microcontroller?
i) Differentiate between 8051 and 80196.
j) Write down various features of a programmable timer.

2x10

PART-A

Q.2 a) Find out the contents of descriptor for designing a read protected data segment with privilege level 10, starting at an address 20AB00D1 H and ending at address 20AD11D1 H.

10

b) Name and explain the special purpose and multipurpose register of 32 bit processor.

10

Q.3 a) Explain the architecture of an 80186 microprocessor with the help of a suitable diagram.

10

b) What is PCB? Write the instruments to relocate the memory 50,000 H to new address 20,000 H in memory space.

10
Q.4  a) Describe the operation of an 80386 memory management unit and paging unit.  
    b) Explain the special purpose registers of 80386.  

PART-B

Q.5  a) Describe the following signals in case of 80486:
     i) PCHK          
     ii) FLUSH    
     b) Differentiate between Pentium processor and 80486. Describe cache organization of 80486.
     c) How memory management system of 80486 is different from 80386?

Q.6  a) Explain the memory mapping of 80196 for registers, vectors, RAM and ROM.
     b) Describe the general features of 8096/80196 microcontroller.
     c) Name the addressing mode in following instructions:
        i) LD AX, [BX]   
        ii) POPF         
        iii) ADD AX, BX, [CX]+  
        iv) LD DX, #3AD4 H

Q.7  a) List down the maskable and non-maskable interrupts in 80196. Explain how software timer interrupts work.
     b) Explain and demonstrate how pulse width modulation (PWM) output is obtained using programmable timers.

End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
DIGITAL ELECTRONICS AND CIRCUITS-I (EC-I-303)

Time: 3 hrs
Max Marks: 100

No. of pages: 2
Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.
Q.1  a) What is positive and negative logic?
   b) Draw XOR gates by using only four NAND gates.
   c) What is Excess-3 code? How it can be obtained from BCD code?
   d) What is significance of error detection and correction mechanisms?
   e) What Karnaugh Map? How it is better as compare to Boolean algebra?
   f) Write truth table of (one) comparator.
   g) What is difference between toggle and race around condition.
   h) What do you understand by modify of a counter?
   i) What is universal shift register?

PART-A

Q.2  a) What are universal logic gates? Why they are called so? Draw:

   i) Inverter by using only NAND gates.
   ii) AND gates using only NOR gates.
   iii) OR gates by using only NAND gates.
   iv) XOR gates by using only NOR gates.
   v) XNOR gate by using only NAND gates.

   b) Differentiate between analog and digital signals.

Q.3  a) Convert:

   i) (1011.11)₂ = (?)₁₀
   (ABCDEF)₁₆ = (?)₂

   ii) (777)₈ = (?)₂
   (1001)₂ = (?)₉

   iii) (1101)₁₀ = (?)₉

   b) Solve:

   i) (1111)₂ + (1111)₂ = (?)₂
   (111)₂ = (?)₂

   ii) (1111)₂ × (1000)₂ = (?)₂
   (110111)₂ ÷ (110)₂ = (?)₂

   v) 2's Complement of (11011)₂

Q.4  a) Minimize the given function using K-Map:

   F(A, B, C, D) = Σ(0, 2, 8, 10)

   And realize the function using NAND gate.
b) What are SOP and POS expressions? How SOP is converted to POS and vice versa?

6

c) Prove that:
   i) \[ A + \bar{A}B = A + B \]
   (\[ A + B \] (\[ A + C \]) = A + BC
   iii) \[ A + AB + AC = A \]

6

**PART-B**

Q.5  
a) Draw and explain with truth table 4.16 line decoder circuit.
7  
b) Draw and explain with truth table decimal to BCD encoder.
7  
c) Draw and explain with truth table circuit diagram of full adder.
6

Q.6  
a) Explain operation of:
   i) S-R Flip Flop.
   J-K Flip Flop.
   iii) D Flip Flop.
   With truth table.
   15

b) Differentiate between Latch and Flip-Flop.
5

Q.7  
a) Differentiate between ring counter and Johnson counter. Why they are called as shift register counters?
8

b) Explain with circuit diagram and working.
   i) SISO
   ii) SIPO
   iii) PISO
   iv) PIPO
   12
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
ELECTRONIC DEVICES AND CIRCUITS-II (EC-I-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the advantages of R-C coupling over other coupling schemes?
b) Differentiate between voltage and power amplifiers.
c) What is the role of emitter by pass capacitor in an R-C coupled amplifier?
d) What are single and double tuned voltage amplifiers?
e) Explain working principle of a crystal oscillator.
f) Draw and explain R-C circuit acting as a differentiator.
g) Explain waveshaping circuits with their applications.
h) Draw op-AMP as adder and write its output expression.
i) Define load regulation.
j) What is the difference between series and shunt voltage regulators?

2x10

PART-A

Q.2 a) What are the various coupling schemes of a multistage amplifier? Explain with comparison.

10

b) Explain complimentary symmetry push-pull amplifier.

10

Q.3 a) Explain negative feedback amplifier and derive an expression of gain for voltage series and voltage shunt feedback.

10

b) Explain emitter follower with its working.

10

Q.4 a) Explain wein bridge cycillator with its working principle.

10

b) Explain series and parallel resonant circuits.

10

PART-B
Q.5  a) What are clipping circuits? Give different type of clipping circuits along with their input and output waveforms.  

b) Explain RC integrator and differentiator with their applications.

Q.6  a) Explain op-AMP as: i) Differentiator  

ii) Integrator  

b) Explain IC 555 as: i) Monostable  

ii) Astable multivibrator  

Q.7  Write short notes on:  

a) SMPS  

b) IC regulators  

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End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Fourth Semester  
DIGITAL ELECTRONICS AND CIRCUITS-II (EC-I-402)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Which logic family consumes the least power?  

b) What do you mean by propagation delay?  

c) What is the other name of parallel type A/D converter?  

d) Which is the fastest A/D converter?  

e) Describe the advantages of an EEPROM over an EPROM.  

f) How does a PLA differ from a ROM?  

g) What do you mean by maxterm of a Boolean expression?  

h) Which code is used in K-map?
i) What is the disadvantages of K-map?

j) Define FPGA.

2x10

**PART-A**

Q.2 a) Explain TTL logic family in totem-pole arrangement with a diagram. 15

b) Define the following characteristic of a logic family.
   i) Propagation delay  
   ii) Noise margin 5

Q.3 a) Define the following parameter of DACs:
   i) Percentage resolution  
   ii) Step size 5

b) Explain the working of dual slope A/D converter with a diagram. 15

Q.4 a) Write a short note on FPGA. 5

b) Differentiate between ROM, PROM, EPROM and EEPROM. 10

c) Explain the difference between PLA and PAL with an example. 5

**PART-B**

Q.5 a) Reduce using K-map the expression: \( \sum m(0,1,2,3,5,7,8,9,10,12,13) \). 10

b) Simplify the given expression using Q-map: \( f = \sum m(0,1,6,7,8,9,13,14,15) \). 10

Q.6 a) Implement 3-bits asynchronous counter using J-K flip-flop. 10

b) Differentiate between asynchronous and synchronous counters. 10

Q.7 a) Write a note on arithmetic logic unit w.r.t. IC 74181 and its applications. 10

b) Implement binary addition and subtraction using ALU. 10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
COMMUNICATION SYSTEMS-I (EC-I-403)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between low level and high level modulation.
     b) Define sensitivity and selectivity.
     c) Write the main features of a radio receiver.
     d) What is ground wave propagation?
     e) Define pseudo noise (PN) sequence.
     f) What is processing gain?
     g) What is a spread spectrum?
     h) Define gain of an antenna. How is the isotropic radiation defined?
     i) Explain the operation of Yagi Uda array.
     j) What is skip distance? Give the relation between skip distance and maximum usable frequency.

2x10

PART-A

Q.2  a) For a broadcast superhetrodyne AM receiver having no RF amplifier, the loaded quality factor Q of the antenna coupling circuit is 100. Its intermediate frequency is 455 kHz, then determine the following:
     i) Image frequency and its rejection ratio at an incoming frequency of 1000 kHz.
     ii) Image frequency and its rejection ratio at an incoming frequency of 25 MHz.

5x2

b) Draw the block diagram of an AM transmitter and explain the function of each unit.

10

Q.3  a) Draw and explain the block diagram of reactance transmitter.

10

b) What is intermediate frequency? Explain the choice of intermediate frequency.

10
Q.4  

a) What is double spotting and how does it arise?  

b) How the use of RF amplifier improves the signal to noise ratio of superhetrodyne receiver?  

10

PART-B

Q.5  

a) What is an array? Give brief description of broadside and end fire array.  

b) What is meant by beam angle, beam width and radiation resistance?  

10

Q.6  

a) What is directivity? Show that directivity of an antenna is given by expression:  

\[ D = \left( \frac{4\pi}{\lambda^2} \right) A_{em} . \]  

b) Explain different modes of propagation.  

10

Q.7  

a) Explain with a diagram the concept of CDMA.  

b) Write a short note on Frequency hopping spread spectrum (FHSS) system.  

10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fourth Semester
MICROPROCESSORS-I (EC-I-404)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten:

a) What are four main building blocks of a digital computer system? Explain the function of each block.

b) What is the function of \(\bar{oR}\) signal on memory chip?

c) What are the difficulties in writing program in machine language?

d) What is subroutine? How is it used in programming?

e) Mention the purpose of SID and SOD lines.

f) Explain the need of latches and buffers in interfacing I/O device.

g) Write initialization command word of 8259.

h) Write the control signal of I/O mapped I/O and memory mapped I/O.

i) What is the significance of 8253 IC?

j) Draw flag register format for 8085.

k) If 8085 has fetched machine code located at memory location 2055H, specify the contents of PC.

l) How stack pointer is initialized in 8085? Explain.

2x10

PART-A

Q.2 a) Give a step by step evolution of a microprocessor and explain its impact on modern society.

b) Explain the need to demultiplex the bus \(AD_0-Ad_7\) in an 8085 microprocessor with the help of a block diagram.

10

10

Q.3 a) Draw the functional block diagram of 8085 microprocessor and explain the function of ALU and flag register.

b) Discuss the function of following signals of 8085 microprocessor:

i) ALE  

v) CLK(out)

ii) IO/ \(\bar{M}\)  

vi) TRAP

iii) Reset out  

vii) HLDA

10
Q.4  
   a) What do you understand by an instruction cycle? How does it differ from the machine cycle? Explain using example of an 8085 microprocessor.  
   b) Write down a delay routine for 10 m seconds using the instructions of 8085 having clock period of 3 MHz.  

PART-B

Q.5  
   a) Interface eight DIP switches to the CPU 8085 using 74LS138, 3 to 8 decoder to decode the address bus and 74LS244, a tristate octal buffer to interface these switches to the data bus.  
   b) What are various schemes of I/O data transfer from CPU to I/O devices and vice versa? Explain programmed data transfer scheme.  

Q.6  
   a) Draw the functional block diagram of 8257 and explain its each block.  
   b) Draw the block diagram of Intel 8251 programmable communication interface. Briefly explain the CPU interface and control logic of 8251A.  

Q.7  
   a) Explain various registers of Z-80 microprocessor.  
   b) Differentiate between Z-80 and MC-6800 microprocessors.
Q.1  a) What is a microphone? Explain its working principle.
    b) Explain multispeaker system.
    c) What is the difference between sequential and interlaced scanning?
    d) What is the advantage of horn radiating loudspeaker?
    e) Why are sound signal frequency modulated and picture signal amplitude modulated?
    f) Explain horizontal and vertical resolution of TV scanning and calculated bandwidth requirement.
    g) Why sound signal is frequency modulated and picture signal is amplitude modulated?
    h) Why burst signal is required in T.V. signal?
    i) What is the principle of video recording on magnetic tapes?
    j) Explain the use of baffle and enclosure in a loudspeaker.

2x10

PART-A

Q.2  a) What do you understand by term microphone?  
    b) Explain the construction and working principle of (i) Carbon (ii) Moving coil (iii) Velocity (iv) Crystal (v) Capacitor microphone.

Q.3  a) Draw block diagram of monochrome T.V. receiver and briefly explain functions of each block.
    b) Draw and explain plumbicon camera tube and write down its advantages and disadvantages over vidicon camera tube.

Q.4  a) Draw a block diagram of a colour TV receiver.
b) Explain the working principle of a PIL colour camera tube.

5

PART-B

Q.5  a) Draw and explain the block diagram of a cable TV.

10

b) Explain block diagram of a VCR.

10

Q.6  Explain with block diagram the working principle of Trinitron and PIL colour picture tube.

20

Q.7  Write short notes on any four:

a) DTH (Direct TO Home)
b) VCD and DVD
c) VHS tape transport mechanism
d) Digital sound recording
e) NTSC system

5x4
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fifth Semester
COMMUNICATION ENGINEERING-II (EC-I-502)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Give the frequency range of S, C, X and K bands.
b) What are microwaves?
c) What is a vacuum tube? What are different vacuum tubes?
d) What do you mean by thermionic emission?
e) What do you understand by transverse electric and transverse magnetic (TE and TM) modes?
f) Sketch the field pattern of $TE_{10}$ mode.
g) What is the difference between fixed and variable alternators?
h) Draw a neat diagram of E plane tee.
i) What do you mean by microwave communication link?
j) Explain the following terms with reference to satellite communication:
   i) Apogee.
   ii) Perigee.

2x10

PART-A

Q.2  a) What are various advantages of microwaves? 8
b) Explain all microwave frequency bands with their applications. 10
c) What is the relationship between velocity, frequency and wavelength of an electromagnetic wave? 2

Q.3  a) What are the limitations of conventional tubes at microwave frequencies? Explain how these limitations can be overcome. 10
b) Explain the bunching process in reflex klystron. 10

Q.4  a) Write a note on rectangular and circular waveguides. Also discuss their applications. 10
b) Why TEM mode does not exist in a waveguide?  

5

c) Write short notes on cut-off wavelength, guide wavelength and propagation constant of a rectangular waveguide.  

5

**PART-B**

Q.5  

a) What are ferrites? Explain the action of an isolator using ferrites. Mention its typical applications.  

10

b) Write short notes on **any two:**  

i) Directional coupler.  

ii) Circulator.  

iii) Detector mount.  

5x2

Q.6  

a) Explain tropospheric duct formation in detail.  

12

b) Write a short note on dish antenna.  

8

Q.7  

a) What are the elements of satellite communication system? Explain each block in detail.  

10

b) Explain the principle and working of an MTI radar with a neat block diagram.  

10
End Semester Examination, Dec. 2014
B. Tech. (Integrated) - Fifth Semester
OPTICAL COMMUNICATION (EC-I-503)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define the term refractive index in context of an optical fibre.
b) Explain the terms: acceptance angle and numerical aperture in case of fibre optics.
c) Give two points of differences between step index and graded index fibres.
d) What is a multimode fibre?
e) The mean optical power at the fibre output in 3 µW when the mean optical power launched into an 8 km length of fibre in 120 µW. Determine the signal attenuation or loss in dB through the fibre.
f) Define internal quantum efficiency of an LED.
g) Explain two important characteristics of LASER as an optical source.
h) What are the various types of splices used in optical communication?
i) Give two advantages of optical fibre communication.
j) Give two points of difference between LED and injection Laser Diode.

2x10

PART-A

Q.2 a) Explain the operation of optical fibre communication link with the help of a block diagram.

b) Give advantages and applications of optical fibre communication system.

Q.3 a) Define numerical aperture (NA). Derive an expression for NA, given the refractive index for core as \( n_1 \) and for cladding as \( n_2 \). Also give relation between NA and acceptance angle.

b) Compare and contrast mono-mode and multimode-step index optical fibres.

Q.4 What are different types of losses found in an optical fibre? Explain them.

20
**PART-B**

Q.5  
**a)** Explain the working of avalanche photodiode. List the factors which limit its response time. What are the benefits and drawback of avalanche photodiode?  

10  
**b)** Briefly describe the principle of operation of injection laser diode.  

10

Q.6  
**a)** Explain the various types of connectors in optical fibre communication.  

10  
**b)** Explain fibre alignment and joint losses in optical fibre communication.  

10

Q.7  
**a)** What are various multiplexing methods used in optical fibre communication? Explain any one in detail.  

10  
**b)** Write a note on optical power budgeting.  

10
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
MEDICAL ELECTRONICS (EC-I-601)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Differentiate between electrode and bioelectrode.  
b) Define medical electronics.  
c) Name the various organs involved in respiratory system.  
d) Explain nucleus.  
e) What is prosthesis?  
f) Explain neuron.  
g) Name various electrodes used for ECG.  
h) Write about principle of MRI (in short).  
i) Differentiate between artery and vein.  
j) What are the various transducers used in medical field?

2x10

PART-A

Q.2  
Explain ECG with its a block diagram. Write application areas of ECG.

20

Q.3  
a) Define cell structure with diagram.  
b) Explain circulatory system.

10

Q.4  
a) Categorize all medical electronics equipments and explain any two of them.  
b) Write about pacemaker.

10

PART-B

Q.5  
Explain the origin of bioelectric signal with diagram.

20

Q.6  
a) What is skin contact impedance?

10
b) Explain respiration rate measurement system.  

Q.7   a) Differentiate between gross and micro-current shock.  

b) What are the various safety standards of medical devices?
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
DIGITAL AND DATA COMMUNICATION (EC-I-602)

Time: 3 hrs  
Max Marks: 100  

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define serial transmission.  
b) Define the term quantization.  
c) Explain the function of MODEM.  
d) Classify various types of switching.  
e) Define DSL.  
f) Explain the need of companding in communication.  
g) Give various features of GSM standard.  
h) Mention various features of FAX machines.  
i) Draw NRZ-L, Manchester encoding for 100010 patterns.  
j) Mention various protocols used in data link layer.  

2x10

PART-A

Q.2  
a) Draw a block diagram of data communication.  
8  
b) What are the various types of data transmissions?  
6  
c) Write a note on transmission impairments.  
6

Q.3  
a) Draw and explain a block diagram of TDM-PCM communication system.  
10  
b) Explain in detail various types of bipolar encodings.  
10

Q.4  
a) Draw and explain a block diagram of MODEM.  
6  
b) Give classification of various types of serial interfaces.  
6  
c) Write notes on:  
i) UART
ii) USART

**PART-B**

Q.5  
a) Explain various standard organizations for data communication.  

total: 10

b) Explain the need of switching. Give classification of various types of switchings.  

total: 10

Q.6  
a) Explain in detail various generations of mobile communication.  

total: 10

b) Write notes on:
   i) All sectoring  
   ii) Handover  
   iii) WLL  
   iv) Frequency reuse.  

total: 10

Q.7  
a) Explain a block diagram of a modern FAX system.  

total: 10

b) Discuss various features and application of FAX machines.  

total: 10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
MICROCONTROLLER AND PLCs (EC-I-603)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the difference between RET and RETI instructions? Explain.
b) State the functions of EA and ALE pins of 8051 microcontroller.
c) Write instructions to use the registers of bank 3 and load 05H value in the registers R0 to R3.
d) Explain the function of SCON register.
e) If crystal frequency of an 8051 based system is 11.0592 MHz, find the period of machine cycle.
f) Give the memory structure of PLCs.
g) Write a program for 8051 microcontroller to add two 8-bit numbers.
h) Differentiate between microprocessor and a microcontroller.
i) Show the contents of A and B after execution of following instructions:
   MOV    A, #59H
   ADD    A, #32H
   DA A,
j) Explain why program counter is 16 bit wide in 8051 microcontroller.

Q.2 a) Draw and explain architecture of an 8051 microcontroller.

   b) Explain the following instructions with examples:
      i) MOVX  ii) SETB  iii) ADDC
      iv) SJMP

Q.3 a) Explain various modes of operations of timers in 8051 microcontroller.

   b) Explain various addressing modes of 8051 microcontroller.
Q.4  a) Write a program to generate 100 KHz square wave on pin P 2.3. Use timer 1 in mode 1. Crystal frequency 11.0592 MHz.  
      b) State the various ways to increase the baud rate of data transfer in 8051.  

PART-B

Q.5  a) What is PLCs? Explain the architecture of PLCs.  
      b) What are various assembler directions for an 8051 microcontroller? Explain.  

Q.6  a) Interface 8 K ROM and 16 K RAM with an 8051 microcontroller. Draw the interfacing diagram.  
      b) How many address lines are required for accessing the data in 8 K RAM memory chip? Here data is organized as bytes.  

Q.7  a) What is ladder diagram programming? Write a program to control the water level in the tank.  
      b) What do you mean by program SCAN and PLCs?
End Semester Examination, Dec. 2014
M. Tech. (Comm. Sys.) - First Semester
INFORMATION THEORY AND CODING (EC-M-C-101)

Time: 3 hrs
Max Marks: 75

No. of pages: 2
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) One of four possible messages $Q_1$, $Q_2$, $Q_3$ and $Q_4$, having probabilities $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$ and $\frac{1}{8}$, respectively is transmitted.
   i) Calculate entropy.
   ii) Find $R$ if $r = 1$ message per second.
   iii) What is the rate at which binary digits are transmitted if the signal is sent after encoding $Q_1$ to $Q_4$ as $00, 01, 10, 11$?
   iv) What is the rate, if the code employed is $0, 10, 110, 111$?
   
   b) Define entropy. Show that entropy is maximum when all the messages are equally likely. Find $H_{\text{max}}$ (Take $M = 3$).

Q.2 a) Find the relation between mutual information and entropy.
   Consider a channel with an input $X$ and an output $Y$. Show that if $X$ and $Y$ are statistically independent, then:
   $H(Y|X) = H(X)$ and $I(X,Y) = 0$
   
   b) Find the differential entropy $H(X)$ of the random variable which is uniformly distributed between 0 and 4.
   
   c) Define minimum Hamming distance. What is its significance?

Q.3 a) State and prove Shannon Hartley theorem for a television transmission, the required number of brightness level $= 16$, pixels per picture frame $= 10^6$, frames transmitted per second $= 30$ and SNR $= 30$ dB.
   Find minimum bandwidth required.
   
   b) Compare coding efficiency of Shannon Fano coding and Huffman coding when five source messages have probabilities $m_1 = 0.4, m_2 = 0.15, m_3 = 0.15, m_4 = 0.15$ and $m_5 = 0.15$. 

753/4
Q.4 a) Consider a two hop satellite channel as shown in the figure along with transition probabilities. Find its channel capacity.

![Diagram of a two hop satellite channel]

b) Discuss in detail rate distortion function.

c) What is a linear code? Show that \( C = (000, 111) \) is a linear code.

Q.5 a) Consider a (6,3) linear block code with the parity check matrix \( H \) given by:

\[
H = \begin{bmatrix}
1 & 0 & 1 & 1 & 0 & 0 \\
0 & 1 & 1 & 0 & 1 & 0 \\
1 & 1 & 1 & 0 & 0 & 1
\end{bmatrix}
\]

i) Find the generator matrix \( G \).

ii) Find the code word for the data bit 101.

iii) If the received bit is 1110101, find the error bit.

b) What is a cyclic code. For a (7,4) cyclic code, the generating polynomial \( g(x) = (1 + x + x^3) \)? Find the code word if data word is:

i) 0011

ii) 0100

Show how cyclic code is decoded to get data word for previous case (i)?

Q.6 Write short notes on:

a) Perfect codes.

b) BCH codes.

c) Burst error correction.

Q.7 a) Consider the convolution encoder shown in the figure.

i) Sketch the state diagram the tree diagram and the Trellis diagram.
ii) Find the free distance of this convolution code.

8
b) Explain Viterbi algorithm for decoding convolutional codes.
End Semester Examination, Dec. 2014  
M. Tech. (Comm. Sys.) - First Semester  
SECURITY ENGINEERING (EC-M-C-102)

Time: 3 hrs  
Max Marks: 75

No. of pages: 1  
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Explain data encryption standard (DES) in detail.  

b) How do you break an encryption scheme?  

10  
5

Q.2  
Explain the terms any three:  
a) Multilevel model of security.  
b) Viruses, worms and Trojan horses.  
c) Directory services and replicated services.  
d) Function of first four layers of an OSI model.  

5x3

Q.3  
a) Assume a client C wants to communicate with the server S using Kerberos protocol. How can it be achieved?  

b) With the help of a neat diagram, explain SSL (Secure socket layer), record protocol operation.  

10  
5

Q.4  
a) Describe the five principle services that pretty good privacy (PGP) provides.  

b) Explain the functionality of secure / multipurpose internet mail extension (S/MIME).  

10  
5

Q.5  
a) What are important security issues with the web?  

b) Discuss the management strategies and policies for enterprise information security.  

6  
9

Q.6  
a) Write short notes on ‘trusted intermediaries’ and ‘mutual authentication’.  

10
b) Write a short note on firewall.  

Q.7  

a) What is secure IP protocol (IPSec)? Describe authentication header mode of IP security.  

b) List the differences between symmetric and asymmetric cryptography.  

Q.8  

Write short notes on any three:  

a) Hashes and message digests.  

b) Management issues for security system in the real world.  

c) International data encryption algorithm (IDEA).  

d) Digital signature.  

e) Public key infrastructure (PKI).  

5x3
End Semester Examination, Dec. 2014  
M. Tech. (Comm. Sys.) - First Semester  
SIGNAL THEORY (EC-M-C-103)

Time: 3 hrs

Max Marks: 75

No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
(a) Categorize different types of discrete random variables and explain any two of them.

(b) A car hire firm has two cars. The number of demands for a car on each day is distributed as Poisson variate with mean = 0.5. Calculate the proportion of days on which:
   i) Neither car is used.
   ii) Some demand is refused.

Q.2  
(a) The actual volume of soup in 500 ml jar follows a normal distribution with mean 500 ml and variance 16 ml. If x denotes the actual volume of soup in a jar, what is:
   i) \( P(x > 496) \)
   ii) \( P(x < 498) \)
   iii) \( P(492 < x < 512) \)

(b) Explain exponential distribution of a continuous random variable.

Q.3  
(a) Use Gram-Schmidt procedure to express functions in the figure given below in terms of orthonormal components.

(b) State and explain central limit theorem.
Q.4 What do you mean by stochastic convergence? Explain different types of convergences with suitable examples.

Q.5 a) Find mean variance and root mean square value of the process whose auto correlation function is given as:

i) \( R_{xx}(\tau) = 25 + \frac{4}{1 + 6\tau^2} \).

ii) \( R_{xx}(\tau) = \frac{25\tau^2 + 36}{6.25\tau^2 + 4} \).

b) State two properties of cross correlation function.

Q.6 a) What do you mean by power spectral density function? Find the power spectral density of a stationary process \( x(t) \) with \( R_{xx}(\tau) = 6 + e^{-3|\tau|} \).

b) Explain wide sense stationary (WSS) random process.

Q.7 a) If the random variable \( x \) takes the value 1, 2, 3, 4 such that \( 2P(x = 1) = 3P(x = 2) = P(x = 3) = 5P(x = 4) \). Find the probability distribution function and cumulative distribution function of \( x \).

b) Let \( x \) be a random variable with PDF:

\[
f(x) = \begin{cases} 
\frac{1}{3} e^{-\frac{x}{3}} & x > 0 \\
0 & \text{otherwise}
\end{cases}
\]

Find:

i) Moment generating function of \( x \).

ii) \( E(x) \) and \( \text{var}(x) \).

iii) \( P(x > 3) \).

Q.8 a) Show that if the processes \( x(t) \) and \( y(t) \) are wss and \( E \left[ \left| x(0) - y(0) \right|^2 \right] = 0 \), then

\( R_{xy}(\tau) = R_{yx}(\tau) = R_{yy}(\tau) \).

b) Write a short note on Poisson process.
End Semester Examination, Dec. 2014
M. Tech. (Comm. Sys.) - First Semester
DIGITAL COMMUNICATION (EC-M-C-104)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) State and prove sampling theorem for band limited stochastic processes.  
      5
   b) Distinguish between impulse sampling and natural sampling. How the 
      problem of aliasing can be tackled using antialiasing filters?  
      10

Q.2  a) Discuss with a block diagram, the working of adaptive delta modulation 
      (ADM). Mention advantages over ordinary delta modulation.  
      7
   b) A voice signal is prefiltered to 4 kHz and its rms bandwidth is 1.3 kHz. 
      Assuming that this signal is applied to a DM system with optimum slope over 
      loading factor. Find out the SNR of this system for a bandwidth expansion 
      factor of 8. Compare this bandwidth to a PCM system bandwidth assuming 
      the SNR of both the systems to be identical.  
      8

Q.3  Discuss continuous-phase FSK (CPFSK) and minimum shift keying (MSK) 
      modulation methods. Give block diagram of MSK modulator and explain its 
      working. Compare waveforms for QPSK, OQ PSK and MSK for the same data 
      sequence.  
      15

Q.4  With a block diagram discuss frequency-hopped spread spectrum system. What 
      is block hopping and independent tone hopping? Discuss applications of FH 
      spread spectrum signals.  
      15

Q.5  a) Discuss generation of PN sequences for spread spectrum applications.  
      7
   b) Discuss time synchronization of the receiver to the received spread spectrum 
      signal taking initial acquisition and tracking phase.  
      8
Q.6  
   a) Discuss layered architecture of data networks in detail.  
       
   b) Explain store and forward switching.  

Q.7  
   a) Explain quantisation of analog signal mentioning uniform and non-uniform quantisations. What is companding?  
       
   b) A signal $m(t)$ is uniformly distributed in the range $\pm v_p$. The signal is quantised by an uniform quantiser. Find the ratio of peak SNR to the average SNR for the quantised signal.  

Q.8  
   Write short notes on any three:  
   a) M-ary FSK.  
   b) Adaptive linear equaliser.  
   c) PAM signals and their power spectra.  
   d) Coherent and non-coherent detection.
End Semester Examination, Dec. 2014
M. Tech. (Comm. Sys.) - First Semester
OPTICAL COMMUNICATIONS (EC-M-C-105)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) Briefly discuss various types of optical fibres, their merits and demerits.

b) Derive an expression for numerical aperture for an optical fibre. Assume \( n_1 \) and \( n_2 \) as refractive index for core and cladding, respectively.

Q.2 a) What do you understand by the terms: attenuation and dispersion in optical fibre? List various types of dispersion in optical fibre.

b) Explain material dispersion and draw material dispersion variation as a function of wavelength.

Q.3 a) Explain working principle and characteristics of LED.

b) List various types of structures of LED. Explain working of surface emitting LED.

Q.4 a) Explain the working principle of laser.

b) With the help of a diagram, discuss the principle of operation of Fabry-Perot and a Quantum-well laser.

Q.5 a) Compare laser and LED.

b) Explain any one of the schemes used for coupling the emission from LED to the fiber.
Q.6  a) Explain various characteristics of photo detectors.  

b) With the aid of a diagram, explain the working of PIN-photodiode.

Q.7  a) Compare Homodyne and Heterodyne detection schemes in optical communication system.

b) Explain direct intensity modulation.

Q.8  Write short notes on any three:

a) Synchronous and asynchronous demodulation.

b) Optical power budgeting.

c) Advantages of optical fibre communication system.

d) Fibre bending losses.
End Semester Examination, Dec. 2014
M. Tech. (Comm. Sys.) - Second Semester
SATELLITE AND SPACE COMMUNICATION
(EC-M-C-223 / EC-M-C-223A)

Time: 3 hrs
Max Marks: 75

No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What are important differences between satellite communication and terrestrial communication?

8

b) Different kinds of satellites use different frequency bands. Write the letter, designation, frequency range and the type of services for which each band is used.

7

Q.2  a) Define the following terms with respect to an earth orbiting satellite:
   i) Line of Apsides
   ii) Inclination Angle
   iii) Sub satellite point
   iv) Elevation angle

8

b) Explain the effects of rain attenuation and free space path loss in satellite communication.

7

Q.3  a) Briefly describe the important characteristics and the preferred uses of the following orbits:
   i) Molniya orbit
   ii) Geostationary orbit
   iii) Sun synchronous orbit

5

b) The difference between the farthest and the closest points in a satellite’s elliptical orbit from the surface of the Earth is 30000 km and the sum of the distances is 50000 km. If the mean radius of the Earth is considered to be 6400 km, determine the orbit eccentricity.

5

c) What are the factors that determine the earth coverage and range of geostationary satellite? Explain these using a suitable block diagram.

5
Q.4  a) Explain the multiple access for the satellite system. List various types of multiple access techniques. Describe satellite switched TDMA and DAMA.  

b) A TDMA frame and burst structure has the following parameters:
   i) TDMA frame length = 20 ms
   ii) Length of carrier and clock recovery sequence = 352 bits
   iii) Length of unique word = 48 bits
   iv) Length of order wire = 510 bits
   v) Length of management channel = 256 bits
   vi) Length of transmit timing channel = 320 bits
   vii) Length of service channel = 24 bits
   viii) Guard time = 64 bits
   ix) Also each of the 10 stations in the network transmit two traffic bursts each frame and each frame also contains two reference bursts.

Q.5  What are the factors that affect the uplink and down link design in a geostationary satellite communication link? Discuss in detail.

Q.6  a) What are different perturbations and orbital effects which affect the performance of a satellite? Explain these briefly.

b) “Even if a perfect station keeping manoeuvre is carried out, the satellite may display motions about its centre of mass”. How will you overcome this problem?

Q.7  a) Explain basic differences between the optical satellite communication link and RF satellite communication link. Mention the advantages of an optical satellite communication system.

b) Explain the basic working of a heterodyne optical satellite receiver.

Q.8  Write short notes on any two:
   a) Use of LEO and MEO satellites in telephony
   b) Antennas for satellite communication
   c) SPADE system
   d) Deep space optical communication link

   \[ 7^{1/2} \text{x} 2 \]
Q.1 What is meant by the term: adaptive? Explain any system in reference to adaptation. Also explain open and closed adaptive systems.  

Q.2 Explain state space model and derive the same for:  

\[ \frac{d^3 y(t)}{dt^3} + 6 \frac{d^2 y(t)}{dt^2} + 11 \frac{dy(t)}{dt} + 10 y(t) = 8 x(t) \]  

Q.3 Explain RLS algorithm in detail. State the relationship between RLS and Kalman filter.  

Q.4 Calculate MMSE for Weiner Hopf filter.  

Q.5 a) Write a short note on gradient search algorithm and prove that:  

\[ W_k - W^* + (1 - 2 \mu \lambda)^k (\omega_0 - \omega^*) \]  

b) Explain stability and rate of convergence.  

Q.6 Derive an expression for stochastic gradient search using LMS algorithm.  

Q.7 a) Explain excess mean square error and misadjustment.  

b) State orthogonality principle and derive the equation.  

Q.8 Explain any two:  

a) Adaptive equalization.
b) Adaptive noise cancellation.
c) Adaptive echo cancellation. 

$7^{\frac{1}{2}} \times 2$
End Semester Examination, Dec. 2014
M. Tech. (Comm. Sys.) - Third Semester
IMAGE PROCESSING (EC-M-C-322)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) i) What is quantization error in context of image processing?
   ii) Is it possible to display all kinds of colours in a colour monitor? Justify.

   5

b) Consider the two image subsets $S_1$ and $S_2$ for $V = \{1\}$, determine whether $S_1$ and $S_2$ are:
   4- Connected
   8- Connected
   m- Connected

\[
\begin{array}{cccc}
S_1 & & S_2 \\
1 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 \\
0 & 0 & 1 & 0 \\
\end{array}
\]

   5

c) Discuss in brief about the elements of digital image processing system.

   5

Q.2 a) Define 2-D DFT and explain its properties.

   10

b) Show that cosine transform is a fast transform.

   5

Q.3 a) Explain the model of image degradation process and discuss its role in image restoration.

b) Explain the function of Wiener filter for image restoration in presence of additive noise.

\(7\frac{1}{2}\times 2\)
Q.4 a) What is meant by loseless and lossy compression?
   
   b) Explain run length coding used for image compression.
   
   c) How an image is compressed using JPEG image compression standard?

Q.5 a) Gray level histogram of an image is given below:

<table>
<thead>
<tr>
<th>Gray level</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>400</td>
<td>700</td>
<td>1350</td>
<td>2500</td>
<td>3000</td>
<td>1550</td>
<td>550</td>
<td>0</td>
</tr>
</tbody>
</table>

   Compute the gray level histogram of the output image obtained by enhancing the input by the histogram equalization technique.

   b) How mean filters are used for image enhancement?

Q.6 a) Specify the expression for the following:
   i) Geometric mean filter.
   ii) Harmonic mean filter.
   iii) Contraharmonic mean filter.

   b) Write a note on homomorphic filtering.

Q.7 a) Explain image segmentation based on amplitude thresholding.

   b) Explain various edge detection techniques used for image segmentation.
End Semester Examination, Dec. 2014  
M. Tech. (VLSI & ES) - First Semester  
SEMICONDUCTOR DEVICE MODELLING (EC-M-VE-101)

Time: 3 hrs  
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) What is the significance of SPICE in circuit simulation?  
   4
b) How many types of analysis are possible in SPICE? Explain it with suitable  
   examples.
   7
c) What are the main objectives of circuit simulation?  
   4

Q.2 a) Explain the effect of noise diode with a proper model.  
   10
b) What do you mean by measurement of diode model parameter?  
   5

Q.3 a) Explain the small signal high frequency model of BJT.  
   9
b) Explain HEMT.  
   6

Q.4 a) Explain the different capacitances found in MOS circuit.  
   6
b) Write a capacitances model of MOS circuit in different region of operation.  
   Also explain the need of modeling of capacitances.  
   9

Q.5 a) Explain different type of scaling in MOSFET. Also explain the effect of full  
   scaling on different MOS parameter.  
   12
b) What is difference between level 1 and level 2 model of MOSFET?  
   3

Q.6 a) Explain small signal model of MOSFET.  
   4
b) What do you mean narrow channel effect?  
   4

770/4
c) Write short notes on:
   i) DIBL
   ii) Charge sharing in MOS

Q.7 Write notes on following:
   a) BSIM model
   b) Modeling of MESFET
   c) HBT
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - First Semester
MICROCONTROLLERS AND APPLICATIONS (EC-M-VE-102)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q. 1  a) Explain the internal architecture of an 8051 microcontroller.

b) Explain the following instructions.
   i)  ACALL
   ii) MOVX
   iii) DA

Q. 2  a) Explain various addressing modes of an 8051 microcontroller.

b) Show the status of PSW register after the execution of following instructions:
   MOV A, #9CH
   ADD A, #64H

c) Explain the following signals:
   i)  ALE
   ii)  EA

Q. 3  a) Write a program to logical AND the contents of port 1 and port 2 then put the
       result in external RAM location 0150H.

b) Explain the following registers:
   i)  IP
   ii)  PCON

c) Write a program to load the accumulator with value 55H and then
   complement it 700 times.

Q. 4  a) Write a program to generate a rectangular waveform of $T_{ON} = 4ms$ and
       $T_{OFF} = 6ms$ on port pin 2.3.
b) Explain mode 1 and mode 2 operations of timer in an 8051 microcontroller.

Q.5  

a) Explain various modes of serial interface in an 8051 microcontroller.  

b) Write a program to bring in data in serial form and send it out in the parallel form.

c) Explain the bits of SCON register.

Q.6  

a) Describe various interrupt sources in an 8051 microcontroller. How are they handled?

b) Assuming $XTAL = 12\, MHz$. Find $TH1$ value needed to have 1200 Baud rate.

Q.7  

a) Show the interface design of an 8051 microcontroller system with $8k\, bytes$ of program ROM and $8k\, bytes$ of data ROM.

b) Interface ADC with an 8051 microcontroller.

Q.8  

Write short notes on any two:

a) Design tools for development.

b) Regulating compliance testing.

c) Memory organization of an 8051 microcontroller.
End Semester Examination, Dec. 2014  
M. Tech. (VLSI & ES) - First Semester  
ANALOG IC DESIGN (EC-M-VE-103)

Time: 3 hrs

Max Marks: 75

No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Give the quantitative analysis of differential pair as shown in the figure. Also plot the input-output characteristics with tail current variation.

![Differential pair](image)

Q.2 a) Find the drain current of M4 of the figure, if all of transistors are in saturation.

![Current mirror](image)

b) Derive an expression for output impedance of Wilson current mirror.
Q.3 Estimate the frequency response of differential pair shown in the figure. Also calculate voltage gain.

![Differential pair](image)

Q.4 a) Explain the compensation in two stage op-amp.

b) What is the need of a two stage op-amp over single stage? Draw the simple structure of two stage op-amp.

Q.5 a) Design a fully differential telescopic op-amp with following specifications.

- $V_{DD}=3V$,
- Differential output swing=$3V$,
- Power dissipation = 10 mV, voltage gain = 2000

Assume $\mu_{ncon} = 60 \mu A/V^2$, $\mu_{pcon} = 30 \mu A/V^2$, $\lambda_n = 0.1 V^{-1}$, $\lambda_p = 0.2 V^{-1}$

b) Write the different performance parameters of a op-amp.

Q.6 a) What is a V.C.O.? Write the performance parameters of a V.C.O.

b) Explain the source follower circuit.

Q.7 a) What is PLL? Where is it used? Implement PLL using CMOS technology.

b) Explain SAR ADC.

Q.8 Write short notes on any two:

- Switched capacitor circuits.
- Cascode current mirror.
c) Analog buffers.
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - First Semester
EMBEDDED SYSTEMS DESIGN (EC-M-VE-104)

Time: 3 hrs
Max Marks: 75
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Explain share data problem with a suitable example and also give the solutions for removing this problem.

    b) What are the skills required for different types of embedded systems designed?

Q.2  a) Explain the various ways in which RTOS handles interrupts.

    b) Explain the concept of semaphore and various services of RTOS.

Q.3  a) What is custom single purpose processor design? Design a sequential logic design for calculating GCD (greatest common divisor). Draw its black box view, state diagram, come up with a state table, minimize the logic and draw a final circuit.

    b) What is the significance of datapath and controller in processor design?

Q.4  a) Explain the architecture and operation of application specific instruction set processor.

    b) Write a short note on DMA.

Q.5  Explain the following protocols:
    a) CAN
    b) I\(^2\)C
    c) PCI

5x3
Q.6  a) Discuss general purpose processor design of a simple microprocessor system. Draw its FSMD, datapath and controller.  
     b) Write a short note on message queues and mailboxes.  
     
Q.7  a) What is RT level design for a single purpose processor design? Take any design, draw its problem specification and draw its FSMD.  
     b) How interfacing is done using I/O addressing? Briefly discuss ISA bus protocol.  

Q.8  Write short notes on *any Three:*  
     a) UART.  
     b) PWM.  
     c) Stepper motor controller.  
     d) Assembler and cross assembler.  
     
*5x3*
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - First Semester
EMBEDDED SYSTEMS DESIGN (EC-M-VE-104A)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is Round Robin Architecture? How it is different from Round Robin with interrupt function architecture? Explain in detail.
    b) What is memory? Draw timing diagram for a typical RAM and ROM. Explain the term DMA in context of memory and timing diagrams.

Q.2  a) What is shared data problem? How interrupt latency is associated with shared data problems?
    b) What are the rules for creating the interrupt routines in an RTOS environment? Explain in detail.

Q.3  a) What are semaphores? How semaphores help in removing shared data problems?
    b) What are task and task states? How memory management is done in the RTOS environment? Also discuss briefly about events.

Q.4  a) What is a general purpose processor basic architecture? Discuss its data path and control unit in detail with the help of a diagram.
    b) Design a custom single purpose processor design for a task of computing GCD (Greatest Common Divisor) of two numbers. Draw the data path and controller for the problem and make the final circuit.

Q.5  a) Discuss the basic DRAM architecture in detail. What are its variants? Discuss in brief.
b) What is I/O addressing for microprocessor interfacing? Differentiate between memory mapped I/O and standard I/O system.

Q.6  a) What are HCFSM and state chart language? How do they differ from program state machine (PSM) model?

b) Discuss a basic state machine model of finite state machine with the help of a suitable example. Also draw FSMD for the above and discuss in detail.

Q.7  Write short notes on any three:
   a) ASIP processor design.
   b) Arbitration mechanism.
   c) Concurrent processes.
   d) Parallel protocols.
   e) IP cores.
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - First Semester
DIGITAL IC DESIGN (EC-M-VE-105)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is propagation delay? Derive an expression of $\tau_{PHL}$ for a CMOS inverter. 10
  b) Briefly discuss MOS system under the influence of applied electric field. 5

Q.2  a) Differentiate between ratioed logic and ratioless logic. 5
  b) Draw layout diagram of two input CMOS NOR gate. 5
  c) Design the following function using CMOS:
      $$F = A \oplus B$$ 5

Q.3  a) Explain voltage transfer characteristics (VTC) of CMOS inverter in detail. 7
  b) Design a two-input AND gate using domino logic. 3
  c) What is interconnect delay? Briefly discuss RC delay model. 5

Q.4  a) Design CMOS implementation of D-latch and explain its operation. 8
  b) What is monostable multivibrator circuit? Design a monostable multivibrator circuit using CMOS NOR gates. 7

Q.5  a) Discuss the mechanism of dynamic power dissipation in CMOS circuits. 7
  b) The size of a CPU chip is 15 mm x 25 mm with clock frequency of 300 MHz operating at 3.3V. The length of clock routing is estimated to be twice the circumference of the chip. Assume that the clock signal is routed on a metal layer with width of 1.2 μm and the parasitic capacitance of the metal layer is
What is the power dissipation of the clock signal?

Q.6  a) Explain the working of I T DRAM cell in detail.
     b) What is the need of sense amplifier in SRAM? Differentiate between differential and single ended sensing.

Q.7  Write short notes on:
     a) Bicmos circuits and its applications.
     b) Shift registers.
     c) Pass transistor logic (PTL).
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Second Semester
REAL TIME OPERATING SYSTEMS (EC-M-VE-201)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What do you mean by OS? What is the difference between OS and RTOS?
Give some examples of OS and RTOS.

8

b) Explain software architecture. Also explain basic architecture with examples.

7

Q.2  a) Explain hard and soft real time systems with their applications.

8

b) Write down advantages and disadvantages of RTOS.

7

Q.3  a) What do you mean by reference model? Explain the following:
i) Processors and resources.
ii) Temporal parameters of real-time work.

10

b) Explain the concept of a real-time system.

5

Q.4  a) What do you mean by job and resources? Explain resource parameters of
jobs and parameters of resources.

8

b) Explain the following:
i) Clock driven scheduling.
ii) Weighted round robin scheduling.

7

Q.5  a) What do you mean by synchronization of a process? Explain task and threads.

8

b) Explain the problem of data sharing in multiple tasks and routines.

7

Q.6  a) Explain various timing parameters in an RT system.

8

b) Explain hard and soft timing constraints on the basics of:
i) Function criticality of job.
ii) Usefulness of late result.

Q.7 Explain case study of an automatic chocolate vending machine using RTOS.

Q.8 Write short notes on any two:
   a) Interrupt routine in RTOS.
   b) Offline and online scheduling.
   c) VX-works.
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Second Semester
ADVANCED DIGITAL SYSTEM DESIGN (EC-M-VE-202)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What do you mean by hardware description language? List the difference between VHDL and verilog.  
      b) Explain the flow of digital system design.

Q.2  a) Explain different styles of VHDL modeling with a suitable example.
      b) Discuss:
         i) Elaboration.
         ii) Initialization.
         iii) Simulation.

Q.3  a) Write behavioural and structural VHDL model for a 4:1 multiplexer.
      b) Discuss data-object in detail.

Q.4  a) Differentiate between array data type and record data type.
      b) Explain scalar data type with an example.
      c) Perform the following operations:
         i) 7 mod -4.
         ii) “1001010” sll 2
         iii) “1001010” ror 3.

Q.5  a) Write VHDL model for a 9 bit parity generator in structure modeling.
      b) Explain the following statements:
         i) Case statement.
         ii) Signal Assignment statement.
iii) For loop.

Q.6  
   a) Explain subprogram overloading and operator overloading.
   b) Differentiate between function and procedure with suitable examples.

Q.7  
   a) Write VHDL model for 4 bit up counter.
   b) Write VHDL model for 2:4 decoder in structural modeling.

Q.8  
   Write short notes on:
   a) CPLO.
   b) FPGA.
   c) PLA and PAL.
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Second Semester
LOW POWER VLSI DESIGN (EC-M-VE-203)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any **FIVE** questions in all. Each question carries equal marks.

Q.1  a) Why does short-circuit flow in CMOS circuits? How does it vary with output load and input signal slope?  
     b) A 64-bit off chip bus operating at 5 V and 72 MHz clock rate is driving a capacitance of 28 pF/ bit. Each bit is estimated to have a toggling probability of 0.25 at each clock cycle. What is the power dissipation in operating the bus?  

Q.2  a) Discuss the impact of technology scaling on speed and MOSFET current in the circuits.  
     b) Describe the impact of transistor sizing and oxide thickness on delay and delay energy product.

Q.3  a) What is gate level logic simulation? Explain internal switching energy and static state power with an example.  
     b) What is data correlation in DSP switching frequency?

Q.4  a) Discuss Monte Carlo simulation. How is it used for power estimation?  
     b) What is signal gating?

Q.5  Discuss various transformation techniques implemented on flow graphs to reduce the power dissipation.

Q.6  Discuss pre computation logic. How is it derived for a given function? Also explain design issues in pre-computation logic technique.
Q.7  a) Describe the techniques implanted for low power memory design.  
     12  
     b) How does clock gating help in power reduction?  
     3  

Q.8  Write short notes on:  
     a) Architectural level analysis.  
     b) Signal entropy.  

    7\frac{1}{2}x2
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Second Semester
DIGITAL SIGNAL PROCESSORS AND APPLICATION SPECIFIC INSTRUCTION-SET PROCESSOR ARCHITECTURE (EC-M-VE-204)

Time: 3 hrs

Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) The first five points of 8 point DFT of a real valued sequence are given by
\( x(0) = 0, x(1) = 2 + 2j, x(2) = -j4, x(3) = 2 - 2j, x(4) = 0 \). Determine remaining points and obtain time domain sequence \( x(n) \).

10

b) How we can represent floating point number in IEEE 32 bit and 64 bit formats. 5

Q.2 a) How many number of multiplications and additions are required to compute
the 16-point DFT and FFT? Also write down the formula used.

3

b) If \( x(n) = \{0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0\} \), find \( X(k) \) using DIT algorithm.

12

Q.3 a) Explain properties and applications of unfolding.

9

b) How we can use folding in multirate systems?

6

Q.4 a) Write a MATLAB program for finding IDFT of a signal.

5

b) What are the architectural approaches and characteristics of DSP?

10

Q.5 a) Obtain the direct form I, direct form II and cascade form realization for the
following system
\[
y(n) = \frac{3}{4} y(n-1) - \frac{1}{8} y(n-2) + x(n) + \frac{1}{3} x(n-1).
\]

8

b) Differentiate between recursive and non-recursive filters. Explain interpolation filter.

7
Q. 6  a) Explain pipelining and parallelism by a diagram.
     
     b) An unpipelined processor has a cycle time of 30 ns. What is the cycle time of
        a pipelined version of the processor with 5 evenly divided pipeline stages, if
        each pipeline latch has a latency of 1 ns?

Q. 7  a) What is the condition for having linear phase filter?
     
     b) Explain memory structure and addressing modes for a DSP processor.

Q. 8  Write short notes on any two:
     a) ASIP design space
     b) ASIP design flow
     c) Energy performance in ASIP
End Semester Examination, Dec. 2014  
M. Tech. (VLSI & ES) - Second Semester  
RF MICROELECTRONICS (EC-M-VE-223)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Explain the heating property of μ wave and where it is used.  
      5  
    b) Why is tunnel diode different from other diode? Explain the V.I characteristics 
       of tunnel diode with the help of ELDs.  
      10

Q.2  a) Differentiate between enhancement and depletion MOSFET.  
      5  
    b) Draw the block diagram of HEMT. Explain its operation. Also write its 
       advantages and disadvantages.  
      10

Q.3  a) Differentiate between Butterworth and Chebyshev filters.  
      5  
    b) Realize 2nd order high pass Butterworth filter using Caur-I topology.  
      10

Q.4  a) Derive an expression of cascaded amplifier to show bandwidth shrinkage.  
      10  
    b) How is tuned amplifier used as a narrow band amplifier?  
      5

Q.5  a) Explain different type of internal noises presents in R. F. circuits.  
      5  
    b) Explain classical two port noise theory.  
      10

Q.6  a) What is PLL? Show its importance in communication.  
      7  
    b) Explain the operation of crystal oscillator with its diagram. Write its 
       advantages.  
      8

Q.7  a) What is importance of mixers in a receiver?  
      5
b) What is multiplier based mixer? Explain single balanced mixer.

Q.8 Write short notes on any two:
   a) Sequential phase detectors.
   b) Negative resistance oscillator.
   c) Bandwidth enhancement with \( f_r \).

7\frac{1}{2}\times2

End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Third Semester
VLSI TEST AND TESTABILITY (EC-M-VE-301)

Time: 3 hrs
Max Marks: 75
No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) What are the different types of physical faults that may occur in chip?

b) Show an example where a combinational logic circuit will become a sequential circuit in presence of a bridging fault.

Q.2 a) How many test vectors are needed to detect all single stuck at fault present on each input of 4 input AND gate?

b) What is fault detectability? Differentiate PODEM and D-algorithm.

Q.3 a) Explain different types of test vectors. What is the importance of pseudo random test vectors?

b) What do you mean by signature? Explain any two compression techniques.

Q.4 a) What is maximal length LFSR? How is LFSR used as signature?

b) What is BIST? Explain the block diagram of BIST in detail.
Q.5  a) What is boundary scan? Explain the architecture of a boundary scan.
   8
b) Explain different types of faults that may occur in RAM.
   7

Q.6  a) Differentiate between parallel and concurrent fault simulation techniques.
   7
b) What do you understand by Boolean difference? Explain it with a suitable example.
   8

Q.7  a) Write the advantages and disadvantages of DFT. Explain the terms: controllability and observability.
   6
b) What is the importance of scan cells in testing of sequential circuits? Explain any two adhoc methods to increase controllability and observability.
   9

Q.8  Write short notes on any two:
   a) PLA testing
   b) Delay fault testing
   c) Fault modeling
   7½x2
End Semester Examination, Dec. 2014
M. Tech. (VLSI & ES) - Third Semester
VLSI TECHNOLOGY (EC-M-VE-323)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) What is EGS? Describe various process steps to obtain EGS. 6
b) Describe the transport phenomena involved in Chzochralski technique. 6
c) What is Gettering treatment? Why is it done on a wafer? 3

Q.2 a) Define vapour phase epitaxy. Also describe the basic transport process involved in epitaxy. 10
b) Explain doping and auto-doping process with an example. 5

Q.3 a) Explain Deal and Groove model for the oxidation of silicon. 10
b) Differentiate between contact and proximity printing processes in lithography. 5

Q.4 a) What is Fick’s law of diffusion? 5
b) Explain ion-stopping mechanism in ion-implantation process. 10

Q.5 a) What is X-ray lithography? Also explain the following:
i) Proximity printing process using X-ray. 10
ii) Synchrotron radiation.

b) Explain AC plasma excitation. 5

Q.6 a) Describe raster scan and vector scan process used for electron beam lithography.
b) Discuss various properties of etch processes.

Q.7  
   a) Differentiate between lift-off and etching process.
   b) Explain eutectic and epoxy die bonding techniques.

Q.8  
   a) What is the generic assembly sequence for plastic and ceramic packages?
   b) Explain various fundamentals of physical vapour deposition process followed for metallization.
End Semester Examination, Dec. 2014  
B. Tech. – Second Semester  
ELEMENTS OF ELECTRICAL ENGINEERING (EE-101A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define rms value of an alternating quantity.  
b) Under resonant condition the power factor of a series RLC circuit is _________.  
c) State Kirchhoff’s voltage law.  
d) _______ is the unit of power and _______ is the unit of energy.  
e) Moving coil voltmeters can measure only ________.  
f) What is a commutator?  
g) What are the two types of transformer based on its construction?  
h) Write down the expression for synchronous speed?  
i) If an inductor of 300 mH is connected across a 100 V, 50 Hz Ac supply. What will be its inductive reactance?  
j) Write an expression for the synchronous speed.  

2x10

PART-A

Q.2  
a) Find the current in the 5 Ω using Thevenin’s theorem of networking given in figure1.  

b) Explain Thevenin’s theorem.  

10

Q.3  
a) A coil of resistance 20 Ω and an inductance of 200 mH is connected in series with a capacitance of 40 μF across 200 V, 50 Hz, ac supply. Calculate:  
i) Impedance.  
ii) Magnitude of current.
iii) Power factor.
iv) Voltage across each element.
v) Phasor diagram of the circuit.

b) Derive the relationship between line voltage and phase voltage in a star connected system.

Q.4 a) Explain the working and construction of PMMC voltmeter.

b) Explain the working and construction of electrodynamometer type watt meter.

PART-B

Q.5 a) Derive the emf equation of a single phase transformer?

b) Explain the different losses in a transformer. How eddy current losses are reduced in transformer?

Q.6 a) Draw the parts of a dc machine and briefly explain.

b) Explain the different methods of speed control of a dc motor.

Q.7 a) Explain the working principle of 3-Φ induction motor.

b) Explain the working principle of synchronous generator.

End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRICAL ENGINEERING (EE-101 / EE-101A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define average value of an alternating quantity.
b) State the condition of resonance of an RLC series circuit.
c) State Kirchoff’s voltage law.
d) ________ is the unit of power.
e) Name two methods of providing controlling torque in a measuring instrument.
f) What is a commutator?
g) What are the two types of transformers based on its construction?
h) Write down an expression for synchronous speed.
i) If a capacitor of \(400 \, \mu F\) is connected across a \(200 \, V, 50 \, Hz\) supply, what will be its capacitive reactance.
j) Write an expression for the synchronous speed.

\[2 \times 10\]

**PART-A**

Q.2 a) Find current in the \(5 \Omega\) using mesh analysis for the network given in the figure:

\[\begin{align*}
15V & \rightarrow 6\Omega & \rightarrow 2\Omega & \rightarrow 5\Omega & \rightarrow 8\Omega & \rightarrow 4\Omega & \rightarrow 15V \\
\end{align*}\]

\[10\]

b) State and explain superposition theorem.

\[10\]

Q.3 a) A coil of resistance \(10\Omega\) and an inductance of \(100 \, mH\) is connected in series with a capacitance of \(80 \, \mu F\) across \(280 \, sin \, 314 \, t \, V\) supply. Find an expression for current flowing in the above circuit.

\[10\]

b) Derive the relationship between line voltage and phase voltage in a star connected system.

\[10\]

Q.4 a) Explain the working and construction of a PMMC voltmeter.

\[10\]

b) Explain the working and construction of an induction type Wattmeter.

\[10\]

**PART-B**

\[798/4\]
Q.5  a) Explain the working principle of a single phase transformer.  
      b) Explain the different losses in a transformer. How eddy current losses are reduced in transformer?

Q.6  a) Draw the parts of a dc machine and briefly explain them.  
      b) Derive the emf equation of a dc machine.

Q.7  a) Explain the working principle of a 3-φ induction motor.  
      b) Explain the working principle of a synchronous generator.
End Semester Examination, Dec. 2014
B. Tech. – First Semester
ELEMENTS OF ELECTRICAL ENGINEERING (EE-101B)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Find the equivalent resistance of the following network shown in the figure:

   \[
   \begin{bmatrix}
   2 \Omega & 6 \Omega \\
   8 \Omega & 3 \Omega \\
   4 \Omega & 6 \Omega
   \end{bmatrix}
   \]

   b) State Kirchoff’s current law.
   c) The dual of Thevenin’s theorem is the ________ theorem.
   d) An ideal voltage source should possess ________ source resistance.
   e) Define slip in an induction motor.
   f) Moving iron type of instrument has ________ scale.
   g) Define voltage regulation of a transformer.
   h) Define active or true power.
   i) Field system is stationary in the case of ________ machines.
   j) A star connected network with \( R_a, R_b, R_c \) is to be converted to a delta connected network. Write down the expression for the same.

   2x10

   **PART-A**

   Q.2 a) Explain superposition theorem.

   b) Find the current in the 8Ω resistor of the network shown in the figure using superposition theorem. All the resistances are in ohms.
Q.3  
   a) A series circuit consists of a resistance of $10\, \Omega$ an inductance of $8\, mH$ and a capacitance of $500\, \mu F$. A sinusoidal voltage of $10\, V$ amplitude with variable frequency is applied to the circuit. Find the frequency at which maximum current flows and the maximum current.  
10  
b) Derive the relation between line voltage and phase voltage in a star connected system.  
10

Q.4  
   a) Explain construction of moving iron voltmeter.  
10  
b) Distinguish between energy meter and Wattmeter.  
10

**PART-B**

Q.5  
   a) Derive the emf equation of a single phase transformer.  
10  
b) Explain open circuit and short circuit test for a single phase transformer.  
10

Q.6  
   a) Draw the parts of a dc machine and briefly explain.  
10  
b) Differentiate between dc shunt generator and dc series generator.  
5  
c) State the applications of a dc series motor.  
5

Q.7  
   a) Explain any two different types of single phase induction motors.  
10  
b) Explain the working principle of a synchronous generator.  
10

**End Semester Examination, Dec. 2014**  
B. Tech. – First / Second Semester
Q.1 Answer the following:
   a) State Kirchoff’s current law.
   b) Define slip of an induction motor.
   c) State the condition for resonance in a series RLC circuit.
   d) When ________ is equal to the load resistance, maximum power is transferred from the source to load.
   e) Write the emf equation of a transformer.
   f) What are the different configurations of a transistor?
   g) Draw the symbol of Zener diode specify one of its application.
   h) Convert binary number 10101111 to decimal number.
   i) Draw a NAND gate and write down its truth table.
   j) Draw a circuit of half wave rectifier.

   \[
   \text{2x10} 
   \]

   \[
   \text{PART-A} 
   \]

   Q.2 a) Obtain the current in 3Ω resistor using mesh analysis.

   \[
   \text{10} 
   \]

   b) Explain Thevenin’s theorem.

   \[
   \text{10} 
   \]
Q.3  a) A coil of resistance 20 $\Omega$ and an inductance of 100 mH is connected in series with a capacitance of 40 $\mu$F across 100 V, 50 Hz ac supply. Calculate:
   i) Impedance.
   ii) Magnitude of current.
   iii) Power factor.
   iv) Voltage across each element.
   v) Phasor diagram of the circuit.

b) Derive the relation between line voltage and phase voltage in a star connected system.

10

Q.4  a) Differentiate core type and shell type transformer.

10

b) Explain the working principle of 3-$\phi$ induction motor.

10

PART-B

Q.5  a) Explain the characteristics of PN junction diode.

10

b) Explain the working of a full wave rectifier showing its input and output wave forms.

10

Q.6  a) Explain the working of an NPN transistor.

10

b) Why CE configuration is commonly used?

5

c) Explain how transistor can work as an amplifier.

5

Q.7  a) Why NAND and NOR gate is called an universal gate? Realize an AND gate using NOR gates.

10

b) Convert decimal number 125 into binary and hexadecimal.

5

c) What are counters?

5

End Semester Examination, Dec. 2014
B. Tech. – First Semester
ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(EE-102)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are active and passive elements?
     b) What is Kirchhoff’s voltage and current law?
     c) What is the principle of moving coil instruments?
     d) What is form factor?
     e) What are the applications of DC motors?
     f) Draw the symbol for Zener diode and photodiode.
     g) Which is the commonly used transistor circuit arrangement?
     h) What is an oscillator?
     i) What are applications of Zener diode?
     j) What are counters?

2x10

PART-A

Q.2 a) State and explain Thevenin’s theorem. 10
     b) Using mesh analysis find the current in each branch.

Q.3 a) What is power factor in AC circuits and explain the importance of power factor? 8
     b) A coil of resistance 1.5 ohms and impedance 60 ohms is placed in series with a second coil of resistance 2 ohms. When a voltage of 230 V, 50 Hz is applied to the circuit, the current flowing through the circuit is 7 \( A_o \)? Find the inductance of second coil.

12
Q.4  a) Explain the construction and working of a DC machine.  
      10  
    b) Derive the e.m.f. equation of a single phase transformer.  
      10  

    PARTICLE B  

Q.5  a) Draw the circuit diagram of a half-wave rectifier. Explain its working. What is 
      the minimum frequency of ripples in its output?  
      10  
    b) What do you understand by an ideal diode? Draw its VI characteristics. 
      Explain its switching action.  
      10  

Q.6  a) Draw the circuit of transistor amplifier configuration using an npn transistor 
      and explain how voltage amplification is achieved by CE amplification and 
      also draw input and output characteristics.  
      12  
    b) Explain the construction and working principle of a field effect transistor.  
      8  

Q.7  a) What is Karnaugh map? Reduce the equation $Y = A\bar{B} + AB$ using 2 variables 
      K-map.  
      10  
    b) Write a short note on flip flops.  
      10
End Semester Examination, Dec. 2014
B. Tech. – First Semester
ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(EE-102A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1   a) State and explain superposition theorem. How is it applied for solving a network?
b) What are star and delta connections? Where do we use them?
c) The power consumed in a pure inductive circuit is zero. Why?
d) Can an induction motor run at synchronous speed? State why?
e) Differentiate between Zener and Avalanche breakdowns.
f) Define knee voltage in P-N junction diode.
g) What is pinch off voltage in an FET?
h) What is current amplification factor? Define relation between $\alpha$, $\beta$ and $\gamma$.
i) Differentiate between patch and flip-flop.
j) What is the difference between synchronous and asynchronous counters?

2x10

PART-A

Q.2   a) Use i) Thevenin’s theorem ii) Norton’s theorem to determine current through and voltage across 25Ω resistor.

\[ 2\text{V} \]
\[ 10\text{V} \]
\[ 25\text{V} \]

b) Calculate current and power in 6Ω resistor by superposition theorem.
Q.3  a) Explain how single and three phase emf are generated.

b) Define:
   i) Average value
   ii) RMS value
   iii) Form factor
   iv) Peak factor
   v) Instantaneous value
   of an alternating quantity.

Q.4  a) Explain construction and working principle of a synchronous motor.

b) Explain construction and working principle of a transformer and derive its emf equation.

PART-B

Q.5  a) Explain working principle of: 
    i) Zener diode 
    ii) Photo diode

b) What are clamping circuits? Explain its working with its classifications.

Q.6  a) Draw and explain with input and output characteristics, circuit of common base configuration.

b) Draw and explain with construction and working of n-channel depletion MOSFET.

Q.7  a) Convert: 
    i) \((\text{FF.FF})_{16} = (?)_{2}\) 
    ii) \((77654)_{8} = (?)_{2}\) 
    iii) \((11110.101)_{2} = (?)_{10}\)
iii) \((FEDCBA)_{16} = (?)_8\)  
iv) \((456)_8 = (?)_{10}\)  

5x2

b) Draw and explain with truth table working of a \(J-K\) flip-flop.

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
NETWORK ANALYSIS AND SYNTHESIS (EE-301 / EE-301A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is a transient?
    b) Define time constant of an RC circuit.
    c) Distinguish between one-port and two-part network.
    d) What is the significance of poles and zeros?
    e) What are hybrid parameters and why they are called so?
    f) Write the conditions to be satisfied for a polynomial to be Hurwitz.
    g) What is positive real function?
    h) Draw the circuit of m-derive high pass filter.
    i) Give the applications of a filter.
    j) Draw the dual circuit of series RLC network.

2x10

PART-A

Q.2  a) Derive an expression for current \( i(t) \), when an RL network is subject to sudden dc voltage and hence calculate the current at \( t = 0 \) when switch \( S \) is closed for the circuit given in the figure. Also Calculate time constant.

\[ \text{Diagram of RL network} \]

10

b) Write the equation of the function shown in the figure.

\[ \text{Graph of i(t)} \]

10
Q.3  
(a) Obtain the pole zero plot of \( I(s) = \frac{s^2 + 6s + 5}{s(s^2 + 4s + 5)} \), and hence determine the time domain response.

(b) What are the restrictions on location of poles and zeros in a driving point function?

Q.4  
(a) Find the Y-parameters of the network for the circuit shown in the figure.

(b) Find h-parameters in terms of Z-parameters.

PART-B

Q.5  
Realize the following RC driving point impedance function in:

(a) First foster form.

(b) First cover form form.

\[ Z(s) = \frac{s^2 + 6s + 8}{s^2 + 4s + 3} \]

Q.6  
(a) Derive the characteristic impedance of a prototype \( \pi \) section of a low pass filter. Also find the cut-off frequency, attenuation and propagation constant.

(b) Design a constant-K HPF with \( \pi \) and \( \Pi \) sections when the cut off frequency is 8 kHz and a nominal characteristic impedance of 600 \( \Omega \).

Q.7  
(a) Find the current of all the branches for the given circuit:
b) Give the procedure to write cut-set matrix for any circuit.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ELECTRICAL MACHINERIES-I (EE-302 / EE-302A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is counterbalancing current of a transformer?
     b) Why brushes of a DC motor are slightly shifted from GNP by a small angle?
     c) Draw Scott connection circuit diagram.
     d) Why the short circuit test is carried on by shorting the low voltage winding?
     e) List the conditions for performing parallel operations of transformers.
     f) Define Co-energy.
     g) Wave winding has __________ number of parallel paths.
     h) What is the main drawback of brake test?
     i) What is back emf in DC motor?
     j) What is the condition for maximum efficiency of a DC machine?

2x10

PART-A

Q.2  a) Explain the difference in phasor diagrams of ideal and actual single phase transformer on inductive load.
     12

     b) How can the hysteresis and eddy current losses in a transformer be separated?
     8

Q.3  a) Explain in detail Scott connection with a neat circuit diagram for getting two phase output from three phase supply. Also draw the phasor diagram.
     10

     b) Explain the procedure of operating two transformers in parallel with the help of a circuit diagram.
     10

Q.4  a) Explain energy balance and force in a singly excited magnetic field system.
     10

     b) Derive an expression for energy stored in a magnetic field system.
     10

PART-B
Q.5  a) Explain construction and working principle of a DC generator with a neat diagram.
    
    10

    b) What is armature reaction? Describe the effects of armature reaction on the operation of DC machines. How it can be minimized?
    10

Q.6  a) Explain the working of a three point starter.
    
    10

    b) Draw and explain various characteristics of DC motors.
    
    10

Q.7  a) Explain how a DC series motor is stopped by:
    i) Plugging
    ii) Rheostatic braking

    10

    b) Write note on any one:
    i) Swinburne’s test
    ii) Retardation test

    10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ELECTRICAL MACHINES-I (EE-302B)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define all day efficiency.
b) What is the function of a breather in transformer?
c) State the applications of an autotransformer.
d) Give advantages of 3-phase transformer over 3 single phase transformers bank.
e) What is energy balance equation?
f) Define co-energy.
g) Differentiate between lap winding and wave winding.
h) Why brushes of a DC motor are slightly shifted from the neutral axis by small angle?
i) Draw the external characteristic of DC series generators.
j) Draw the power flow diagram for a DC motor.

2x10

PART-A

Q.2 a) Why do we need instrument transformers? Explain in brief current and potential transformer.

10

b) What are the different losses in the transformer? How can the hysteresis and eddy current losses in a transformer be separated?

10

Q.3 a) Explain in detail Scott-connection with a neat circuit diagram for getting two-phase output from three-phase supply. Also draw the phasor diagram.

12

b) Explain the parallel operation of a transformer.

8

Q.4 a) Derive an expression for energy stored in magnetic field system and hence derive the expression for force and torque for singly excited magnetic field system. Draw graphs.
PART-B

Q.5  a) Explain process of commutation and methods of improving commutation.  
     12

     b) A 50 kW, 250 V short shunt compound generator has the following data:
        \( R_a = 0.06 \Omega \), \( R_{sc} = 0.04 \Omega \) and \( R_f = 125 \Omega \). Calculate the induced armature
        voltage at rated load. Take 2 V as the total brush contact drop.  
     8

Q.6  a) Draw and explain various characteristics of DC shunt and DC compound motors.  
     10

     b) Why is a starter necessary for a DC motor? Explain three-point starter with a
        neat diagram.  
     10

Q.7  Write short notes on any two:
     a) Rheostatic braking
     b) Swinburne’s test
     c) Hopkinson’s test  
     10x2
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ELECTRICAL MEASUREMENTS (EE-303)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are loading effects?
     b) Give the dimensional analysis of capacitance in MKSA system.
     c) How can ‘lag’ be adjusted in energy meters?
     d) Give the formula for binding reactive power.
     e) What is a Wheatstone bridge?
     f) What is Lloyd Fisher Square method used for?
     g) How are ballistic galvanometers calibrated?
     h) How is phase angle measured in potential transformer (P.T)?
     i) How is a current transformer (C.T) tested?
     j) What is the use of a Meggar?

2x10

PART-A

Q.2  a) Explain the working of PMMC instrument in detail and derive its torque equation.
     10
     b) What are moving iron instruments? Derive its torque equation and list its advantages.
     10

Q.3  a) Derive the expression for measurement of 3-phase power using two watt meter method.
     10
     b) Explain Lag adjustment and Friction compensation for induction type energy meters.
     10

Q.4  a) Derive an expression for measuring passive components using Kelvin’s double bridge.
     10
b) What is Wien’s bridge? Explain. 10

**PART-B**

Q.5 Explain the detailed working of Ballistic Galvanometer and derive the expression for finding charge. 20

Q.6 a) Explain working of a current transformer (C.T) with phasors. 10

b) Describe absolute method for the testing of potential transformer (P.T) 10

Q.7 a) Explain moving coil frequency meter. 10

b) What are power factor meters? 10
End Semester Examination, Dec. 2014
B. Tech. – Third / Fourth Semester
POWER SYSTEM-I (EE-304A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is a nuclear reactor?
b) What is a substation?
c) Define a load curve.
d) What important points have to be kept in mind for the selection of units?
e) List types of transmission line supports.
f) Define: Corona.
g) How can flow string efficiency be improved?
h) What is skin effect?
i) Classify underground cables on the basis of voltage to be transmitted.
j) What do you understand by GMD?

2x10

PART-A

Q.2
a) Explain hydro power plant with a neat diagram, its advantage and disadvantages.

10

b) Compare steam power plant and nuclear power plant.

10

Q.3
a) What is tariff? Give its objectives and desirable characteristics.

10

b) A generating station has a maximum demand of 50,000 kW. Calculate the cost per unit generated:
   Capital cost = Rs. 95x10^5;
   Annual load factor = 40 %;
   Annual cost of fuel and oil = Rs. 9x10^5;
   Taxes, wages and salaries = Rs. 7.5x10^5;
   Interest and depreciation = 12%.

10
Q.4  a) How grading of cable is done? Explain capacitance grading in detail.
    10
   
   b) Derive an expression for sag when supports are at equal levels and at unequal levels.
    10

**PART-B**

Q.5  a) Derive an expression for capacitance between conductors of single phase, 2-wire line.
    10
   
   b) What is power flow? Derive an expression for power flow through transmission lines.
    10

Q.6  A two wire DC distributor cable AB is 2 km long and supplies loads of 100 A, 150 A, 200 A and 50 A situated 500 m, 1000 m, 1600 m and 2000 m from the feeding point A. Each conductor has a resistance of 0.01 Ω per 1000 m. Calculate the potential difference at each load point if a potential difference of 300 V is maintained at point A. Also compare DC distribution with AC distribution.
    20

Q.7  a) What is neutral grounding? Give its advantages.
    10
   
   b) Write short notes *any one:*
     i) Equipment grounding.
     ii) Resistance grounding.
    5x2
Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1 Answer the following in brief:
   a) What are the factors taken in account for site selection of hydroelectric power plant?
   b) Define string efficiency.
   c) What is skin effect?
   d) The maximum demand of steam power plant is $480\, MW$. The annual load factor is 40%, calculate the total energy generated.
   e) What is load factor?
   f) Write the names for types of earthing.
   g) Define Kelvin’s law.
   h) What is GMD and GMR?
   i) Compare merits and demerits of underground cables over overhead systems.
   j) What is corona in transmission line?

   2x10

**PART-A**

Q.2 a) Explain with block diagram the working and constructional details of nuclear power plant.

   10

   b) Draw the layout of 11$kv$ substation. And explain the two types of substation.

   10

Q.3 a) Explain all types of tariff’s in detail.

   10

   b) A power station has a maximum demands of $20\, MW$, a load factor of 60%, a plant capacity factor of 48% and plant use factor 80%. Find:

   i) Daily energy produced
   ii) Reserve capacity of plant
   iii) Maximum energy that could be produced daily if plant were running all the time

   10

Q.4 a) What is Sag? Derive an expression to calculate sag when supports are at equal levels?

   10
b) Derive an expression to find capacitance for single core cable. 
10

**PART-B**

Q.5  
a) Derive an expression for inductance per phase of 3-phase transmission line when conductors are unsymmetrical but transposed. 
10 
b) Derive an expression for capacitance per phase of 3-φ transmission line when conductors are symmetrical. 
10

Q.6  
Explain in detail distribution systems:  
a) 3-wire DC systems.  
b) Primary distribution systems.  
10x2

Q.7  
What is equipment earthing? Explain in detail types of earthing? 
20
Q.1  a) Why the stator frame of an induction motor should be strong and rigid?
    b) State two points of difference between 3-phase induction motor and synchronous motor.
    c) State the different losses of an induction motor.
    d) Why a slip ring induction motor can be started on load?
    e) How much torque an induction motor develops at synchronous speed?
    f) State the different types of excitations of an alternator.
    g) Which three phase motor is not self-starting?
    h) Name the generator which employs salient pole rotor for power generator.
    i) In cylindrical motor machine, direct axis reactance is _________ quadrature axis reactance.
    j) Generator converts _________ energy to _________ energy and what provides mechanical energy to generator __________.

2x10

PART-A


     8

    b) Explain the usefulness of a circle diagram and what tests are necessary to draw the same.

     6

    c) Describe in brief:
       i) Breakdown torque
       ii) Breakdown slip
       iii) Maximum torque

     6

Q.3  a) Why starter is necessary for starting of large 3-phase induction motors? State the different starting methods for 3-phase induction motor and explain the
method of star-delta starter for starting with a neat sketch.

b) In a 6-pole 3-phase 50 Hz motor with star connected motor, the rotor resistance phase is 0.3 Ω and reactance at standstill is 1.5 Ω/phase. The emf between slip ring on open circuit is 175 V. Calculate:
   i) Slip at a speed of 950 rpm
   ii) Rotor emf/phase
   iii) Rotor frequency
   iv) Reactance at a speed of 950 rpm

Q.4  a) Why a 1-phase induction motor is not self starting and how it is made self-starting?

   6
   b) Draw the equivalent circuit diagram of 1-phase induction motor based on double revolving field theory.

   4
   c) Explain the working of capacitor-start 1-phase induction motor with a neat schematic diagram.

   10

**PART-B**

Q.5  a) Describe the operating principle of a 3-phase alternator with a neat diagram.

   6
   b) Explain why medium and large capacity alternators are constructed with revolving field.

   6
   c) Explain the terms:
      i) Pitch factor.
      ii) Leakage reactance.
      iii) Effective resistance.
      iv) Draw open circuit characteristics of an alternator.

   8

Q.6  a) Explain effect of varying excitation on armature current and power factor for 100% excitatory and unity power factor for constant supply voltage and constant input power.

   8
b) Describe in brief the two reactance theories as applicable to salient pole synchronous motor.

12

Q.7 a) What are different types of permanent magnet brushless motors? Describe the working principle and constructional details of these with a neat labeled diagram.

12

b) Explain in brief:
   i) Why synchronous motor runs only at synchronous speed?
   ii) Synchronous speed and it is speed of ______.
   iii) Function of synchronous condenser.
   iv) Advantages of synchronous motor.

8
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester (ECE/EEE)
ELECTRONIC INSTRUMENTATION (EE-402)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by seeback effect?
b) Differentiate between primary and secondary transducers.
c) A platinum thermometer has a resistance of 100Ω at 25°C. Find its resistance at 65°C if platinum has resistance temperature coefficient of 0.00392°C⁻¹.
d) Define electrostatic focusing.
e) What is the need of time base generator in CRO?
f) What are types of distortion? What is THD?
g) What are you mean by duty cycle? What is its value for square wave?
h) Explain the purpose of analog multiplexing.
i) Define resolution and quantization error.
j) Draw the block diagram for frequency measurement.

2×10

PART-A

Q.2
a) Explain the construction and working principle of LVDT.
10
b) Discuss various biomedical instruments with their daily life application.
   10

Q.3
a) Draw the block diagram of CRO. Explain its various elements in detail.
   10
b) How can you measure frequency with CRO?
   5
c) Derive the equations for electrostatic deflection for CRO.
   5

Q.4
a) Explain the standard signal generator with the help of a block diagram and also mention its applications.
   12
Q.5  a) Explain AC signal conditioning and DC signal conditioning with the help of a block diagram.
   
   PART-B
   
   8
   
   b) What is PLL? Explain PLL in detail with a diagram.
   
   10

Q.6  a) Draw and explain the pin diagram of DAC 08IC and ADC 670 IC.
   
   10
   
   b) Explain Digital to analog Convertors.
   
   10

Q.7  Write short notes on any two:
   
   a) Data acquisition system
   
   b) VCO and PLL
   
   c) Spectrum analyzer
   
   10x2
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
ELECTRONIC INSTRUMENTATION (EE-402A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is difference between active and passive transducers?
b) What are piezoelectric transducers?
c) What are Lissajous patterns?
d) Define resolution and quantization errors.
e) What are types of sweeps?
f) What type of electrodes are used in EMG?
g) What do you mean by signal conditioning?
h) What is the operation of current source in a pulse generator?
i) Explain PLL.
j) Explain decade counting assembly.

2x10

PART-A

Q.2 a) What are the various methods to measure temperature? Explain in detail.

10
b) What is a strain gauge? Derive an expression for gauge factor.

10

Q.3 a) Draw and explain block diagram for ECG measurement.

10
b) Write a short note on instrumentation amplifier.

10

Q.4 Draw a block diagram and explain various elements of a CRO.

20

PART-B

Q.5 a) Draw a block diagram and explain working of a signal generator.

10
b) Explain wave analyser with help of a block diagram.

10
Q.6  
a) Explain with a block diagram data acquisition system.  

b) Explain DC signal conditioning with a block diagram.

Q.7  
a) Draw and explain a block diagram for time period measurement.

b) What are types of digital voltmeter? Explain any one in detail.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
ELECTRONIC INSTRUMENTATION (EE-402B)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
 a) What is the difference between active and passive transducers?  
 b) What is a load cell?  
 c) What are Lissajous pattern?  
 d) What is blanking circuit in a CRO?  
 e) What types of electrodes are used in EEG?  
 f) Explain a piezoelectric transducer.  
 g) Explain a decade counting assembly.  
 h) Define resolution and quantization errors.  
 i) What is the operation of current source in pulse generator?  
 j) Explain PLL.  

2x10

PART-A

Q.2  
 a) Explain construction and working principle of LVDT.  
 b) What are strain gauges? Derive the expression for gauge factor.

10  
10

Q.3  
 a) Draw and explain block diagram of ECG measurement.  
 b) Write a short note on instrumentation amplifier.

10  
10

Q.4  
 Draw block diagram and explain various elements of CRO.  

20

PART-B

Q.5  
 a) Explain the standard signal generator with help a of block diagram and also mention its application.  
 b) Explain wave analyzer with a block diagram.

10  
10
Q.6  a) Explain AC signal conditioning and DC signal conditioning with the help of a block diagram.

15

b) Explain sample and hold circuit.

5

Q.7  a) Explain working and a block diagram of time-period measurement.

10

b) What are the various types of digital voltmeter? Explain any one in detail.

10
End Semester Examination, Dec. 2014  
B. Tech. – Fourth / Fifth Semester 
SWITCHGEAR AND PROTECTION (EE-403 / EE-403A)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1  a) What are the advantages of per unit computations?
    b) What are negative sequence components?
    c) Draw the single phase equivalent circuit of a 3-winding transformer.
    d) List various type of shunt and series faults.
    e) Define subtransient reactance.
    f) Write the boundary condition for double line to ground fault and $3-\phi$ fault.
    g) What is back up protection?
    h) What are different zones of protection?
    i) What are switching surges?
    j) Why is $3-\phi$ symmetrical fault is more severe them $3-\phi$ unsymmetrical fault?

2x10

**PART-A**

Q.2  a) How transients occur in a synchronous machine? Explain in detail.  
    10
    b) 

![Diagram](image)

Draw reactance diagram by calculating per unit values.  
    10

Q.3  a) Write short notes on:
    i) Positive sequence network.
    ii) Negative sequence network.

    832/4
iii) Zero sequence network.

b) In a 3-phase, 4 wire system, the current in R, Y and B lines under abnormal conditions of loading are as under:

\[ I_R = 100 \angle 30^\circ A, \quad I_Y = 50 \angle 300^\circ A, \quad I_B = 30 \angle 180^\circ A \]

Calculate the positive, negative and zero sequence current in the R line and return current in neutral wire.

Q.4 Explain in detail air circuit breaker and SF6 circuit breaker.

PART-B

Q.5 a) Describe the construction and principle of operation of an induction type directional overcurrent relay.

b) Write a detailed note on differential relay.

Q.6 a) Discuss the important faults in an alternator.

b) Explain with a neat diagram the application of Merz-Price circulating current principle for the protection of an alternator.

Q.7 What is lightning arrester? Explain in detail types of lightning arresters.
End Semester Examination, Dec. 2014
B. Tech. – Fourth / Fifth Semester
SWITCHGEAR AND PROTECTION (EE-403 / EE-403A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Give the advantages of low oil circuit breaker over bulk oil circuit breaker.  
   b) What are the different types of stator winding faults in an alternator?  
   c) What is backup protection?  
   d) What are symmetrical components?  
   e) What is the need of relay coordination?  
   f) Define reach.  
   g) A relay is connected to 400/5 ratio current transformer with current setting of 150%. Calculate the plug setting multiplier (PSM) when the fault current is 4000 A.  
   h) What is meant by time graded system protection?  
   i) What do you mean by current chopping?  
   j) Mention any two applications of differential relay.

2x10

PART-A

Q.2  
   a) Explain in detail the transients occurring on transmission line and also derive an expression for short circuit current.  
10
   b) The currents in a 3-phase unbalanced system are \( \bar{I}_R = (12 + j6), \bar{I}_Y = (12 - j12), \bar{I}_B = (-15 + j10) \). The phase sequence is RYB. Calculate the zero, positive and negative sequence components of the currents in all three phases.

10

Q.3  
   a) Derive an expression for fault current and phase voltage at fault in case of double line to ground fault.  
8
   b) A 25 MVA, 13.2 KV alternator with solidly grounded neutral has a sub-transient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 and 0.1 pu respectively. Determine the fault current and line to line
voltage at fault when a line to line fault occurs at the terminals of the alternator.

Q.4  a) Explain the construction and working of vacuum circuit breaker with proper diagram.

b) Give the advantages of vacuum circuit breaker and for what voltage range it is recommended?

c) Write a short note on any two of the following:
   i) DC circuit breaker.
   ii) Rate of rise of restriking voltage.
   iii) High resistance method for arc extinction in circuit breakers.

PART-B

Q.5  a) Explain attracted armature type and balanced beam type electromagnetic attraction relay.

b) Discuss the fundamental requirements of protective relays and also give the classification of relays.

Q.6  a) What is universal torque equation? Using this equations discuss the operating characteristics of impedance relay with directional unit.

b) Explain the carrier current protection scheme. With the help of block diagram discuss how the phase comparison scheme can be used for protecting a feeder from both the ends.

Q.7  a) What is lightning arresters? Discuss different types of lightning arresters in details.

b) Write a short note on the following:
   i) Internal causes of over voltages.
   ii) Surge absorber.
Q.1  a) What are the basic constituents of a communication system?  
b) What is SSB system? What are its advantages?  
c) Define the following terms as referred to AM receiver:  
i) Sensitivity.  
ii) Image frequency rejection.  
d) Given the angle modulated signal \( x(t) = 10 \cos(2\pi 10^4 t + 200 \cos 2\pi 10^3 t) \). What is its bandwidth?  
e) What is the need of pre-emphasis and de-emphasis in FM?  
f) An analog signal is sampled at the Nyquist rate \( f_s \), and quantized into \( L \) levels. Find the time duration \( t \) of \( \tau \) bit of the binary encoded signal.  
g) What is slope overload error in delta modulation and how it is removed in adaptive delta modulation?  
h) Write the characteristics of PN sequences.  
i) Explain M-ary PSK modulation.  
j) Two resistors of 20 k\( \Omega \) are at room temperature of 15ºC. For a given bandwidth of 100 kHz, determine the thermal noise voltage generated by the two resistors if they are connected in parallel.

2x10

PART-A

Q.2  a) What is modulation? What are different types of modulation techniques? What is the need for modulation?  

10  
b) Define multiplexing. Explain the difference between frequency division multiplexing and time division multiplexing.  

10  

Q.3  a) How is SSB signal generated by the filter method? Explain in detail with a block diagram and necessary equation.  

6
b) A carrier with an unmodulated power $80W$ is modulated simultaneously by two modulating signals with coefficient of modulation $m_1 = 0.3$ and $m_2 = 0.4$. Find:
   i) Total coefficient of modulation.
   ii) Sideband powers.
   iii) Total transmitted power
   iv) Efficiency of transmission.  

Q.4  
   a) An angle modulated signal is described by $x(t) = 10 \cos[2\pi(10^6)t + 0.1\sin(10^5)t]$
   i) Considering $x(t)$ as a phase modulated signal with $k_p = 10$, find $m(t)$.
   ii) Considering $x(t)$ as an FM signal with $k_f = 10\pi$, find $m(t)$.
   
   b) Explain the direct method for FM generation, what are its drawback?  
   c) Explain the principle and operation of envelope detector used for AM detection.  

PART-B

Q.5  
   a) What is the difference between PWM and PPM? How do you generate PPM from PWM?  
   
   b) Explain differential pulse code modulation. What is the need of predictor in DPCM?  
   c) Write a short note on: Noise in PCM systems.  

Q.6  
   a) Draw the block diagram of ASK transmitter and receiver and explain the working.
   
   b) What is spread spectrum system? Explain frequency hopping spread spectrum techniques.  

Q.7  
   a) What is noise? Explain different types of internal noise.
   
   b) For an amplifier:
Input signal power = $1.5 \times 10^{-9}$ W
Input noise power = $1.5 \times 10^{-18}$ W
Power gain = 10,000,000
Internal noise = $4 \times 10^{-12}$

Find:

i) Input S/N ratio in dB.
ii) Output S/N ratio in dB.
iii) Noise factor and noise figure.

6

4

c) Define equivalent noise temperature. What is its significance?
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
CONTROL SYSTEM ENGINEERING (EE-501A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Mention the characteristics of a linear control system.  
b) Define the term stability in reference to control system analysis.  
c) Explain maximum overshoot for a second order control system.  
d) Define the term sensitivity as related to a control system.  
e) Employ Routh stability criterion to check the stability of the characteristic equation:  
\[ s^4 + 4s^3 + 7s^2 + 8s + 4 = 0 \]  
f) What is meant by frequency response analysis?  
g) Define non-minimum phase system.  
h) List various types of compensation techniques used in a control system.  
i) What do you understand by integral control action?  
j) State the purpose of a magnetic amplifier.

2x10

PART-A

Q.2  
a) Define and distinguish between open loop and closed loop control systems.  

b) Find overall transfer function \( \frac{C(S)}{R(S)} \) for signal flow graph shown in the figure.
Q.3  a) A unity feedback system is characterized by the open loop transfer function 
\[ G(s) = \frac{K}{s(s+10)} \]. Find the gain \( K \) so that system will have damping ratio of 
0.5. For this value of \( K \); find settling time, peak overshoot and time to peak 
overshoot for a unit step input.

b) Explain the specifications pertaining to transient response of a second order 
control system. Also find an expression for rise time.

Q.4  Sketch the root locus for given open loop transfer function as \( K \) varies from zero 
to infinity:
\[ G(s)H(s) = \frac{K}{s(s+4)(s^2+4s+13)} \]

PART-B

Q.5  a) Draw the Nyquist plot for a control system with open loop transfer 
function:
\[ G(s)H(s) = \frac{K}{s(1+sT)} \]

b) Sketch the Bode plot for unity feedback system characterized by the open 
loop transfer function.
\[ G(s)H(s) = \frac{40(s+5)}{s(s+10)(s+2)} \]

Q.6  a) Draw a neat sketch of a field controlled DC servo motor. Describe its 
construction and operation.

b) Describe the construction and working on any one type of stepper motors.

Q.7  a) What is the effect of derivative control on the different time response 
specifications of second order control systems?

b) State and explain controllability and observability.
Q.1 a) Define poles and zeroes for a transfer function.
   b) State necessary and sufficient conditions for stability.
   c) Define gain margin.
   d) Why compensation is required in control system?
   e) Define rise time and peak time.
   f) What is phase cross-over frequency?
   g) What is the difference between type and order of a system?
   h) Draw an electrical network for lead compensation.
   i) Classify various types of control systems.
   j) Define steady state error for a system.

Q.2 a) Determine the overall transfer function relating C and R for the system whose block diagram is shown in the figure.

b) The signal flow graph for a system is shown in the figure. Derive the overall transfer function using Mason’s rule.
Q.3  a) Determine the position, velocity and acceleration constants of a unity feedback control system with forward path gain as:

\[ G(s) = \frac{K(s + a)}{s^2(s + b)(s + c)}. \]

b) Derive the expressions for rise time and peak overshoot for the transient response of a second order system.

Q.4  a) Draw a root locus for a unity feedback system whose forward transfer function is:

\[ G(s) = \frac{K}{s(s + 2)(s^2 + 6s + 2s)}. \]

b) The characteristics equation of a closed loop control system is:

\[ 3s^4 + 10s^3 + 5s^2 + 5s + 4 = 0 \]

Construct the Routh array to determine the system stability.

PART-B

Q.5  a) The open loop transfer function of a certain control system is given as:

\[ G(s)H(s) = \frac{1}{s(1 + s)(1 + 2s)} \]

Draw the Nyquist plot for the system.

b) Sketch the polar plot of transfer function:

\[ G(s)H(s) = \frac{K}{s^2(1 + ST)}. \]

Q.6  Write short notes on any two:
a) D.C. servomotor  
b) Synchros  
c) Stepper motor

Q.7  
a) Define controllability and observability of a system. State the conditions of controllability and observability in terms of matrices A, B and C.  

b) Discuss phase lag compensation using electrical network. Also draw its Bode plot.

10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
POWER ELECTRONICS (EE-502)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the applications of power electronics?
b) What is a snubber circuit?
c) Explain the term: holding current.
d) What do you mean by string efficiency?
e) What is the role of freewheeling diode?
f) What is meant by forced commutation?
g) What is difference between a voltage source inverter and a current source inverter?
h) Draw circuit of type C chopper.
i) Define circulating current.
j) Draw V and I characteristics of DIAC.

2x10

PART-A

Q.2 a) Explain various types of power diodes.

b) Explain construction and working of IGBT. What are the applications? Also draw its switching characteristics.

10

Q.3 a) What are the various firing schemes of S.C.R? Explain with help of waveform and circuit diagrams.

b) What are the various classes of commutation? Explain any one type of forced commutation with a circuit diagram and waveforms.

10

Q.4 a) Describe the working of single phase full converter with RLE load. Illustrate your answer with waveforms for source voltage, E, output voltage and current. Assume continuous conduction.

10
b) Describe the effect of source inductance on the performance of 1-phase full converter. 10

PART-B

Q.5  a) Discuss the principle of working of a three phase bridge inverter with an appropriate circuit diagram. Draw phase voltage waveform on the assumption that each thyristor conducts for 120°. The sequence of firing of various SCR should also be indicated. 12

b) Explain with a circuit diagram and waveform of load voltage the working of series inverter. 8

Q.6  a) Describe the principle of step-up chopper. Describe an expression for average voltage in terms of input voltage and duty cycle. 10

b) Explain a four-quadrant chopper. 10

Q.7  a) Describe the working of single phase to single phase step-up cycloconverter. 10

b) Explain single phase full wave ac regulator with R load. Draw a suitable waveform. 10
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
POWER ELECTRONICS (EE-502 / EE-502A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Compare a diode with a thyristor.  
b) Define PIV.  
c) Why a snubber circuit is used with an SCR?  
d) Define derating factor for an SCR.  
e) What is the effect of source inductance in convertors?  
f) Classify various types of inverters.  
g) Explain step-up chopper.  
h) Name two types of ac voltage controllers.  
i) Why feedback diodes are required in inverters?  
j) Define a holding current.

2x10

PART-A

Q.2  
a) How does a GTO differ from a conventional thyristor? Draw its circuit symbol and static V-I characteristics.  

10  
b) What is the role of power electronics in industrial development?  

10

Q.3  
a) Compare an UJT firing circuit with R and RC firing circuit.  

10  
b) Derive an expression for the resistance used for static voltage equalization for a series connected string.  

10

Q.4  
a) A single phase half wave SCR circuit feeds power to a resistive load. Draw waveforms for load voltage and load current.  

10  
b) Explain various power factor improvements techniques in brief.  

10

PART-B
Q.5  a) Explain a three phase 180 degree mode inverter with appropriate waveform of phase voltage and conduction schemes.  

b) Describe the working of a single phase full bridge inverter.  

Q.6  a) Describe the principle of a dc chopper operation. Derive an expression for its average dc output voltage.  

b) A step up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of thyristor chopper is 50 \( \mu s \), compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage.  

Q.7  a) What is a cycloconverter? Explain its principle of operation with a diagram and output waveform.  

b) Explain the working of single phase ac voltage controller with an R-L load with suitable waveforms.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
ELECTRICAL MACHINE DESIGN (EE-503)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer in brief:
   a) What is meant by gap contraction factor?
   b) Define specific electric loading.
   c) Why circular coils are preferred over rectangular coils for windings of a transformer?
   d) Define heating time constant \( (T_h) \).
   e) What are the various factors that are considered while selecting poles of a rotating machine?
   f) What are the various methods adopted to cool a transformer?
   g) Define field form factor.
   h) Why is the current density in primary and secondary windings of a transformer taken equal?
   i) Why should rotor slots never be made equal to stator slots?
   j) Give two advantages of computer aided design of electrical machines.

2x10

PART-A

Q.2 a) Derive an expression of temperature rise with time in an electrical machine under heating conditions.

b) Name different duties of electrical machines and discuss continuous duty and short time duty in detail.

10

5

Q.3 a) Derive the output equation of a three-phase transformer. Explain advantages of using a stepped core over square core.

b) Determine the dimensions of core and window for a 5 kVA, 50 Hz, 1-Φ core type transformer. A rectangular core is used with long side twice as long as
short side window height is 3 times the width. Voltage per turn is 1.8V, space factor 0.2, current density 1.8 A/mm$^2$ and flux density 1 Wb/m$^2$.

Q.4  
a) Derive an expression for total mmf in a magnetic circuit.  

b) Write short notes on: 
   i) Design of electromagnet coil.   
   ii) Real and apparent flux density. 

PART-B

Q.5  
a) Derive an expression for output equation of a DC machine. 

b) Name and explain various factors considered while choosing number of poles of a DC machine. 

C) Explain the term: square faced pole. 

Q.6  
a) Design main dimensions of a salient pole synchronous machine for a 500 kVA, 50 Hz, 3-Φ alternator to run at 375 rpm. Take mean gap density over pole pitch as 0.55 Wb/m$^2$ and specific electric loading as 25000 A/m. The peripheral speed should not exceed 35 m/s. 

b) Write short notes on: 
   i) Cooling of alternators. 
   ii) Choice of number of armature slots. 

Q.7  
a) Derive an expression for output equation of an induction motor. 

b) Discuss the hybrid technique and optimization as used in computer aided design of electrical machines.
End Semester Examination, Dec. 2014  
B. Tech. – Fifth Semester  
POWER GENERATION OPERATION AND CONTROL (EE-504)  

Time: 3 hrs  
Max Marks: **100**  

**No. of pages: 1**

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries **equal marks**.

Q.1  
a) Define economic dispatch problem.  
b) What are the functions of AVR?  
c) Define load curve.  
d) What are the methods for solution of unit commitment problem?  
e) How gradient search techniques are better than other methods?  
f) What is automatic generation control?  
g) Define state estimation.  
h) Classify power system stability.  
i) What do we need interchange?  
j) Write Swing’s equation and give the meaning of various symbols used.  

2x10

**PART-A**

Q.2  
a) Explain load frequency control in detail using a detailed diagram.  

10  
b) Develop the mathematical model of AGC using a diagram.  

10

Q.3  
a) Develop the co-ordination equation for economic dispatch for all thermal systems when losses are to be coordinated.  

10  
b) The fuel input for two thermal units are:  

\[F_1=0.009 P_1^2 + 10.33 P_1 + 200; \quad 10 \leq P_1 \leq 100\]  
\[F_2=0.008 P_2^2 + 10.83 P_2 + 240; \quad 10 \leq P_2 \leq 100\]  

The power loss equation is \[P_L = 0.0 P_1^2 + 0.0 P_2^2 MW\].  

Determine economic schedule for 150 MW.  

10

Q.4  
a) What do you understand by power system stability? Classify PSS.  

5
b) What do you understand by equal area criteria? Explain in detail. What is the effect of clearing time on stability for a single machine infinite bus system?

PART-B

Q.5 a) Explain the concept of energy banking and power pool.

10

b) What do you understand by interchange of power and energy? Discuss interchange between two interconnected systems.

10

Q.6 Explain hydrothermal co-ordination with its advantages. Also develop the co-ordination equations for hydrothermal scheduling.

20

Q.7 a) Explain weighted least square estimation method for state estimation in power system.

10

b) Define PSS and its various functions. Also classify power system security levels.

10
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
DIGITAL SIGNAL PROCESSING (EE-601)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from Part A and **TWO** questions from Part B. Each question carries **equal marks**.

Q.1  

a) State sampling theorem. For the analog signal  
\[ x(t) = 3\cos 50\pi t + 10\sin 30\pi t - \cos 100\pi t \]; calculate the Nyquist rate.

b) Determine whether the following system is linear or not:  
\[ y(n) = nx(n) \]

c) State and prove the Parseval’s theorem of Fourier transform.

d) What is the condition for linear phase characteristics of an FIR filter?

e) Find the linear convolution of  
\[ x(n) = \{1, 2, 3, 4, 5, 6\} \text{ with } y(n) = \{2, -4, 6, -8\} \]

f) Compute DFT of the sequence  
\[ x(n) = \{1, 2\} \]

g) What is frequency warping?

h) What are the limitations of impulse invariant method?

i) Give the transform relation for converting compass filter to bandpass in a digital domain.

j) What are the different memory addressing modes of a TMS 320 C XX DSP processor?

2x10

PART-A

Q.2  

a) Determine the z-transform of  

i)  
\[ x(n) = a^n \cos \omega_n u(n) \]

ii)  
\[ x(n) = n 3^n u(n) \]

b) Obtain  \( x(n) \) for the following:  
\[ x(z) = \frac{1 - \frac{1}{3}z^{-1}}{(1 - z^{-1})(1 + 2z^{-1})}, |z| > 2 \]

7

c) Determine the response of the system with impulse response  \( h(t) = u(t) \) for input  \( x(t) = e^{-2t}u(t) \). Use Laplace transforms.

7
Q.3  a) Explain the following properties of DFT:

i) Convolution
ii) Time shifting
iii) Conjugate symmetry

b) Find the response of an LTI system with impulse response

\[ h(n) = \{-4, -4, -6\} \]

for input \( x(n) = \{1, 2, 3, 4, 5\} \) using circular convolution.

Q.4  a) Using Hamming window, design an FIR filter with

\[ H_d(e^{j\omega}) = e^{-j2\omega} : \frac{-\pi}{4} \leq \omega \leq \frac{\pi}{4} \]

\[ = 0 : \frac{\pi}{4} \leq |\omega| \leq \pi \]

Assume \( N=7 \).  

b) Explain round off effects in an FFT computation.

PART-B

Q.5  a) The system transfer function of analog filter is given by:

\[ H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16} \]

Obtain the system transfer function of digital filter using bilinear transformation which is resonant at \( \omega = \pi/2 \).

b) Write a short note on effects of finite word length in digital filters.

Q.6  a) How will you obtain digital filters from analog filters? Transform the single pole lowpass analog filter with system function,

\[ H_a(s) = \frac{\Omega_p}{s + \Omega_p} \]

into a high pass filter with cut off frequency \( \Omega_p \).

b) What is multivariate signal processing? Explain sampling rate reduction by an integer factor ‘D’. Derive input and output frequency spectra relation.

Q.7  a) Draw the architecture of a DSP processor and explain.
b) Explain about pipeling in a DSP.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
DIGITAL SIGNAL PROCESSING (EE-601A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Determine whether the following sequence is periodic or not. If periodic, determine the fundamental period.
   \[ x(n) = \sin \frac{6\pi n}{7} \]
   b) Find the DFT of the following:
   \[ x(n) = (1, 2, 3) \]
   c) Determine if the system described by the input-output equation,
   \[ y(n) = x(n) + 3x(n + 4) \]
   is causal or non-causal.
   d) State the condition for a digital filter to be causal and stable.
   e) Find inverse \( z \)-transform:
   \[ \times(z) = \log(1 + az^{-1}), |z| > |a| \]
   f) Explain briefly quantization effect in an FFT algorithm.
   g) Explain the design of IIR filter by approximation of derivatives.
   h) Draw the direct form realization of FIR filters.
   i) Explain sampling rate reduction by an integer factor \( D \). Also write the input-output spectra relation.
   j) What are digital filter banks?

\[ 2 \times 10 \]

PART A

Q.2  a) Determine \( z \)-transform of the given signals:
   i) \[ x(n) = na^n \sin(w_0n) u(n). \]
   ii) \[ x(n) = 2^n u(-n - 1). \]

\[ 10 \]

b) State and prove time scaling and convolution properties of DTFT.

\[ 10 \]

Q.3  a) For each of the following discrete-time signals, determine whether or not the system is linear, time-invariant and stable.
   i) \[ y(n) = x(n + 7) \]
   ii) \[ y(n) = x^3(n). \]

\[ 10 \]
b) Determine the impulse response \( h(n) \) for the system described by the second order difference equation, \( y(n) - 4y(n-1) + 3y(n-2) = x(n) \) with initial condition \( y(-1) = y(-2) = 0 \). \( \text{10} \)

Q.4  

a) Derive decimation in frequency radix-2 FFT algorithm for evaluating N point DFT of the given discrete time sequence \( x(n) \). \( \text{10} \)

b) Find the response of a LTI system with impulse response \( h(n) = \{-4, -4, 6\} \) for input \( x(n) = \{1, 2, 3, 4, 5\} \) using circular convolution. \( \text{10} \)

**PART-B**

Q.5  

a) Explain the design of FIR filters using window technique. Discuss the window sequences generally used and compare their properties. What is Gibbs phenomenon? \( \text{10} \)

b) Realize the system function \( H(z) = 1 + \frac{2}{z^4} + \frac{3}{z^8} + \frac{3}{4}z^{-3} + \frac{7}{2}z^{-4} \) by using direct form structure. \( \text{5} \)

c) Show how an FIR filter gives linear phase characteristics? \( \text{5} \)

Q.6  

a) Using impulse invariant mapping technique, convert the following analog transfer function into digital. Assume \( T = 0.1 \) sec.  
\[
H(s) = \frac{2}{(s + 1)(s + 2)}
\]
\( \text{10} \)

b) Write the characteristics of Chebyshev filter. \( \text{5} \)

c) What is zero input limit cycle in IIR filters? Explain it with one example. \( \text{5} \)

Q.7  

a) Explain the process of interpolation in detail. What is the need of low pass filter in interpolation? \( \text{5} \)

b) The output of an A/D converter is applied to a digital filter with the system function \( H(z) = \frac{0.5z}{z - 0.5} \)
Find the output noise power from the digital filter, when the input signal is quantized to have eight bits.

c) With a functional block diagram explain the architecture of TMS 320 CXX DSP processor.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
ELECTRICAL DRIVES (EE-602)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) State essential parts of electrical drives.
b) What are various methods of braking of DC drives?
c) Draw a block diagram of a closed loop speed control.
d) What are circulating currents?
e) Draw speed torque characteristics.
f) Define a duty cycle.
g) Why variable frequency control is more efficient?
h) Compare VSI and CSI.
i) What are various methods of speed control of synchronous motors?
j) What are the different components of load torque?

2x10

PART-A

Q.2
a) Explain the multiquadrant operation of a drive in detail.
10
b) Explain phase locked loop in detail with help of a block diagram.
5
c) Discuss steady state stability.
5

Q.3
Explain the working of single phase to single phase step down cycloconverter for continuous conduction for a bridge type of a cycloconverter. Also derive the output voltage equation.
20

Q.4
a) Explain single phase fully controlled rectifier control of DC separately excited motor in continuous conduction mode. Illustrate your answer with a waveform.
10
b) A 220 V, 960 rpm, 12.8 separately excited dc motor has armature circuit resistance and inductance of 20 Ω and 150 mH, respectively. It is fed from a single phase half controlled rectifier with an ac source voltage of 230 V, 50Hz. Calculate:
i) Motor torque at $\alpha = 60^\circ$ and speed= 600 rpm  
ii) Motor speed at $\alpha = 60^\circ$ and $T = 20\, Nm$.

**PART-B**

Q.5  
a) Explain four quadrant operation of a chopper.  

b) A 230 V, 960 rpm and 200 A separately excited DC motor has an armature resistance 0.02 $\Omega$. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230 V. Assuming continuous conduction:  
i) Calculate duty ratio of chopper for motor operation at rated torque and 350 rpm.  
ii) Calculate duty ratio of chopper for braking operation at rated torque and 350 rpm.

Q.6  
a) Explain voltage source inverter control of an induction motor.  

b) Explain the variable frequency control of an induction motor.

Q.7  
What do you understand by slip power recovery? Explain slip power recovery schemes of speed control in detail.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
POWER SYSTEM-II (EE-603)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is difference between argument incidence matrix and incidence matrix?
b) Name different types of FACTS controllers.
c) What is primitive network and what is its significance in graph theory?
d) Define single line diagram.
e) What are the types of lighting arrestors?
f) What is power flow problem?
g) Represent the power system network using different components.
h) Write the Jacobian matrix for Newton Raphson method.
i) What is the significance of per unit values?

2x10

PART-A

Q.2
a) Draw the graph of network and write bus incidence matrix.

\begin{center}
\begin{tikzpicture}
\node (1) at (0,0) {1};
\node (2) at (1,0) {2};
\node (3) at (1,-1) {3};
\node (4) at (2,0) {4};
\node (5) at (2,-1) {5};
\draw (1) -- (2);
\draw (2) -- (3);
\draw (2) -- (5);
\draw (3) -- (4);
\end{tikzpicture}
\end{center}

b) Derive the relationship between admittance matrix and bus admittance matrix with incidence matrix
\[ Y_{bus} = A^T YA \]

15

Q.3
a) Explain the power system representation of a synchronous machine.

\begin{center}
\begin{tikzpicture}
\end{center}

5
b) Find the p.u. impedance diagram for the power system shown in the figure. Neglect resistances and take base of 100 MVA, 220 kV in 50 ohm line.

![Power System Diagram](image)

**Q.4**


b) For the given figure find voltage and bus angles at three buses using Newton Raphson method. Generators are connected to all four buses while loads are at 2, 3, 4. The values of real and reactive powers are listed in table-1.

<table>
<thead>
<tr>
<th>Bus</th>
<th>( P_i )</th>
<th>( Q_i )</th>
<th>( V_i )</th>
<th>Type of bus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(P.u)</td>
<td>(P.u)</td>
<td>(P.u)</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>-</td>
<td>-</td>
<td>-1.05</td>
<td>( \angle 0^\circ )</td>
</tr>
<tr>
<td>2.</td>
<td>-0.45</td>
<td>-0.25</td>
<td>-</td>
<td>PQ</td>
</tr>
<tr>
<td>3.</td>
<td>-0.51</td>
<td>-0.25</td>
<td>-</td>
<td>PQ</td>
</tr>
<tr>
<td>4.</td>
<td>-0.6</td>
<td>-0.3</td>
<td>-</td>
<td>PQ</td>
</tr>
</tbody>
</table>

**PART-B**

**Q.5** Write an algorithm to find solution by using fast decoupled method of Newton Raphson for load flow problem.

**Q.6** What are different types of FACTs devices? Describe in detail construction and working of shunt and series compensation.
Q.7  

a) Discuss the phenomenon of lightning stroke.  

b) Describe the principle and construction of:  
   i) Rod gaps.  
   ii) Expulsion type.  
   iii) Valve type lightning arrestor.
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
POWER SYSTEM-II (EE-603A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define incidence matrix.  
b) What is the significance of slack bus?  
c) Compare Guass Seidal and Newton Raphson method.  
d) Write full name for FACTs.  
e) What is the difference between automatic generation control and load frequency control?  
f) What is the transient stability?  
g) How do we make Y_{bus} using graph theory? Explain with an example.  
h) Define STATCOM.  
i) What is relationship between loop impedance and admittance matrix?  
j) Write types of FACTS controllers.

2x10

PART-A

Q.2  
a) How synchronous machines are represented in a power system? Explain in detail.

10

b) The one-line diagram of three-phase power system is shown in the figure. Select a common base of 100 MVA and 22 kV on generated side. Draw an impedance diagram with all impedances including the load impedance marked in per unit.

G-90 MVA, 22 kV, X=18%
864/4

T1-50 MVA, 22/220 kV, X=10%, T2-40 MVA, 220/11 kV, X=6%
T3-40 MVA, 22/110 kV, X=6.4%, T4-40 MVA, 110/11 kV, X=8.0%
M-66.5 MVA, 10.45 kV, X=18.5%
Line reactance – line 1- 48.4 Ω
Line reactance – line 2- 65.43 Ω
Load-57 MVA, 10.45 kV, 0.6 p.f. lagging

Q.3 a) Derive the relation for formation of network matrices.

\[ Y_{bns} = A'_Y A \]  

b) Write an algorithm to form \( Z_{bns} \) with addition of branch and link.

Q.4 a) Write an algorithm to explain power flow solution using Newton Raphson method.

b) For one line diagram of simple three bus system with generation at bus1, the magnitude of voltage at bus1 is adjusted to 1.05 per unit. The scheduled loads at buses 2 and 3 are marked. Line impedances in per unit on 100 MVA base and line charging is neglected. Using Guass Seidal method, determine phasor values of the voltages at load buses 2 and 3.

Q.5 Explain the block diagram of load frequency control and also explain automatic generation control for single area system.

Q.6 Explain why compensation is necessary for power quality? Explain all the FACTS devices used for power quality in brief.
Q.7   a) Derive Swing equation.  
       b) Explain the transient stability with equal area criterion for sudden increase in power input.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
DESIGN OF ELECTRICAL MACHINES (EE-604)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define gap contraction factor for slots.
b) What factor decides the number of turns in a winding?
c) Why short time rating of an electrical machine is much higher than continuous rating?
d) Define window space factor.
e) Why is the efficiency of transformer so high?
f) Why silicon content in electrical sheet steel is limited to four to five percent?
g) Differentiate between leakage magnetic flux and useful magnetic flux.
h) List the guiding factors for choice of number of armature slots of a DC machine.
i) Define slot space factor.
j) What is skewing?

2x10

PART-A

Q.2 a) Discuss about the various types of thermal rating of the electrical machines.

10

b) Discuss the temperature rise along with heating and cooling cycles in electrical machines.

10

Q.3 a) Describe the methods of cooling of transformer.

10

b) A single phase transformer 400 V, 50 Hz is built from stamping having a relative permeability of 1000. The length of flux path is 2.5 m, the area of cross-section of core is 2.5x10^-3 m² and the primary winding has 800 turns. Estimate the maximum flux and no-load current of the transformer. The iron loss at the working flux density is 2.6 W/kg. Iron weights 7.8x10^3 kg/m^3. Stacking factor is 0.9.

10
Q.4  a) Explain in detail about the MMF calculation for tapered teeth. 
       10
b) Derive an equation for slot leakage reactance. 
       10

       **PART-B**

Q.5  a) Enumerate the procedure for shunt field design. 
       10
b) Discuss:
       i) Significance of specific loading in design of a DC machine. 
          5
       ii) Choice of poles and speed in DC machines. 
          5

Q.6  a) Prove that kVA rating of a synchronous generator is given by kVA =1.11 kW
       Bav aCLVax10^{-3} where V_a=peripheral speed in m/s. 
       10
b) Explain step by step procedure for design of field winding of water wheel
       alternator. 
       10

Q.7  a) What are the factors to be considered in the selection of magnetic and 
       electric loading in 3-phase induction motor? 
       10
b) Write notes on: 
       i) Hybrid techniques.
       ii) Optimization.
       as used in computer aided design of electrical machines. 
       10
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
HIGH VOLTAGE ENGINEERING (EE-621A)

Time: 3 hrs  
Max Marks: 100  

No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw circuit diagram of voltage doublers circuit.  
b) List advantage of resonant transformer over cascade transformer.  
c) Draw and neatly label the standard impulse wave shape.  
d) Give difference between Zno and thyrite arrester.  
e) Define the principle of basic electrostatic machine.  
f) Draw surge arrester dynamic volt-ampere characteristics.  
g) Differentiate between maintenance and diagnostic testing.  
h) Define impulse current waveform.  
i) What is the purpose of insulation co-ordination?  
j) ?

PART-A

Q.2 a) Derive the relationship for ripple and voltage regulation in Cockcroft-wallon voltage multiplier circuit.  

b) Write short notes on:  
   i) Cascade transformer.  

   ii) Van de Graaff generator.

Q.3 a) Discuss and analyse the circuits for producing impulse waves.  

b) Explain and draw the multistage impulse generator.

Q.4 a) Explain lighting phenomena and principle of lighting protection.  

b) Write note on:  
   i) Expulsion gap.
ii) Surge arrester.

PART-B

Q.5   a) What are causes for switching overvoltages? How are controlled in power system?

10

b) With suitable illustration, explain how insulation level in chaser for various equipments in 230/132 kv substation?

10

Q.6   a) What is “Stressed oil volume theory”, how does it explain breakdown in large volumes of commercial liquid dielectrics?

10

b) How does the ‘internal discharge’ phenomenon lead to breakdown in solid dielectrics?

10

Q.7   a) Write note on biological and environmental aspect in EHU and UHV line design.

10

b) Explain tools for live line maintenance.

10
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
COMPUTER APPLICATIONS IN POWER SYSTEMS (EE-622)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define stack bus and give its importance.
b) Define symmetrical components of three phase system.
c) State drawbacks of Newton-Raphson method.
d) What do you understand by economic dispatch?
e) Discuss sparsity in power system.
f) What is the function of AGC?
g) Which method is used for finding $Z_{BUS}$ and why it is preferred?
h) Draw an equivalent circuit of synchronous motor/ generator.
i) What is meant by state estimation?
j) Define Jacobian matrix.

2x10

PART-A

Q.2
a) What are the various functions of SCADA? Explain the main components of SCADA and its working with the help of a neat and clean diagram.

10

b) Explain the term AGC. What are its functions and operations, explain with block diagram?

10

Q.3
a) Draw an equivalent circuit of synchronous motor, alternator and transmission lines. Also write the relation between e.m.f. and voltage for all cases.

10

b) What are the symmetrical components? Derive an expression for symmetrical components of current for a three phase unbalance system. Also convert all given quantities to put values on a system base of 25 MVA. Assume a base voltage of 33 kV for transmission line.
Q.4
a) Draw the algorithm for $Z_{bus}$ using step by step method.
b) Develop $Z_{bus}$ by building algorithm technique.

![Diagram](image)

All values are given in (Ω).

PART-B

Q.5
a) Derive an expression for three-phase fault current using $Y_{bus}$ with the help of an example. Also draw a flowchart.
b) Define contingency analysis. Discuss the single outage contingency analysis using an example.

Q.6
a) Develop the necessary equations for load flow solution using Gauss Siedel method. Also develop a flow chart for same.
b) For the power system shown below; compute the bus voltages using G S method (one iteration) BUS$_1$ is slack bus and BUS$_2$ and BUS$_3$ are load and voltage-control buses, resp.
Q.7  

a) Develop the co-ordination equation for economic dispatch of all thermal units without ordinating transmission line losses.

b) The operating characteristics of three plants with total capacity of 700 MW are given as:

F₁ = 0.8P₁² + 30P₁ + 100;  
50 ≤ P₁ ≤ 250

F₂ = 0.1P₂² + 32P₂ + 125;  
50 ≤ P₂ ≤ 250

F₃ = 0.12P₃³ + 35P₃ + 150;  
50 ≤ P₃ ≤ 200

Determine economic dispatch if plants are scheduled for a load of 500 MW.
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
NEW AND RENEWABLE ENERGY SOURCES (EE-625)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What do you mean by global warming?
b) What are the different types of solar radiation?
c) Define the term local apparent time (LAT).
d) What are the possible uses of fuel cell?
e) What are the advantages and disadvantages of wind energy?
f) What are different types of biogas plants?
g) State the limitation of OTEC system.
h) Define thermal storage.
i) Draw the characteristics of wind energy.
j) What are the limitations of tidal power generation?

Q.2  a) What are the conventional and non-conventional energy sources? Explain.

Q.3  a) Describe the principle of solar phovoltaic energy conversion and what are its advantage and disadvantages.

Q.4  a) What is the basic principle of wind energy conversion? Derive an expression for power developed due to wind.

b) Give classification of wind turbines on the basis of axis of rotation.

PART-A

Q.2  a) What are the conventional and non-conventional energy sources? Explain.

10

b) Discuss the performance analysis of solar collectors in details.

10

Q.3  a) Describe the principle of solar phovoltaic energy conversion and what are its advantage and disadvantages.

10

b) Discuss the working principle and construction of a pyranometer in detail.

10

Q.4  a) What is the basic principle of wind energy conversion? Derive an expression for power developed due to wind.

10

b) Give classification of wind turbines on the basis of axis of rotation.

10

PART-B
Q.5  a) Explain the principle of open cycle OTEC system with a suitable diagram.  
     10  
b) Explain the various methods of tidal power generation. What are the limitations of each method?  
     10  

Q.6  a) State various routes of biomass energy conversion to energy. What are the factors affecting generation of biogas?  
     10  
b) What are the different types of turbines used in hydro plants? Explain.  
     10  

Q.7  Write short notes on:  
a) Fuel cell  
    7  
b) Nuclear fusion  
    7  
c) Hydrogen energy  
    6
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
ADVANCED CONTROL SYSTEMS (EE-801)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define state space.
b) State two properties of Z-transform.
c) Define observability.
d) Find the Z-transform of \( A^n u(n) \).
e) What is sampling?
f) Define instability.
g) What are variable structure systems?
h) Define droop rate.
i) What are the advantages of state space techniques?
j) What is inherent nonlinearity?

2x10

PART-A

Q.2  a) Consider the state space representation given below. Convert this to diagonal canonical form:

\[
\begin{align*}
\dot{x}(t) &= \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u(t) \\
y(t) &= [1 \ 0 \ 0] x(t)
\end{align*}
\]

b) A system is described by the following differential equations:

\[
\begin{align*}
\frac{d^3 x}{dt^3} + 3 \frac{d^2 x}{dt^2} + 4 \frac{dx}{dt} + 4x &= u_1(t) + 2u_2(t) + 5u_3(t) \\
y_1 &= 4 \frac{dx}{dt} + 3u_1 \\
y_2 &= \frac{d^2 x}{dt^2} + 4u_2 + u_3
\end{align*}
\]

Obtain the space state model of the system.

10
Q.3  a) Check the controllability of the following state space system:
\[
\begin{bmatrix}
\dot{x}_1 \\
\dot{x}_2 \\
y
\end{bmatrix}
= \begin{bmatrix}
0 & 1 \\
-1 & -2 \\
1 & 0
\end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \end{bmatrix} u
\]

\[y = x_1\]

b) Derive the transfer function from state model \( \dot{x} = Ax + Bu \ y = c_1 \).

Q.4  a) Find the pulse transfer functions for the given system:

\[\text{b) Find the inverse Z transform of } H(z) = \frac{-4 + 8z^{-1}}{1 + 6z^{-1} + 8z^{-2}}\]

\[\text{PART-B}\]

Q.5  a) Explain the Jury’s test of stability analysis of a discrete time system.

b) Derive the transfer function of a zero order hold (ZOH).

Q.6  a) Derive the describing function of an ideal relay.

b) Explain the stability analysis of an autonomous system with single nonlinearity using a describing function.

Q.7  a) Investigate the stability using Lyapunov method:
\[
\begin{align*}
\dot{x}_1 &= x_2 \\
\dot{x}_2 &= -x_1 + x_2 + 2
\end{align*}
\]

b) Explain direct method of Liapunov for stability analysis of a linear system.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q. 1 a) Why alternating current is considered most suitable for resistance welding.
b) How can the rate of dialectic heating be varied?
c) What is the fundamental difference between electric arc welding and resistance welding?
d) Explain the advantage of using inert gas in filament lamps.
e) Discuss the types of passenger services.
f) Discuss inverse square law of illumination.
g) Define tractive effort.
h) Discuss the term: tonne of refrigeration.
i) What are the advantages of series parallel control of DC motors?
j) Define the following terms:
i) Lumen. ii) Mean spherical candle power. 2x10

PART-A

Q. 2 a) Explain the working of a fluorescent tube with the help of circuit giving the function of various parts. How stroboscopic effect is eliminated in a fluorescent tube light?

b) A room 50 x 20 m is illuminated by indirect lighting. An average illumination of 60 lux is required to illuminate the working plane. 80 W filament lamps having luminous efficiency of 14 lumens/W are to be used. The coefficient of utilization is 0.75 and depreciation factor is 0.85. Calculate the following:
i) Grass lumens required.
ii) Power required for illumination.
iii) Number of lamps.
iv) Find the saving in power if instead of 80 W filament lamps, 30 W fluorescent tubes are used having efficiency of 50 lumens/W. Also, find the number of tube lights required.

10
Q.3  a) Explain with neat sketches the construction, principle of operation and application of Ajax Wyatt furnace.  
   b) Discuss in detail the applications of dielectric heating.  

Q.4  a) Compare the performance of various electrodes used in electric arc furnaces.  
   b) Name and describe the various types of resistance welding processes.  

PART-B

Q.5  a) Explain the terms used in electrolytic processes: 
   i) Throwing power.  
   ii) Current efficiency.  
   iii) Energy efficiency.  
   iv) Electro-chemical equivalent.  
   b) What is electroplating? What is it used for? Describe the various operations involved in electroplating.  

Q.6  a) Discuss different methods of electrical braking in detail.  
   b) Discuss different types of current collectors used in electric traction.  
   c) A train service consists of the following: 
      Uniform acceleration of 5 km/hr/s for 30 seconds followed by free running for 10 minutes then uniform braking at 5 km/hr/s to stop followed by a stop of 5 minutes. Draw the speed vs time curve and calculate: 
      i) Distance between the stations.  
      ii) Average speed.  
      iii) Scheduled speed.  

Q.7  a) Explain vapour absorption and vapour compression systems.  
   b) What is air-conditioning? On what factors does it depend?  

8
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define illumination and mention properties of good illumination.
   b) What is role of condenser and choke used in a fluorescent tube?
   c) Why sodium vapour discharge lamp is placed horizontally?
   d) Name few elements that are widely used as heating element materials.
   e) What are qualities of good weld?
   f) What are desirable properties of refrigerants?
   g) On what principle does thermoelectric refrigeration system work?
   h) Draw neat sketch of a refrigeration cycle.
   i) Why dc series motor is ideally suited for traction purposes.
   j) What is regenerative braking?

PART-A

Q.2 a) Explain laws of illumination. 5
   b) Explain the working of fluorescent tube with help of circuit giving functions of various parts. How stroboscopic effect is eliminated? 8
   c) A minimum illumination of 80 lumen/m² is required in a factory shed of 100 m x 80 m. Calculate the number, location and wattage of units to be used. Assume depreciation factor is 0.8. Co-efficient of utilization is 0.4 and efficiency of the lamp is 40 lumens/W. 7

Q.3 a) Explain the method of induction heating and describe in detail the coreless type of induction furnace. 10
   b) Explain dielectric heating. Explain the factors on which the dielectric loss in a dielectric material depends. Discuss some of its applications. 10
Q.4 What is electric heating? Explain different methods of induction heating. Give some examples of induction heating.

**PART-B**

Q.5 a) Discuss in detail refrigeration Systems.

b) Explain with the help of a diagram working of window type room air-conditioner.

12

Q.6 a) Draw and explain a typical speed-time curve for an electric train and what do you understand by crest speed, average speed and schedule speed.

b) Discuss in brief the tractive effort for propulsion of train.

c) The speed-time curve of train carries the following parameters:

i) Free running for 12 minutes.

ii) Uniform acceleration of 6.5 kmphps for 20 sec.

iii) Uniform deceleration of 6.5 kmphps to stop the train.

iv) A stop of 7 minutes.

Then determine the distance between two stations, the average and the schedule speeds.

7

Q.7 a) Explain the methods of track electrification systems.

b) Explain metadyne and series-parallel control of starting of DC series motor.

12
End Semester Examination, Dec. 2014  
B. Tech. – Eighth Semester  
ELECTRICAL POWER QUALITY (EE-822)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define voltage flicker.  
b) Differentiate between under-voltage and over-voltage.  
c) Name any two international IEEE standards that define power quality.  
d) What are the components of waveform distortion?  
e) List types of interruption and causes of interruption.  
f) What are the causes of sags and swells?  
g) State two reasons for increased power quality concern.  
h) What is the use of oscilloscope?  
i) Differentiate between power quality, voltage quality and current quality.  
j) Define an active filter.

2x10

PART-A

Q.2  
a) Explain the term: power quality. What are the various causes for poor power quality?  

10  
b) Discuss the origin of long interruption. How will you monitor and mitigate a long interruption? Explain.  

10

Q.3  
a) What are transient overvoltages? Explain different types of transient overvoltages.

10  
b) What is a voltage sag? What are different voltage sag mitigation techniques? Explain.

10

Q.4  
a) What are the different sources of sags and interruptions? Differentiate between them.

10
b) What are the different power quality issues? Explain in details.

10

**PART-B**

Q.5  

a) What are the main harmonic introducing devices? Explain in details.

10

b) What are the harmonic mitigation techniques? Which technique is most effective and how?

10

Q.6  

a) What are the various filtering techniques for harmonics cancellation and isolation? Explain briefly.

10

b) What are the various instruments used for power quality measurements? Which factor is considered for selecting the instruments?

10

Q.7  

Write short notes on:

a) Motor start transient.

5

b) Dynamic voltage restorers for sag.

5

c) True RMS meter.

10
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
NEW AND RENEWABLE ENERGY SOURCES (EE-625)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you mean by global warming?
    b) What are the different types of solar radiation?
    c) Define the term local apparent time (LAT).
    d) What are the possible uses of fuel cell?
    e) What are the advantages and disadvantages of wind energy?
    f) What are different types of biogas plants?
    g) State the limitation of OTEC system.
    h) Define thermal storage.
    i) Draw the characteristics of wind energy.
    j) What are the limitations of tidal power generation?

Q.2 a) What are the conventional and non-conventional energy sources? Explain.
    b) Discuss the performance analysis of solar collectors in details.

Q.3 a) Describe the principle of solar photovoltaic energy conversion and what are its advantage and disadvantages.
    b) Discuss the working principle and construction of a pyranometer in detail.

Q.4 a) What is the basic principle of wind energy conversion? Derive an expression for power developed due to wind.
    b) Give classification of wind turbines on the basis of axis of rotation.

PART-A

PART-B
Q.5  a) Explain the principle of open cycle OTEC system with a suitable diagram.
      10
      b) Explain the various methods of tidal power generation. What are the limitations of each method?
      10

Q.6  a) State various routes of biomass energy conversion to energy. What are the factors affecting generation of biogas?
      10
      b) What are the different types of turbines used in hydro plants? Explain.
      10

Q.7  Write short notes on:
      a) Fuel cell
         7
      b) Nuclear fusion
         7
      c) Hydrogen energy
         6
End Semester Examination, Dec. 2014  
B. Tech. – Seventh / Eighth Semester  
ADVANCED CONTROL SYSTEMS (EE-801)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define state space.  
b) State two properties of $Z$-transform.  
c) Define observability.  
d) Find the $Z$-transform of $A^n u(n)$.  
e) What is sampling?  
f) Define instability.  
g) What are variable structure systems?  
h) Define droop rate.  
i) What are the advantages of state space techniques?  
j) What is inherent nonlinearity?

2x10

PART-A

Q.2  
a) Consider the state space representation given below. Convert this to diagonal canonical form:

\[
\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} u(t) \\
y(t) = [1 \ 0 \ 0] x(t)
\]

10

b) A system is described by the following differential equations:

\[
\frac{d^3 x}{dt^3} + 3 \frac{d^2 x}{dt^2} + 4 \frac{dx}{dt} + 4x = u_1(t) + 2u_2(t) + 5u_3(t)
\]

and its output is represented as

\[
y_1 = 4 \frac{dx}{dt} + 3u_1 \\
y_2 = \frac{d^2 x}{dt^2} + 4u_2 + u_3
\]

Obtain the space state model of the system.

10
Q.3  
   a) Check the controllability of the following state space system:
   \[
   \begin{bmatrix}
   \dot{x}_1 \\
   \dot{x}_2
   \end{bmatrix} = \begin{bmatrix}
   0 & 1 \\
   -1 & -2
   \end{bmatrix} \begin{bmatrix}
   x_1 \\
   x_2
   \end{bmatrix} + \begin{bmatrix}
   1 \\
   -1
   \end{bmatrix} u
   \]
   \[
   y = x_1
   \]
   b) Derive the transfer function from state model \( \dot{x} = Ax + Bu \ y = c^t \).

Q.4  
   a) Find the pulse transfer functions for the given system:
   \[
   \begin{array}{c}
   R(s) \downarrow \\
   \downarrow \\
   1 \downarrow \\
   \downarrow \\
   1 \downarrow \\
   \downarrow \\
   \downarrow \\
   2 + s \downarrow \\
   \downarrow \\
   \downarrow \\
   \downarrow \\
   C(s)
   \end{array}
   \]
   b) Find the inverse Z transform of \( H(z) = \frac{-4 + 8z^{-1}}{1 + 6z^{-1} + 8z^{-2}} \).

\textbf{PART-B}

Q.5  
   a) Explain the Jury’s test of stability analysis of a discrete time system.
   b) Derive the transfer function of a zero order hold (ZOH).

Q.6  
   a) Derive the describing function of an ideal relay.
   b) Explain the stability analysis of an autonomous system with single nonlinearity using a describing function.

Q.7  
   a) Investigate the stability using Lyapunov method:
   \[
   \begin{align*}
   \dot{x}_1 &= x_2 \\
   \dot{x}_2 &= -x_1 + x_2 + 2
   \end{align*}
   \]
   b) Explain direct method of Liapunov for stability analysis of a linear system.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from PART A and TWO questions from PART B. Each question carries equal marks.

Q.1  a) Why alternating current is considered most suitable for resistance welding.
     b) How can the rate of dialectic heating be varied?
     c) What is the fundamental difference between electric arc welding and resistance welding?
     d) Explain the advantage of using inert gas in filament lamps.
     e) Discuss the types of passenger services.
     f) Discuss inverse square law of illumination.
     g) Define tractive effort.
     h) Discuss the term: tonne of refrigeration.
     i) What are the advantages of series parallel control of DC motors?
     j) Define the following terms:

     i) Lumen.  
     ii) Mean spherical candle power.  

Q.2  a) Explain the working of a fluorescent tube with the help of circuit giving the function of various parts. How stroboscopic effect is eliminated in a fluorescent tube light?

     b) A room 50 x 20 m is illuminated by indirect lighting. An average illumination of 60 lux is required to illuminate the working plane. 80 W filament lamps having luminous efficiency of 14 lumens/W are to be used. The coefficient of utilization is 0.75 and depreciation factor is 0.85. Calculate the following:

     i) Grass lumens required.
     ii) Power required for illumination.
     iii) Number of lamps.
     iv) Find the saving in power if instead of 80 W filament lamps, 30 W fluorescent tubes are used having efficiency of 50 lumens/W. Also, find the number of tube lights required.
Q.3  a) Explain with neat sketches the construction, principle of operation and application of Ajax Wyatt furnace.  

b) Discuss in detail the applications of dielectric heating.  

Q.4  a) Compare the performance of various electrodes used in electric arc furnaces.  

b) Name and describe the various types of resistance welding processes.  

**PART-B**  

Q.5  a) Explain the terms used in electrolytic processes:  
i) Throwing power.  
ii) Current efficiency.  
iii) Energy efficiency.  
iv) Electro-chemical equivalent.  

b) What is electroplating? What is it used for? Describe the various operations involved in electroplating.  

Q.6  a) Discuss different methods of electrical braking in detail.  

b) Discuss different types of current collectors used in electric traction.  

c) A train service consists of the following: Uniform acceleration of 5 km/hr/s for 30 seconds followed by free running for 10 minutes then uniform braking at 5 km/hr/s to stop followed by a stop of 5 minutes. Draw the speed vs time curve and calculate:  
i) Distance between the stations.  
ii) Average speed.  
iii) Scheduled speed.  

Q.7  a) Explain vapour absorption and vapour compression systems.  

b) What is air-conditioning? On what factors does it depend?
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define illumination and mention properties of good illumination.
   b) What is role of condenser and choke used in a fluorescent tube?
   c) Why sodium vapour discharge lamp is placed horizontally?
   d) Name few elements that are widely used as heating element materials.
   e) What are qualities of good weld?
   f) What are desirable properties of refrigerants?
   g) On what principle does thermoelectric refrigeration system work?
   h) Draw neat sketch of a refrigeration cycle.
   i) Why dc series motor is ideally suited for traction purposes.
   j) What is regenerative braking?

   2x10

PART-A

Q.2  a) Explain laws of illumination.
   b) Explain the working of fluorescent tube with help of circuit giving functions of various parts. How stroboscopic effect is eliminated?
   c) A minimum illumination of 80 lumen/m² is required in a factory shed of 100 m x 80 m. Calculate the number, location and wattage of units to be used. Assume depreciation factor is 0.8. Co-efficient of utilization is 0.4 and efficiency of the lamp is 40 lumens/W.

   5
   8
   7

Q.3  a) Explain the method of induction heating and describe in detail the coreless type of induction furnace.
   b) Explain dielectric heating. Explain the factors on which the dielectric loss in a dielectric material depends. Discuss some of its applications.

   10
   10

889/4
Q.4  What is electric heating? Explain different methods of induction heating. Give some examples of induction heating.

PART-B

Q.5  
a) Discuss in detail refrigeration Systems.

b) Explain with the help of a diagram working of window type room air-conditioner.

Q.6  
a) Draw and explain a typical speed-time curve for an electric train and what do you understand by crest speed, average speed and schedule speed.

b) Discuss in brief the tractive effort for propulsion of train.

c) The speed-time curve of train carries the following parameters:
   i) Free running for 12 minutes.
   ii) Uniform acceleration of 6.5 km/hps for 20 sec.
   iii) Uniform deceleration of 6.5 km/hps to stop the train.
   iv) A stop of 7 minutes.
   Then determine the distance between two stations, the average and the schedule speeds.

Q.7  
a) Explain the methods of track electrification systems.

b) Explain metadyne and series-parallel control of starting of DC series motor.
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
ELECTRICAL POWER QUALITY (EE-822)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define voltage flicker.
b) Differentiate between under-voltage and over-voltage.
c) Name any two international IEEE standards that define power quality.
d) What are the components of waveform distortion?
e) List types of interruption and causes of interruption.
f) What are the causes of sags and swells?
g) State two reasons for increased power quality concern.
h) What is the use of oscilloscope?
i) Differentiate between power quality, voltage quality and current quality.
j) Define an active filter.

2x10

PART-A

Q.2 a) Explain the term: power quality. What are the various causes for poor power quality?

b) Discuss the origin of long interruption. How will you monitor and mitigate a long interruption? Explain.

Q.3 a) What are transient overvoltages? Explain different types of transient overvoltages.

b) What is a voltage sag? What are different voltage sag mitigation techniques? Explain.

Q.4 a) What are the different sources of sags and interruptions? Differentiate between them.

10
b) What are the different power quality issues? Explain in details.

10

PART-B

Q.5 a) What are the main harmonic introducing devices? Explain in details.

10

b) What are the harmonic mitigation techniques? Which technique is most effective and how?

10

Q.6 a) What are the various filtering techniques for harmonics cancellation and isolation? Explain briefly.

10

b) What are the various instruments used for power quality measurements? Which factor is considered for selecting the instruments?

10

Q.7 Write short notes on:

a) Motor start transient.

5

b) Dynamic voltage restorers for sag.

5

c) True RMS meter.

10
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
POWER MANAGEMENT (EE-825)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Name the load dispatch centres (LDC) as per Electricity Act 2003.
b) What are the factors to be considered for power plant layout?
c) What are the conditions affecting the cost of power plant?
d) State different conditions required for quantitative forecasting.
e) Why load forecasting is important?
f) _______ is the time covering for short term forecasting.
g) _______ is the first step in planning.
h) What is the effect of time-horizon on load forecasting methods?
i) _______ is not an economic assessment method.
j) What is the aim of generation planning?

2x10

PART-A

Q.2 a) State the features of Electricity Regulation Act 2003. 10
b) Explain grid management. 10

Q.3 a) Explain the various costs involved in a power plant. 10
b) How the cost of power plant is analysed? 10

Q.4 a) Differentiate between explanatory and time series forecasting models. 10
b) Explain peak demand forecasting technique. 10

PART-B

Q.5 Explain different methods of short term forecasting. 20
Q.6  a) Compare univariate and multivariate forecastings.  

 b) What are the steps involved in power plant planning.

Q.7  Explain transmission and distribution system planning.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – First Semester
BASICS OF ELECTRICAL ENGINEERING (EE-I-101)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the unit of current and charge?
b) When three batteries of 2v each are connected in series? What is the equivalent voltage?
c) State Ohm’s law.
d) Write the expression for energy stored in a magnetic field.
e) Write the relationship between line voltage and phase voltage of star connected system.
f) What is impedance of a RLC circuit?
g) State Lenz’s law.
h) What is inductive reactance?
i) State any two advantages of three phases over single phase system.
j) Define active power.

2x10

PART-A

Q.2 a) State the advantages of electrical over other forms of energy.

10

b) Define power and energy with their units. Write down the relation between the two.

10

Q.3 a) Explain the construction of lead acid battery.

10

b) Explain the charging method of lead acid battery.

10

Q.4 a) Explain Kirchoff’s voltage and current laws.

10

b) Two 8Ω resistor are connected in parallel and this combination is connected in series with a 6Ω resistor. This circuit is fed from a 10v battery. Find the
current flowing in the circuit and total resistance.

**PART-B**

Q.5  
(a) Derive an expression for the force between two parallel current carrying conductors.  
(b) State Fleming’s left hand and right hand rule.

Q.6  
(a) An alternating voltage $V_m \sin \omega t$ is applied to a RLC series circuit. Derive an expression for current and impedance of this circuit. Draw the phasor diagram also.

(b) A circuit with resistance 8Ω and reactance 6Ω is connected in series. Find the impedance of the circuit.

Q.7  
(a) Differentiate between star and delta connected system.

(b) How will you measure three phase power using two wattmeter method?
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Second Semester
FUNDAMENTALS OF ELECTRICAL ENGINEERING (EE-I-201)

Time: 3 hrs
Max Marks: 100

No. of pages: 1
Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) What are the units of power and energy?
   b) Two batteries of 1.5 V are connected in series. What is the equivalent voltage?
   c) What is admittance?
   d) State Kirchoff’s current law.
   e) What is the relation between line current and phase current in a delta connected system?
   f) Write an expression for energy stored in a magnetic field.
   g) What do you mean by resonance of a series RLC circuit?
   h) Conductance is the reciprocal of ___________.
   i) Define the term: voltage.
   j) State Fleming’s right hand rule.

   2x10

   PART-A

Q.2 a) State the advantages of electrical energy over other form of energy.
    10
   b) Define the quantities charge and current with their units.
    10

Q.3 a) Describe the construction and working of a lead acid battery.
    10
   b) How can you keep this lead acid battery in good condition?
    10

Q.4 a) Obtain the current in the 2 Ω resistor of the following circuit:
b) Explain maximum power transfer theorem.

PART-B

Q.5  a) Explain Faraday's law of electromagnetic induction.

b) Explain self induced emf and mutually induced emf.

Q.6  a) Explain the terms: inductive reactance, capacitive reactance and impedance of RLC circuit.

b) A series RL circuit with resistance 10 ohm and inductance 100 mH is connected to a 200 V, 50 Hz ac supply. Find impedance, current and voltage across each element.

Q.7  a) Differentiate between the star and delta connections.

b) Explain thermal generation with a block diagram.

End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Third Semester
BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (EE-I-303)

Time: 3 hrs

Max Marks: 100

No. of pages: 1
Note: Attempt **FIVE** questions in all. **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1  
   a) What is a fuse?  
   b) Name the limit of power.  
   c) What is a Zener diode?  
   d) State Faraday’s law of electromagnetic induction.  
   e) What is an MCB?  
   f) Draw the VI characteristics of a diode.  
   g) Name any two electrical wiring systems.  
   h) Why single phase induction motor is not self-starting?  
   i) Write any two applications of a thyristor.  
   j) What is the knee voltage of a silicon diode?  

2x10

**PART-A**

Q.2  
   a) Define voltage, current energy. Mention its units also.  
   b) State the advantages of electrical energy over other form of energies.

10  
10

Q.3  
   a) Explain the construction and working principle of a transformer.  
   b) Differentiate statically induced emf and dynamically induced emf.

10  
10

Q.4  
   a) Differentiate between 3-phase and single phase supplies.  
   b) Explain low voltage distribution systems.

10  
10

**PART-B**

Q.5  
   a) Distinguish between a lighting circuit and a power circuit.  
   b) List the various accessories with their applications used in an electrical installation.

10  
10

Q.6  
   a) Explain the starting of an induction motor using star-delta starter.  
   b) Explain the difference between three phase and single phase induction motors.

10  
10
Q.7  a) Explain the working of an NPN transistor.  
     10

   b) Draw the characteristics of a thyristor and explain.  
     10
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fifth Semester
NETWORK, FILTERS AND TRANSMISSION LINES (EE-I-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Give the difference between a mesh and loop.
b) Explain a dependent sources with a diagram.
c) State Tellegen’s theorem.
d) Define bandwidth.
e) What do you mean by image impedance?
f) Write down the equation for admittance parameters.
g) What is the need for m-derived filters?
h) Give applications of filters.
i) What are the different types of transmission lines?
j) Draw the T-network high pass filter.

Q.2
a) State and explain KVL and KCL with the help of an example.
b) Find the currents in various branches by using mesh analysis.

c) Differentiate between:
   i) Active and passive elements.
   ii) Node and junction.
Q.3 a) State and prove maximum power transfer theorem. Also give an expression for maximum power.

b) For the network shown, calculate the current in 3 Ω resistances by using Thevenin’s theorem.

![Network Diagram](image)

Q.4 a) What is the condition for parallel resonance? Derive an expression for cut-off frequency at parallel resonance. Also give an expression of Q-factor, and selectivity for the same.

b) Find the current, voltage, impedance and power factor of the following circuit.

![Circuit Diagram](image)

Q.5 a) Calculate the Z-parameters for the given network.

![Network Diagram](image)

b) Explain series interconnection of two port networks.
Q.6  a) What is a filter? Explain all types of filters with their circuit diagram and frequency response curves.

b) Derive an expression for cut-off frequency, propagation constant and attenuation constant for K-type law pass filter.

Q.7  a) Derive an expression for the input impedance of a loss-free line of length L when the load ends:
   i) Short circuited.
   ii) Open circuited.

b) Describe:
   i) Reflection coefficient.
   ii) Standing wave ratio.
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Fifth Semester
POWER ELECTRONICS (EE-I-501)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define commutation.
b) Draw static V-I characteristics of an SCR.
c) Why freewheeling diodes are used in converters?
d) Draw symbols of: i) Diac ii) MOSFET
e) Distinguish between current source inverter and voltage source inverter.
f) Discuss the importance of \( \frac{di}{dt} \) rating during turn on process of thyristor.
g) What is a cycloconverter? 
h) Describe the principle of dc chopper operation.
i) Draw two transistor models of a thyristor.
j) Enumerate the various single phase ac drives used.

2x10

PART-A

Q.2
a) A single phase half-wave SCR circuit feeds power to a resistive load. Draw waveforms for source voltage, load voltage, load current and voltage across SCR for a given firing angle \( \alpha \).

b) Discuss the methods of turning-on of a thyristor with its gate disconnected.

Q.3
a) Describe class-A type commutation used for thyristors with appropriate current and voltage waveforms.

b) For resistance firing circuits, show that firing-delay angle is proportional to the variable resistance.

Q.4
a) Describe the principle of working of three-phase thyristorised inverter using 180° conduction scheme.
b) Describe the working of a single phase, half-bridge inverter. What are its main drawback and how can these drawbacks be overcome? 10

**PART-B**

Q.5  a) Describe the operating principle of single phase to single phase step-up cycloconverter with the help of mid-point configuration.  
    10  
    b) Discuss circulating type cycloconverter in detail. Also derive relations for circulating current.  
    10

Q.6  a) What is a dc chopper? Describe the various types of chopper configurations with appropriate diagrams.  
    10  
    b) Explain working of a step-up chopper.  
    10

Q.7  Write short notes on any two:
    a) Speed control of dc motors using choppers.
    b) Slip power control of AC drives.
    c) Full wave drives.  
    10x2
End Semester Examination, Dec. 2014  
B.Tech. (Integrated) – Sixth Semester  
ELECTRICAL MACHINES (EE-I-601)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Give advantages of three phase system over single phase system.  
b) What do you mean by apparent power?  
c) What are the types of DC motors?  
d) Explain servomotors.  
e) Discuss the applications of a stepper motor.  
f) Give the comparison between single phase and three phase induction motors.  
g) Write down the emf equation of a transformer.  
h) What are the types of rotors used in a 3-phase induction motor?  
i) A transformer is called a static electrical machine. Why?  
j) The two types of windings used in dc armature are _______ and _______.  
2x10

PART-A

Q.2  
a) Derive a relationship between line voltage and phase voltage for star connections.  
10  
b) How power is measured by two-Wattmeter in a 3-phase balanced load? Explain with a neat circuit and phasor diagram.  
10

Q.3  
a) Differentiate between core type and shell type transformers.  
10  
b) Discuss voltage regulation and its significance.  
10

Q.4  
a) Draw the parts of a D.C. machine and explain them briefly.  
10  
b) Explain the different methods of speed control of a D.C. motor.  
10

PART-B

906/4
Q.5  a) Explain the principle and construction of 3-phase synchronous motor.  
     10  
     b) Discuss the methods of starting of a synchronous motor.  
     10

Q.6  a) Discuss capacitor start and capacitor run single phase induction motor.  
     10  
     b) Discuss speed control and applications of a universal motor.  
     10

Q.7  a) What do you mean by a stepper motor and also explain its types?  
     10  
     b) Explain the A.C. type of servomotors with its torque-speed characteristics.  
     10
Q.1  a) What is the importance of measurement? 
b) Define transducer. List its various classifications. 
c) Distinguish between accuracy and precision. 
d) What are primary and secondary transducer? Give example. 
e) What is piezoresistive effect? 
f) Write the expression for gauge factor. 
g) What is the basic principle of an LVDT? 
h) Write the basic principle of thermocouple. What are the materials used for its construction. 
i) What is fourden tube? Why is it used? 
j) A thermistor has a resistance temperature coefficient of -5% over a temperature range of 25°C to 50°C. If the resistance of thermistor is 10 Ω at 25°C. What is the resistance at 35°C?
Q.4  a) What is Hall Effect transducer? Discuss its principle. What are its applications?  
     10  
b) What is potentiometer? Explain its principle construction and working.  
     10

**PART-B**

Q.5  a) What is a load cell? Why is it used? Discuss its construction and working.  
     10  
b) Explain various methods for measurement of speed or acceleration.  
     10

Q.6  a) Discuss the method of measurement of differential pressure using an inductive transducer.  
     10  
b) Explain the methods for the measurement of humidity.  
     10

Q.7  a) What are thermistors? Explain their different forms of construction.  
     10  
b) Describe the methods for measurement of temperature.  
     i) RTD  
     ii) Pyrometer  
     5x2
End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D.) - First Semester
ADVANCED POWER ELECTRONICS (EE-M-102)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) How does a GTO differ from conventional thyristor? Draw its circuit symbol and static V-I characteristics. Under what conditions, it may work as a low gain transistor?  
     b) Enumerate the various abnormal conditions against which thyristors must be protected.  

Q.2  Explain constructional details and working of low power MOSFET and power MOSFET and bring out the differences between the two. Also discuss transfer and output characteristics of power MOSFET.  

Q.3  a) Describe the basic structure of an IGCT. Give its equivalent circuit and explain turn on and turn off processes.  
     b) Why are IGBT becoming popular in their applications to controlled converters? Enumerate some applications of IGBT.  

Q.4  a) Explain over voltage snubber circuit in detail with the help of a neat sketch.  
     b) Show that a turn off snubber is needed for the IGBT.  

Q.5  a) Explain drive circuits connected in cascade with the help of a neat diagram.  
     b) Why do drive circuits require isolation?  

Q.6  a) Explain d.c. coupled drive circuits with unipolar output.  
     b) Why is a snubber circuit required for GTO?
Q.7 A thyristor is controlling the power in a load resistance $R_L$ figure. The supply voltage is $240V$ d.c. and the specified limits for $\frac{di}{dt}$ and $\frac{dv}{dt}$ for the SCR are $50A/\mu s$, respectively. Determine the values of the $\frac{di}{dt}$, inductance and the snubber circuit parameters $R_s$ and $C_s$.

Q.8 Write short notes on *any two*:
   a) New semiconductor materials.
   b) Copper windings.
   c) Magnetic materials and cores.
Q.1 What is power system stability? Explain:
   a) Angular stability
   b) Transient stability
   c) Steady state stability
   d) Dynamic stability

Q.2 a) Obtain the IEEE ST1A excitation system model.
     b) Obtain the transfer function for a steam turbine.

Q.3 a) Derive Swing equation.
     b) Develop the block diagram of SMIB using classical generator model.

Q.4 With the help of block diagram provide the structure of power system stabilizer. Discuss in detail different components of a power system stabilizer.

Q.5 Discuss the SSR phenomenon and make a distinction between SSR due to self excitation effect and interaction with torsional oscillations.

Q.6 a) Explain the small signal stability of single machine infinite bus system.
     b) Explain the effect of AVR on synchronizing and damping torque components.

Q.7 a) Write short notes on:
      i) Dynamic simulation
      ii) Proximity indices
b) How does voltage collapse occur?

Q.8 Elaborate the assumptions made in the derivation for basic equations of a synchronous machine? Derive electrical and mechanical equations of the machine.
End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D) - First Semester
COMPUTER AIDED POWER SYSTEM ANALYSIS (EE-M-104)

Time: 3 hrs
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Discuss any two schemes to reduce a sparse matrix. Also explain any storage technique to store it. 7

   b) Develop Z_{BUS} building algorithm with all modifications and develop the flow chart for same. 8

Q.2  a) For a given network, find the admittance matrix by nodal analysis. All the values are given in \( \Omega \) (ohms). 7

   b) Develop the Z_{BUS} by building algorithm:
All values are in Ω.

Q.3  
(3)
a) Discuss the power flow problem and develop the generalized form of power flow equations.

b) Develop the algorithm for Gauss-Seidel method for load flow studies when all types of buses are present.

Q.4  
(4)
a) Derive the Jacobian elements for Newton-Raphson using polar co-ordinates.

b) For a power system shown, compute bus voltages using Gauss-Seidel iteration method. Consider Bus-1 as slack bus, Bus 2 and 3 as load and voltage control bus, respectively. Perform 1 iteration:

Q.5  
(5)
a) Discuss step-by-step analysis of line to line fault.
b) For the following network, find out positive impedance $Z_{\text{BUS}}$ matrix.

Q.6 Write a short note on *any two*:
   a) Detection and identification of bad measurements.
   b) Network sensitivity using load flow.
   c) Power system security and reliability.

Q.7 a) What is the role of power system state estimator? Discuss its application to determine state variables.

   b) In given power system, the system is being monitored for $V_1, V_2, Q_2, P_{12}$ and $Q_{12}$. Formulate a Jacobian matrix and develop the linearized mathematical model for computing state variables.

Q.8 a) Explain contingency analysis in power system.

   b) Explain weighted least square estimation method for state estimation in a power system.
End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D) - First Semester
INDUSTRIAL DRIVES (EE-M-105)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) What is the state-of-the-art of power electronic and drives?  

b) Characterize different types of loads and selection of drives for load.  

Q.2  a) A $200V, 875 \text{rpm}, 150A$ separately excited DC motor has armature resistance of $0.06 \Omega$. It is fed from single phase fully controlled rectifier with an ac voltage of $220V, 50Hz$. Assuming continuous conduction, calculate:

i) Firing angle for rated motor torque at $750 \text{rpm}$.  

ii) Firing angle for rated motor torque at $(-500) \text{rpm}$.  

iii) Motor speed $\alpha = 160^\circ$ and rated torque.  

b) What are the different operating modes of DC motor? Explain them in quadrants.  

Q.3  a) Explain with the help of a block diagram closed loop control of a DC motor drive.  

b) Describe adaptive control technique of speed control of a DC motor drive. Give the advantage of this technique.  

Q.4  Develop mathematical model of an induction motor drive. What are the different parameters used to control the speed of an induction motor?  

Q.5  a) Explain closed loop control of induction motor drive with constant $V/f$ control strategy.  


b) What is sensor less vector control? How it is applied in speed control of an induction motor?  

7

Q.6  a) Explain various types of synchronous motor drives. Derive an expression for developed power in a cylindrical rotor synchronous motor.  

8  

b) Write a short note on self-controlled motor drive employing load commutated thyristor inverter.    

7

Q.7  a) What is the state-of-art in automation?  

7  

b) Explain various component of automation. What are the application of automation?  

8

Q.8  Write short note on any two:  

a) DTC drive  

b) PLC application in automation  

c) Steady state stability  

d) Cycloconverter fed induction motor drive.  

$7\frac{1}{2}x2$
End Semester Examination, Dec. 2014  
M. Tech. (P.S.E.D) - Second Semester  
OPTIMAL POWER SYSTEM OPERATIONS (EE-M-201) 

Time: 3 hrs  
Max Marks: 75

No. of pages: 1

Note: Attempt any \textbf{FIVE} questions in all. Each question carries equal marks.

Q.1 a) Explain the concept of multi-objective economic dispatch using weighting method.  
b) Prove the power flow equations: 
\[ P_R = \frac{|V_r| |V_s| \sin \delta}{X}, \quad Q_R = \frac{|V_s| |V_r| \cos \delta}{X} - \frac{|V_r|^2}{X} \]

Q.2 a) State the characteristics of power generation units.  
b) Discuss the general mechanism of coordinating load frequency control and economic dispatch.

Q.3 a) Develop the mathematical model for AGC of two area system.  
b) Discuss the types of interchange in a power system.

Q.4 a) Develop the equation for economic dispatch using Newton Raphson technique for thermal system.  
b) The operating characteristics of three thermal units are given. Determine economic schedule for a load of 500 MW.
\[ F_1 = 0.08 P_1^2 + 30 P_1 + 100 \hspace{1em} Rs / MW \]
\[ F_2 = 0.10 P_2^2 + 32 P_2 + 125 \hspace{1em} Rs / MW \]
\[ F_3 = 0.12 P_3^2 + 35 P_3 + 150 \hspace{1em} Rs / MW \]
\[ 50 \leq P_1, P_2, P_3 \leq 250 \]

Q.5 a) Develop the co-ordination equation for economic dispatch for thermal system when losses are neglected.  
b) The fuel input for two thermal units are given as:
\[ F_1 = 0.008 P_1^2 + 10.83 P_1 + 240 \hspace{1em} Rs / hr \]
\[ F_2 = 0.009 P_2^2 + 10.33 P_2 + 200 \hspace{1em} Rs / hr \]
\[ 10 \leq P_1, P_2 \leq 100 \]
If \( P_L = OP_1^2 + OP_2^2 \) MW. Determine economic schedule for 150 MW.

7½x2

Q.6 a) Develop the Newton Raphson technique for short range fixed-hed hydrothermal scheduling.
   b) Develop the economic schedule for following hydrothermal system for a load of 600 MW:

\[
\begin{align*}
F_1 &= 0.01P_1^2 + 0.1P_1 + 100 \text{ Rs/hr} \quad 50 \leq P_1 \leq 200 \\
Q_2 &= 0.05P_2^2 + 20P_2 + 140 \text{ m}^3/\text{hr} \quad 10 \leq P_2 \leq 150
\end{align*}
\]

The availability of water is 20,000 m³/day.

7½x2

Q.7 a) Explain the concept of unit commitment using dynamic programming with example.
   b) Explain the concept of interchange evaluation with unit commitment with an example.

7½x2

Q.8 a) What are the merits and demerits of centralized economic dispatch?
   b) Explain the optimal power flow problem based on gradient method.

7½x2

End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D) - Second Semester
INTELLIGENT TECHNIQUES AND APPLICATIONS (EE-M-202)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 a) Distinguish between propositional logic and predicate logic.

7
   b) Write the following predicate logic:

   i) Only tomatoes are red.
   ii) Not all peas are green.
   iii) Some teachers are not good.
   iv) All rabbits are white.

2x4

Q.2 Explain various membership functions used to describe fuzzy systems.

15
Q.3  
a) What is learning? With examples explain supervised and unsupervised learning. 8
b) Explain recurrent networks. 7

Q.4  
Explain AI applications in load forecasting, transient stability and power system stabilizers. 15

Q.5  
Describe the algorithm for neurofuzzy system and explain the steps involved. 15

Q.6  
a) Explain radial basis functions. 7
b) How back propagation algorithm is used in ANN? 8

Q.7  
a) What do you understand by multi-valued logic? Give examples. 7
b) Draw and explain a feedback neural network. 8

Q.8  
Write short notes on any two:
  a) Supervised learning in ANN
  b) Soft computing
  c) Defuzzification 7½x2
End Semester Examination, Dec. 2014  
M. Tech. (P.S.E.D) - Second Semester  
POWER QUALITY AND FACTS DEVICES (EE-M-203)  

Time: 3 hrs  
Max Marks: 75  

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q. 1  
a) What are the reasons for requirement of power quality for a power system?  
b) What are the issues and causes along with the effects for power quality?  
7½x2  

Q. 2  
a) Explain how the harmonics causes interference with communication lines and radio frequency. Also explain what is total harmonic distortion.  
b) Explain design of a passive filter.  
7½x2  

Q. 3  
Explain the power quality measuring equipments in brief.  
15  

Q. 4  
a) Differentiate between Fourier series, Fourier transform and wavelet transform.  
b) Explain Fourier transform with an example for harmonics in voltage and current.  
7½x2  

Q. 5  
a) Explain principle and working of SSSC.  
b) Compare TCSC and SSSC.  
7½x2  

Q. 6  
a) Explain principle of operation and steady state model of state phase shifter.  
b) Explain operating characteristics of SPS.  
7½x2  

Q. 7  
Explain principle of operation, working and UPFC model for power flow studies.  
15  

Q. 8  
a) Differentiate between voltage sag and voltage swell.  
b) Write the full form and define following terms:  
   i) SAIDI  
5
ii) CAIDI  
iii) SAIFI  
iv) CAIFI  
v) MAIFI  

c) What are the advantages of using FACTS devices?
End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D) - Second Semester
SOLID-STATE CONTROLS OF ELECTRICAL DRIVES (EE-M-204)

Time: 3 hrs
Max Marks: 75

No. of pages: 1

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  a) Explain multiquadrant operation of drives with an example.
     b) What are various methods of braking in ac drives?  

    7½x2

Q.2  Discuss single phase fully controlled rectifier control of dc separately excited 
     motor for both continuous and discontinuous conduction mode. Find an 
     expression for speed and draw speed torque characteristics.  

    15

Q.3  A 230 V, 960 rpm and 200 A separately excited dc motor has an armature 
     resistance of 0.02 Ω. The motor is fed from a chopper which provides both 
     motoring and braking operation. The source has a voltage of 230 V. Assuming 
     continuous conduction. 
     Calculate:
     i) Duty ratio of chopper for motoring operation at rated torque and 350 rpm. 
     ii) Duty ratio of chopper for braking operation at rated torque and 350 rpm. 
     iii) If maximum duty ratio of chopper in limited to 0.95 and maximum 
     permissible motor current is twice the rated. Calculate maximum permissible 
     motor speed obtainable without field weakening and power fed to source. 
     iv) If motor field is controlled, calculate field current as fraction of rated value for 
     speed of 1200 rpm.  

    15

Q.4  What are the various methods of special control of induction motor drives? 
     Explain and do the analysis of any one.  

    15

Q.5  Explain in detail vector control of induction motor drive.  

    15

Q.6  a) Discuss closed loop speed control of VSI fed induction motor drive.  

    10
     b) Compare VSI and CSI.  

    5
Q.7  
a) Describe how a microprocessor is used for speed control of drives.
b) Discuss phase locked loop control system.

\[7\frac{1}{2} \times 2\]

Q.8  
Write short notes on:
a) Steady state stability  
b) State Kramer drive  
c) Cycloconverter fed induction motor drive  
d) Adaptive control

\[7\frac{1}{2} \times 2\]
Q.1  a) An analog electro cardiogram (ECG) signal contains useful frequencies up to 100 Hz.  
   i) What is the Nyquist rate for this signal?  
       2  
   ii) Suppose that we sample this signal at a rate of 250 samples/s. What is the highest frequency that can be represented uniquely at this sampling rate?  
       5  
   b) Given the sequence $x(n) = (6-n)[u(n)-u(n-6)]$, make a sketch of:  
      i) $y_1(n) = x(2n-3)$  
      ii) $y_2(n) = x(8-3n)$  
      iii) $y_3(n) = x(n^2-2n+1)$  
      iv) $y_4(n) = x(4-n)$  
      8  

Q.2  a) A linear discrete time system is characterized by its response $h_k(n)$to a delayed unit sample $\delta(n-k)$. For each linear system defined below, determine whether or not the system is shift-invariant.  
   i) $h_1(n) = (n-k)u(n-k)$  
   ii) $h_2(n) = \delta(2n-k)$  
   iii) $h_3(n) = \begin{cases} 
\delta(n-k-1) & \text{k even} \\
5u(n-k) & \text{k odd} 
\end{cases}$  
      6  
   b) Determine the output response $y(t)$ of the network shown in the given figure due to a unit step as input using a convolution integral.
Q.3  a) Find the $Z$-transform of each of the following sequences:
    i) $x(n) = 2^n u(n) + 3 \left( \frac{1}{2} \right)^n u(n)$
    ii) $x(n) = \cos(n\omega_0) u(n)$

b) Find the inverse $Z$-transform of:
    
    $$x(z) = \frac{1}{1 - \alpha z^{-1}} \quad |z| > |\alpha|$$

Q.4  a) Find the convolution of two signals $x(n) = u(n)$ and $h(n) = a^n u(n)$.

    ROC: $|a| < 1; n \geq 0$

b) If $h(n)$ is the unit sample response of an ideal low-pass filter with a cut-off frequency $\omega_c = \frac{\pi}{4}$; find the frequency response of the filter of that has a unit sample response $g(n) = h(2n)$.

Q.5  a) Discuss circular convolution and linear convolution. How are they related? Explain mathematically and illustrate.

b) A signal $x_a(t)$ that is band limited to $10 kHz$ is sampled with a sampling frequency of $20 kHz$. The DFT of $N = 1000$ samples of $x(n)$ is then computed, that is $x(k) = \sum_{n=0}^{N-1} x(n) e^{-j \frac{2\pi}{N} nk}$ with $N=1000$.

i) What analog frequency does the index $k = 150$ correspond? What about $k = 800$?

ii) What is the spacing between the spectral samples?
Q.6  
a) Design a first-order digital low pass filter with a 3-dB cut-off frequency of \( \omega_c = 0.25\pi \) by applying the bilinear transformation to the analog Butterworth filter.

\[
H_a(s) = \frac{1}{1 + s/\Omega_c}
\]

b) Use the windows design method to design a minimum order high-pass filter with a stop band cut-off frequency \( \omega_s = 0.22\pi \), a passband cut-off frequency \( \omega_p = 0.28\pi \), and a stopband ripple \( \delta_s = 0.003 \).

Q.7  
a) If the Nyquist rate for \( x_a(t) \) is \( \Omega_s \), what is the Nyquist rate for each of the following signals:

i) \( \frac{dx_a(t)}{dt} \)

ii) \( x_a(2t) \)

iii) \( x_a^3(t) \)

iv) \( x_a(t) \cos(\Omega_a t) \)

b) i) What architecture and process of execution be utilized by DSPs for fast data access and quick processing? Explain.

ii) Explain different phases of execution in TMS320C54X processors.

Q.8  
a) Discuss the faults occurring in power system which cause abnormal states and require protection circuits.

b) What is signal orthogonalization? Discuss the frequency response of orthogonalization due to single delay using proper graphs.
End Semester Examination, Dec. 2014
M. Tech. (P.S.E.D.) - Third Semester
HVDC AND EHVAC TRANSMISSION SYSTEM (EE-M-301)

Time: 3 hrs
Max Marks: 75

No. of pages: 1
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Explain how the corona considerations affect the design of a line. Why is this corona phenomena more serious while designing AC lines? 15

Q.2 What are the different sources of reactive power? How do these sources provide reactive power? Give their advantages and disadvantages. 15

Q.3 Explain the faults that occur on converters in an HVDC system and also explain the protection taken against over-voltage and over-current in converter. 15

Q.4 How is an AC passive filter designed? Explain in detail and also do its analysis. 15

Q.5 What are the different types of multi-terminal DC systems? Explain in brief. 15

Q.6 Explain the types of DC links in transmission system with the help of a diagram. 15

Q.7 What is the state of art in HVDC technology? 15

Q.8 a) Give the advantages and disadvantages of an HVDC transmission system. 8

b) Explain the surrounding effect of EHV-AC. 7
End Semester Examination, Dec. 2014  
M. Tech. (P.S.E.D.) - Third Semester  
LOAD AND ENERGY MANAGEMENT (EE-M-324)

Time: 3 hrs  
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1  
a) Explain the following terms:  
i) Group diversity factor.  
ii) Load factor.  
iii) Capacity factor.  
iiv) Utilization factor.  
v) Demand factor.  

b) Explain the significance of peak diversity factor.  

1x5  
c) Explain chronological load curve, load duration curve and energy load curve.  

5

Q.2  
a) Explain the details of energy growth scenario in India with some detail of the  
State of Haryana.  

5  
b) Explain future trends of energy management in India.  

5  
c) Explain the reasons for power crisis in India and steps taken by government  
of India and various other States for reducing the same.  

5

Q.3  
a) A steam station has two 110 MW units.  
The cost data is under:  

<table>
<thead>
<tr>
<th>Unit</th>
<th>VC₁</th>
<th>VC₂</th>
<th>FCR₁</th>
<th>FCR₂</th>
<th>CF₁</th>
<th>CF₂</th>
<th>Fuel consumption</th>
<th>Fuel consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rs. 18000</td>
<td>Rs. 30000</td>
<td>10 percent</td>
<td>10 percent</td>
<td>0.55</td>
<td>0.60</td>
<td>0.7 kg/kWh</td>
<td>0.65 kg/kWh</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>


Fuel cost = Rs. 1500 per 1000 kg.

OM₁ = 20 percent of annual fuel cost
OM₂ = 15 percent of annual fuel cost
Utilization factor = 1

Calculate:

i) Annual plant cost and generation cost of unit 1.

ii) Annual plant cost and generation cost of unit 2.

iii) Overall generation cost of station.

b) What do you mean by depreciation? Explain various methods to charge depreciation.

Q.4  

a) Explain the objectives of tariff. Discuss the different types of tariffs used for charging the consumers of electric energy.

b) Write a short note on spot pricing.

Q.5  

a) What is load forecasting? What factors affect load forecasting and explain its various techniques?

b) What is the aim of energy audit? Discuss energy flow diagram and various strategies of energy audit.

Q.6  

a) Explain the concept of demand side management (DSM) with various planning stages.

b) Explain load management as DSM strategy.

c) What are the applications of load control?

Q.7  

a) Discuss the various options available for captive power generation and what are the government polices for encouraging captive power generation?

b) Write a short note on energy wheeling.

Q.8  

a) Explain the role of Central Electricity Regulatory Commission (CERC) for implementation of deregulation in India. Also enumerate the salient features

b) Explain power system restructuring. Efforts made in foreign countries.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
CAREER SKILLS-III (HM-503 / HM-503A)

Time: 2 hrs
Max Marks: 60
No. of pages: 4

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions of PART-A are of 1½ marks each and all questions of PART-B are of 1 marks each. There is no negative marking.

PART-A

Q.1. If A’s salary is 20% lower than B’s salary, then how much present is B’s salary higher than A’s?
   a. 15%  
   b. 20%  
   c. 25%  
   d. 33 1/3%

Q.2. If there is a planet Oz in which there is 36 hrs in a day & 90 minutes in an hrs and 60 hand in 1 minute it is having same pattern as our watch. Then what will be angle between hour hand and minute hand at 9:40?
   a. 29  
   b. 12  
   c. 67  
   d. 98

Q.3. The ratio of boys and girls in a class of 72 is 7:5. How many more girls should be admitted to make the number of boys and girls equal?
   a. 9  
   b. 12  
   c. 220  
   d. 240

Q.4. A can do a piece of work in 4 hours; B and C together can do it in 3 hours, while A and C together can do it in 2 hours. How long will B alone take to do it?
   a. 8 hours  
   b. 10 hours  
   c. 12 hours  
   d. 24 hours

Q.5. A large tanker can be filled by two pipes A and B in 60 minutes and 40 minutes respectively. How many minutes will it take to fill the tanker from empty state if B is used for half the time and A and B fill it together for the other half?
   a. 15 min  
   b. 20 min  
   c. 27.5 min  
   d. 30 min

Q.6. Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?
   a. 10 min 20 sec  
   b. 11 min. 45 sec  
   c. 12 min 30 sec  
   d. 14 min 40 sec

Q.7. Find the remainder when 75^{80} is divided by 7
   a. 4  
   b. 3  
   c. 2  
   d. 6

Q.8. What number should be subtracted from x^3+4x^2−7x+12 if it is to be perfectly divisible by x + 3?
   a.41  
   b. 39  
   c. 13  
   d. None of these

Q.9. The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:
Q.10. How many four letter distinct initials can be formed using the alphabets of English language such that the last of the four words is always a consonant?
   a. $26 \times 21$  b. $26 \times 25 \times 24 \times 21$  c. $25 \times 24 \times 23 \times 21$  d. None of these

Q.11. A thief steals a car and drives it at 15 km/hr. The theft has been discovered after one hour and the owner of the car sets off in another car at 25 km/hr. When will the owner overtake the thief from the starting point?
   a. 1hr  b. 1.5hr  c. 2hr  d. 2.5hr

Q.12. A boatman rows to a place 45 km distant and back in 20 hour. He finds that he can row 12 km with the stream in the same time as 4km against the stream. Find the speed of the stream (in kmph).
   a. 2  b. 2.5  c. 3  d. 4

Q.13. If a selling price of Rs 24 results in a 20% discount of the list price, the selling price that would result in a 30% discount of the list price is?
   a. Rs 16  b. Rs 21  c. Rs 25  d. Rs31

Q.14. A trader marked the selling price of an article at 10% above the cost price. At the time of selling, he allows certain discount and suffers a loss of 1%. He allowed a discount of?
   a. 9%  b. 10%  c. 10.5%  d. 11%

Q.15. There are two vessels which are filled only with the pure components. Vessel I contains 20L brandy and vessel II contains 20L water. From vessel I, 5L brandy is taken and placed in vessel II. Then 4L mixture is transferred from vessel II to vessel I. Find the ratio of water in vessel I to brandy in vessel II?
   a. 7:8  b. 8:7  c. 1:1  d. None of these

Q.16. A, B, C, D........... X, Y, Z are the players who participated in a tournament. Everyone played with every other player exactly once. A win scores 2 points, a draw scores 1 point and a lose scores 0 points. None of the matches ended in a draw. No two players scored the same score. At the end of the tournament, the ranking list is published which is in accordance with the alphabetical order. Then:
   a. M wins over N  b. N wins over M  c. M doesn’t  d. None of these

Q.17. John buys a cycle for 31 dollars and given a cheque of amount 35 dollars. Shop Keeper exchanged the cheque with his neighbor and gave change to John. After 2 days, it is known that cheque is bounced. Shop keeper paid the amount to his neighbor. The cost price of cycle is 19 dollars. What is the profit/loss for shop keeper?
   a. 23 loss  b. 54 gain  c. 54 gain  d. 54 loss

Q.18. The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 4th hour?
   a.400  b.450  c.480  d.500
Q.19. In a circle, OA and OB are two radii of 3 cm making an angle of 60’ at centre. Then the length of the major arc is
a. \(2\pi \text{ cm}^2\)  b. \(5\pi \text{ cm}^2\)  c. \(4/3\pi \text{ cm}^2\)  d. \(\frac{3}{4}\pi \text{ cm}^2\)

Q.20. A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:
 a. 720  b. 900  c. 1200  d. 1800

Q.21. Procrastination is a term related to

Q.22. Twitter is

Q.23. Which of the following activities deserve most of your time?

Q.24. Which of the following activities need to be eliminated from your schedule?

Q.25. Adhoc meetings are

Q.26. Which of the following techniques is not a part of problem solving process?
a. 5 Why Technique  b. Root Cause Analysis  c. Fish bone diagram  d. Snorkeling

Q.27. What is the Last step in Problem solving process?
a. Generate Alternatives  b. Problem Definition  c. Selecting Alternatives  d. Implementing Solutions

Q.28. Cause and Effect Analysis helps you in

Q.29. Which of the following is a not a valid category for Cause and Effect Analysis?

Q.30. Which of the following techniques helps in Alternative Evaluation and Selection?
a. 5 Why Technique  b. Root Cause Analysis  c. Fish bone diagram  d. Pareto’s rule

Q.31. _________ fulfills the demand and creates relationships

Q.32. In Transactional selling what is a salesperson chasing
Q.33. If I am selling 500 GB of Hard drive instead of 250 GB, I am
a. Up selling  
  b. Cross Selling  
  c. Mis-selling  
  d. None of the Above

Q.34. If I sell a Center Table with a Sofa then I am
a. Up selling  
  b. Cross Selling  
  c. Mis-selling  
  d. None of the Above

Q.35. In SPIN Sales model, N stands for
a. Necessary Questions  
  b. Noble Questions  
  c. Need Payoff Questions  
  d. None

Q.36. Boomrang is a technique used in
a. Call Opening  
  b. Probing  
  c. Objection Handling  
  d. Closing

Q.37. “You are going to get the basic product in an easy-carry box with a remote control and batteries. You are getting free delivery, a five-day exchange assurance plus our comprehensive guarantee”. This is an example of
a. Trial Close  
  b. Inducement Close  
  c. Alternative Close  
  d. Summary Close

Q.38. If I reduce the price by 5%, will you go for the purchase immediately? This is an example of
a. Trial Close  
  b. Inducement Close  
  c. Alternative Close  
  d. Summary Close

Q.39. Offering more than one clearly defined alternative to the customer is what type of closing technique
a. Alternative Close  
  b. Inducement Close  
  c. Trial Close  
  d. Summary Close

Q.40. “Your business cannot afford any downtime so I will suggest you to go for our three years onsite warranty”. This is an example of
a. Alternative Close  
  b. Inducement Close  
  c. Trial Close  
  d. Suggestive Close

Q.41. Which of the following is a technique of customer service
a. Courtesy  
  b. Flexibility  
  c. Problem solving  
  d. All

Q.42. Customer Delight is
a. Meeting Promises  
  b. Exceeding Promises  
  c. Both  
  d. None

Q.43. First step in managing an irate customer is
a. Listening  
  b. Probing  
  c. Cushioning  
  d. Apologizing

Q.44. I am a participant in a GD. I, realizing that the group is losing focus on the topic, bring the group back on the topic. This makes me a
a. Moderator  
  b. Channelizer  
  c. Contributor  
  d. Initiator

Q.45. I am a participant in a GD. I ensure that I listen to other participants, encourage others to speak and ensure that there is one conversation all the time. This makes me a
a. Moderator  
  b. Channelizer  
  c. Contributor  
  d. Initiator
Q.46. Case studies are used in GD’s to test

Q.47. I want to make an effective CV. My CV must have
a. Project Details  b. Scholastics  c. Achievements and Awards  d. All of the Above

Q.48. You’re asked a really difficult question. You don’t know the answer off the top of your head, so you
a. “That’s a tough question. I’m really not sure.”  b. Say the first thing that comes to mind.
c. Take a deep breath and think of an answer while paraphrasing the question.  d. None of the Above

Q.49. How early should you arrive to the interview?
 a. 30 minutes  b. 10 minutes  c. 1 minute  d. None of the Above

Q.50. The purpose of an interview is
a. To match employees with the employer that best suits them, and vice versa.
b. for the job candidate to talk about his achievements.
c. for the employer to test the interviewee by asking tricky questions
d. All of the above
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
COMMUNICATION SKILLS (HM-101A)

Time: 1 hrs
Max Marks: 100
No. of pages: 3

Note: Attempt All questions:

Q. 1 Rewrite the following sentences after correcting them for grammatical errors:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) He go for a walk yesterday.</td>
<td>b) I play cricket since childhood.</td>
</tr>
<tr>
<td>c) He is a honest man.</td>
<td>d) I like to running.</td>
</tr>
<tr>
<td>e) I have an important work to do.</td>
<td>f) What an awful weather!</td>
</tr>
<tr>
<td>g) She is one of the best writers that has ever lived.</td>
<td>h) Much need to be done to eradicate poverty.</td>
</tr>
<tr>
<td>i) One of his good traits are modesty.</td>
<td>j) Neither Ramesh nor his brother are able to run fast.</td>
</tr>
<tr>
<td>k) All failed except he.</td>
<td>l) This is one of the best novels that was published this year.</td>
</tr>
<tr>
<td>m) He is one of the brightest boys that has passed through our school.</td>
<td>n) You and me are invited to tea this morning.</td>
</tr>
<tr>
<td>o) None of the two sisters can swim.</td>
<td>p) She likes to feed the poors.</td>
</tr>
<tr>
<td>q) My hairs are grey.</td>
<td>r) He did good.</td>
</tr>
<tr>
<td>s) He sings good.</td>
<td>t) Switzerland is known for its beautiful sceneries.</td>
</tr>
</tbody>
</table>

1x20

Q. 2 Make two different sentences of the following homonyms (Noun and Verbs):

<table>
<thead>
<tr>
<th></th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Wind</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verb</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>b) Bank</td>
<td>Noun</td>
</tr>
<tr>
<td></td>
<td>Verb</td>
</tr>
<tr>
<td>c) Desert</td>
<td>Noun</td>
</tr>
<tr>
<td></td>
<td>Verb</td>
</tr>
<tr>
<td>d) Ring</td>
<td>Noun</td>
</tr>
<tr>
<td></td>
<td>Verb</td>
</tr>
<tr>
<td>e) Lead</td>
<td>Noun</td>
</tr>
<tr>
<td></td>
<td>Verb</td>
</tr>
</tbody>
</table>

**Q.3** Write your views on the topic “Increase in crime against women” in the space given below (180-200 words):

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

**Q.4** Make sentences using the following phrases in such a way to bring out their meanings:

a) A drop in the ocean:

_________________________________________________________________
_________________________________________________________________
b) A diamond is forever:

c) A dog is man’s best friend:

d) No-brainer:

e) A safe pair of hands:

f) A sight for sore eyes:

g) Accidents will happen:
h) Barking up the wrong tree:

delicate

g) I'm taking ___________ (a nice / an ice) hot shower.

h) That's the (biggest hurdle / biggest turtle) __________ I've ever seen!

i) You'd be surprised to see a ____________ (mint spy / mince pie) in your bank.
Q.6 Give one word substitutes for the group of words given below:

a) One who feels sympathetic towards other human beings:
   _______________________________________________________

b) One who pretends to be what he is not:
   _______________________________________________________

c) A sound that cannot be heard:
   _______________________________________________________

d) A disease spread by contact:
   _______________________________________________________

e) A action of looking back on past time:
   _______________________________________________________

f) One who eats too much:
   _______________________________________________________

g) A shed for motor car:
   _______________________________________________________

h) Animals who live in water:
   _______________________________________________________

i) What happens once a year:
   _______________________________________________________

j) A sentence who’s meanings is unclear:
Q.7 Match the following words with their antonyms and write the answer in the given column:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Words</th>
<th>Antonyms</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frequent</td>
<td>Stingy</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Inferior</td>
<td>Seldom</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Generous</td>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Giant</td>
<td>Hope</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Junior</td>
<td>Dwarf</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Intentional</td>
<td>Wide</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Demand</td>
<td>Senior</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Despair</td>
<td>Superior</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Melt</td>
<td>Accidental</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Narrow</td>
<td>Freeze</td>
<td></td>
</tr>
</tbody>
</table>

1x10

End Semester Examination, Dec. 2014
B. Tech. – Second Semester
COMMUNICATION SKILLS (HM-101B)

Time: 1 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Spot the error in the following sentences and rewrite them after correcting the error.
   a) John has been working on the pilot project since two years.
   b) When he entered the classroom the lecture already was beginning?
   c) Rama has returned back her book in the library.
d) If Peter works hard he would get distinction in the exam.

e) They turn up with the flying colours if they practiced well.

f) If he told them about the route they would not have missed their way.

g) She would not have sent the mail if you did not instruct her.

h) If I had painted the picture well it would cost a great deal.

i) If the manager had received your project on time he would not fire you.

j) The boy, together with his teachers and friends, are going to the ground.

2x10

PART-A

Q.2  a) Make sentences using the following foreign words to bring out their meaning:

i) Agile

ii) Embarrassment

iii) Lunar

iv) Nocturnal

v) Kindergarten

vi) Anthology

vii) Plethora

viii) Saga

ix) Bon voyage

x) A la mode

1x10

b) Fill in the correct form of one of the phrasal verbs from the following:

(fall for, figure out, give in, go along with, look for, pay for, pull through, put on, run into, show up, take off, talk down to)

i) I looked for my keys everywhere but I couldn't _________ where I put them.

ii) I _________ you at the party but I couldn't see you.

iii) Although he tried to eat less he _________ some weight during the holidays.

iv) I _____________ Karen and her new boyfriend when I went shopping.

v) Over a hundred people _____________ for the news conference.

vi) Our plane ____________ an hour late because of the fog.

vii) My son drove me crazy about buying a new bike, so finally I _________.

viii) Erich is very sick at the moment but I am sure he’ll _____________.

ix) She couldn’t _____________ him like that. You’re not his boss.

x) I understand your opinion but I have to _____________ Linda on this question.

1x10
Q.3 "Joint Family: it is better than nuclear one". Write a debate in favour or against the topic. (150-200 words)  

Q.4 Write a paragraph on the topic "Unemployment". (150-200 words)  

PART-B  

Q.5 Express your views on any one of the topic: (150-200 words)  
   a) Women safety in India.  
   b) Poverty in India.  

Q.6 Write a letter to the director of your institute apologizing for using mobile phone in academic zone.  

Q.7 Develop a discussion between two friends discussing the coming of an unwanted guest.  

End Semester Examination, Dec. 2014
B. Tech. – First Semester
PROFESSIONAL COMMUNICATION-I (HM-104)

Time: 2 hrs
Max Marks: 50

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Spot the error in the following sentences and rewrite them after correcting those errors. (Any Ten of the following):

a) Have you packed your luggages?
b) Switzerland is known for its beautiful sceneries.
c) He gave me an advice.
d) Have you got any bread?
e) I have an important work to do.
f) What an awful weather!
g) She is one of the best writers that has ever lived.
h) You are not the first man that have ever been deceived by appearances.
i) One of his good traits are modesty.
j) Treasure island is one of the best pirate stories that was ever written.
k) All failed except he.
l) This is one of the best novels that was published this year.

1x10

PART-A

Q.2 a) Bring out the difference of the meanings of the following words given in the pairs by using them in sentences (Any Five):

i) Adopt-Adapt
   Except-Accept

ii) i)

iii) Hair-Here
   iv) There-Thei

vi) Past-Passed

b) Rewrite the following sentences replacing the underlined words with their appropriate synonyms (Any Five):

i) Drunk driving is risky.

ii) Sumit was glad to meet his friends after a long time.

iii) The flower blossom in the morning to fade away in the evening.

iv) The chief suspect was grilled for a day by the investigation team.

v) People deposit their savings in bank to keep their money safe.
vi) There was **suffocation** in the environment after the emission of toxic gases for the pant

1x5

Q.3 Write a paragraph of approximately 100 words on the topic “Saving our environment”.

10

Q.4 “Corruption in Public Place”. Write a debate in favour or against this statement (100 words).

10

PART-B

Q.5 Read the following passage carefully:
The worst days of any summer are the rainy ones. We spend all year looking forward to nice weather and long, hot days. All of winter, with its dreary gray days and bitter cold, we dream of those endless days at the beach, laying on the sand and soaking in the bright and burning sun. And then, summer comes, and it rains. As a child, I would wake up to rainy summer days and come close to crying. It wasn't fair. We suffered through months of school and miserable weather for those scant ten weeks of freedom and balmy weather. Any day that I could not spend at the beach or playing ball with my friends seemed like a punishment for something I didn't even do. On those rainy summer days, I had nothing fun to do and could only sit inside, staring out at the rain like a Dickensian orphan. I was an only child, so there was no one else to play with. My father worked from home, so I was not truly alone, but he could not actively play with me since he was technically at work. It was those days that I would resign myself to whatever was on television or any books that I could find lying around. I'd crawl through the day and pray each night that the rain would not be there the next day. As an adult, though, my opinion of summer rain has changed. When you have to work every day, summer is not as eagerly anticipated. Mostly, the days run together, bleeding into each other so that they no longer seem like separate entities and instead feel like continuations of the same long day. Everything seems monotonous and dull, and an ennui or listlessness kicks in. Such a mindset makes you cheer for anything new or different. I spend the winter dreaming of summer and the summer dreaming of winter. When summer comes, I complain about how hot it is. And then I look forward to the rain, because the rain brings with it a cold front, which offers a reprieve-admittedly one that is all too short-from the torture of 100° and humid days. Rainy days are still the worst days of the summer, but summer rain today means positively beautiful-and considerably cooler-weather tomorrow.

947/4
Now answer the following question based on the above passage:
a) According to the passage, why summer is different for adults?
   2
b) According to the passage, explain briefly narrators view about summer rain?
   2
c) As used in the final paragraph, what does the word ‘reprieve’ means?
   2
d) The author of this passage describes his or her feelings about rainy summer days. In general, how do you feel about such days? Do you agree with the author’s opinions, or do you not mind this type of weather? Briefly explain your views below.
   4

Q.6 Write a letter to the director of your institution requesting him to allow you to join the institute 7 days after the commencement of normal academic session.
   10

Q.7 Write a conversation between two friends expressing their concern over incidences of match fixing in sports (15 dialogues each).
   10
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
PERSONALITY AND SOFT SKILLS DEVELOPMENT (HM-201A)

Time: 1 hrs
Max Marks: 100
No. of pages: 3

Note: Attempt All questions:

Q.1 Scrambled sentences. Rearrange these words to make meaningful sentences:

a) Ship / violently / the storm / rocked the.
   b) Masterpiece / artist / painstakingly / the / his / worked at.
   c) Gift / free/ a / Dad/ offered / firm/ by/ the/ was.
   d) I read / in the paper / burglar / been / caught/ had/ the/ that.
   e) Parts/ many/ coffee/ popular/ in world/ the/ is/ very/ of.

   2x5

   Answers:
   a) ____________________________

   b) ____________________________

   c) ____________________________

   d) ____________________________

   e) ____________________________

Q.2 Choose the most appropriate option from the options below:

a) You don’t speak Russian ________________ ?
   i) Do you                      ii) Don’t you                        iii) Can you                      iv) Can’t you
b) We don’t have time for a quick drink ______________.
   i) Have we ii) Don’t we iii) Do we iv) Haven’t we

c) It doesn’t rain much in summer ______________?

d) We should obey traffic signals, it’s __________ duty.
   i) My ii) Mine iii) Our iv) Your

e) Did you like the meal ______________?
   i) No I didn’t ii) No, I don’t iii) No I haven’t iv) No I hadn’t

Q.3 Fill in the blanks with correct form of verbs given in the brackets:

a) The major said that it ____________ him great pleasure to be there that evening.
   i) Gives ii) Gave iii) Was giving

b) He said that he ___________ go as soon as it was possible.
   i) Will ii) Would iii) Can

Q.4 Write three rhyming words for the following words:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Word</th>
<th>Rhyming Word 1</th>
<th>Rhyming Word 2</th>
<th>Rhyming Word 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shoe</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q.5  Circle the odd one:
   a)  Baby, mary, very, bad.
   b)  Fame, blame, game, dome.
   c)  Bed, led, shed, read.
   d)  Donkey, funky, bloody, monkey.
   e)  Deaf, chef, check.
   f)  Meet, tweet, bleak, bloat.
   g)  Short, taught, bought, caught.
   h)  Win, sin, pin, put.
   i)  Dear, hear, wear, mature.
   j)  Lay, may, bay, bare.

Q.6  Mark the functions below as permission, request, offering, departing, agreeing, greetings:
   a)  Could you wait a moment, please?

       ____________________________

   b)  May I come in? Yes, please do.

       ____________________________

   c)  Can I get you a cup of coffee?

       ____________________________

   d)  See you soon.

       ____________________________

   e)  May I smoke here?
f) I agree with what you say.

g) How are you this morning?

h) Please close the door.

i) I have the same opinion about it.

j) Good bye.

\textbf{1x10}

Q.7 Write appropriate dialogue for the given situations:
\textbf{a)} How will you introduce yourself while you’re calling a delegate from another university for a conference taking place in our university?
b) Apologize to your teacher for being late in the class.

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

c) A friend of yours is asking you out for coffee. How would you make a polite refusal?

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

d) You’re taking a telephonic call on behalf of your colleague in the office, how would you take a message for him?

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

e) Greet a friend whom you’re meeting nearly after a decade.
Q.8 What is goal setting? Explain with examples. (75-100 words)  

Q.9 What are the different forms of non verbal communication?  

Q.10 Who is team player? List stages of team formation.  

End Semester Examination, Dec. 2014
B. Tech. – Second Semester
ENVIRONMENTAL STUDIES (HM-202)

Time: 1 hrs
Max Marks: 50

No. of pages: 5

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 Which of the following is the most likely consequence of the continuing release of CFCs in the environment?
   a) Global warming will decrease.
   b) The sunlight intensity at the Earth’s surface will decrease.
   c) Ultraviolet radiations reaching the Earth’s surface will increase.
   d) The upper atmosphere will disappear. 

   1

Q.2 Animal dung is a _____________ waste.
   a) Biodegradable
   b) Non-biodegradable
   c) Hazardous
   d) Toxic

   1

Q.3 In a lake polluted with pesticides, which one of the following will contain the maximum amount of pesticides?
   a) Small fish
   b) Microscopic animals
   c) Big fish
   d) Water birds

   1

Q.4 Which of the following is not a method for water conservation?
   a) Rainwater harvesting
   b) Groundwater extraction
   c) Improving irrigation efficiency
   d) Avoiding water wastage

   1

Q.5 Algal bloom results in:
   a) Global warming
   b) Salination
   c) Eutrophication
   d) Biomagnification

   1
Q.6 The main atmospheric layer near the surface of earth is:
   a) Troposphere
   b) Mesosphere
   c) Ionosphere
   d) Stratosphere

Q.7 Ecology deals with the study of:
   a) Living beings.
   b) Living and non living components.
   c) Reciprocal relationship between living and non living components.
   d) Environment.

Q.8 Man made sources of radiation pollution are:
   a) Mining.
   b) Explosion of nuclear weapons.
   c) Nuclear fuels and preparation of radioactive isotopes.
   d) All of these.

Q.9 Trophic levels are formed by:
   a) Only plants
   b) Only animals
   c) Only carnivorous
   d) Organisms linked in food chain

Q.10 When fluoride concentration in $H_2O$ exceeds about 1.5 mg/1, the disease that may be caused, is:
   a) Dental caries in children
   b) Fluorosis
   c) Polymyelitis
   d) Methemoglobinemia

Q.11 Energy flow in ecosystem is:
   a) Unidirectional
   b) Bidirectional
   c) Multidirectional
   d) None of the above

Q.12 Which of the following on inhalation dissolved in the blood hemoglobin more rapidly than oxygen?
   a) Sulphur dioxide
   b) Carbon monoxide
c) Ozone  
d) Nitrous oxide

Q.13 Photovoltaic energy is the conversion of sunlight into:
   a) Chemical energy
   b) Biogas
   c) Electricity
   d) Geothermal energy  

Q.14 Which of the following is a secondary air pollutant?
   a) Ozone
   b) Carbon dioxide
   c) Carbon monoxide
   d) Sulphur dioxide

Q.15 The point where movement occurred which triggered the earthquake is the _____.
   a) Dip
   b) Epicenter
   c) Focus
   d) Strike

Q.16 Air pollution from automobiles can be controlled by fitting:
   a) Cyclone separator
   b) Electrostatic precipitator
   c) Catalytic converter
   d) Wet scrubber

Q.17 Taj Mahal at Agra may be damaged by:
   a) Sulphur dioxide
   b) Chlorine
   c) Hydrogen
   d) Oxygen

Q.18 The term ‘threatened species’ refers to:
   a) Endangered
   b) Vulnerable
   c) Rare
   d) All of the above

Q.19 The study of population is called.
   a) Demography
   b) Population explosion
Q.20 Which of the following is not an ex-situ technique?
   a) Zoo
   b) Gene bank
   c) National park
   d) Seed bank
   
Q.21 Global warming can be controlled by:
   a) Reducing deforestation, cutting down use of fossil fuel.
   b) Reducing reforestation, increasing the use of fossil fuel.
   c) Increasing deforestation, slowing down the growth of human population.
   d) Increasing deforestation, reducing efficiency of energy usage.
   
Q.22 Which one of the following areas in India is a hotspot of biodiversity?
   a) Sunder bans
   b) Western Ghats
   c) Eastern Ghats
   d) Gangetic plains
   
Q.23 A legal limit imposed on countries or companies regarding the amount of greenhouse gas emissions.
   a) Emission cap
   b) International treaty
   c) Kyoto protocol
   d) Vienna convention
   
Q.24 An underground source of water is called.
   a) Stream
   b) Lake
   c) Canal
   d) Aquifer
   
Q.25 Inexhaustible resource among the following is:
   a) Minerals
   b) Solar energy
   c) Plants
   d) Fossil fuels
   
Q.26 The number of live births per thousand persons in a year is:
Q.27 How many bio-geographical regions are present in India?
   a) 7
   b) 8
   c) 9
   d) 10

Q.28 The Air (prevention and control of pollution) act was passed in:
   a) 1980
   b) 1981
   c) 1972
   d) 1974

Q.29 The first order consumers are called.
   a) Autotrophs
   b) Producers
   c) Chemotrophs
   d) Herbivores

Q.30 The census provides us the information regarding.
   a) Population
   b) Resources
   c) Income
   d) Crops

Q.31 Anthropogenic extinction occurs due to:
   a) Earthquakes
   b) Floods
   c) Changing environmental conditions
   d) Human activities

Q.32 Chipko movement is related to:
   a) Forest conservation
   b) Soil conservation
   c) Water conservation
   d) Wetland conservation

Q.33 Population of species decreasing over a period called as:
Q.34 The management of resources on earth which maintains the balances between human requirements and other species is:
   a) Conservation
   b) Conversation
   c) Diversity of ecosystem
   d) Geological diversity 1

Q.35 Biodiversity:
   a) Increase towards the equator
   b) Decrease towards the equator
   c) Remains same throughout the planet
   d) Has no effect on change in latitude 1

Q.36 The method by which the municipal waste is disposed of by burning in large furnaces is called.
   a) Incineration
   b) Landfills
   c) Composting
   d) Vermicomposting 1

Q.37 IUCN is also called as:
   a) Man and Biosphere Program
   b) World Conservation Union
   c) World Conservation Consortium
   d) World Wide Conservation Union 1

Q.38 The age of pyramid with broad base indicates.
   a) High percentage of old individuals.
   b) Low percentage of old individuals.
   c) High percentage of young individuals.
   d) Low percentage of young individuals. 1

Q.39 What are the three main ecological categories of organisms found in aquatic ecosystems?
   a) Plankton, benthos, littoral
   b) Benthos, plankton, nekton
Q.40 Both manure and power are provided by:
   a) Thermal plants
   b) Biogas plants
   c) Hydroelectric plants
   d) Nuclear plants

Q.41 A large proportion of children in a population is a result of:
   a) High birth rate
   b) High death rate
   c) High life expectancies
   d) More married couples

Q.42 In the best of all possible worlds, the best strategy for managing Municipal Solid Waste is to:
   a) Burn it
   b) Reduce it at the source
   c) Recycle it
   d) Landfill it

Q.43 Which is the most populous country of the world?
   a) India
   b) United States
   c) China
   d) Russia

Q.44 Each environment supports a limited population depending upon its:
   a) Biotic potential
   b) Carrying capacity
   c) Natality
   d) Reproductive potential

Q.45 Social, economical and ecological equity is the necessary condition for achieving.
   a) Social development
   b) Economic development
   c) Sustainable development
   d) Ecological development

Q.46 Large amount of solar energy is stored in the oceans and the seas. The process of harnessing this energy is called.
   a) OTEC (Ocean Thermal Energy Conversion)
   b) OTC (Ocean Thermal Conversion)
c) OCTEC (Ocean and Sea Thermal Energy Conversion)
d) STEC (Sea Thermal Energy Conversion)

Q.47 A (n) _______________ is a diagram that shows the relative amounts of energy or matter contained within each trophic level in a food chain or food web.
a) Ecological pyramid
b) Biosphere
c) Biome
d) Green revolution

Q.48 Extraction of mineral and metal form the earth is:
a) Agriculture
b) Transportation
c) Mining
d) Sustainable development

Q.49 Red Data Book provides the data on:
a) Population
b) Photosynthesis
c) Endangered species
d) Red Sea

Q.50 Which of the following gases was responsible for Bhopal Gas Tragedy?
a) Methyl isocyanate
b) Carbon dioxide
c) Carbon monoxide
d) Sulphur dioxide
Q.1 Being a student you have a preference value for:
   a) Studying hard. 
   b) Earning money.
   c) Family tour.
   d) Social relationship. 1

Q.2 Universal values mean:
   a) Same for everyone.
   b) Accepted by everybody.
   c) Both of the above.
   d) Neither of the above. 1

Q.3 Which of the following is not a value under positive personal values?
   a) Affection.
   b) Honesty.
   c) Anger.
   d) Loyalty. 1

Q.4 Which of the following is not a characteristic of core values?
   a) Integrity.
   b) Innovation.
   c) Greed.
   d) Shared prosperity. 1

Q.5 Human Values are:
   a) Ethics+ morals+ values.
   b) History+
   c) Innovation+ Help+ Sincerity.
   d) Nature+ Science+ Knowledge. 1

Q.6 Morals are:
a) Standards of right and wrong.
b) Principles to guide our behavior.
c) Norms or principles of right and wrong.
d) All of the above.  

Q.7 Values are: 
a) Cooperative behaviour. 
b) To be Strong or Vigorous. 
c) Codes for Moral behaviour. 
d) All of the above.  

Q.8 Who was the first person to use the plural form of ‘value’ as values to denote moral beliefs and attitudes?
a) Rousseau. 
b) Friedrich Nietzsche. 
c) Karl Marks. 
d) Sigmund Freud.  

Q.9 The term value is derived from: 
a) Latin word valerie. 
b) French word valeur. 
c) English word evaluate. 
d) None of the above.  

Q.10 Ethics refers to: 
a) Philosophical science. 
b) The consideration of good and right for the society. 
c) Knowledge of basic principles of behavior. 
d) All of the above.  

Q.11 What among the following cannot be taken as a universal value?
a) Truth. 
b) Pride. 
c) Charity. 
d) Beauty.  

Q.12 Values are conditioned by: 
a) Socio - cultural trends. 
b) Physical environment. 
c) Personal conscience. 
d) All of the above.  

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Q.13 Principles of values help an individual:
   a) To prefer one type of values over others.
   b) To value those who follow the values.
   c) To distinguish between moral and immoral.
   d) None of the above.

Q.14 Principles of values do not refer:
   a) To prefer intrinsic values to those extrinsic ones.
   b) To prefer permanent and productive values over less permanent and less
      productive ones.
   c) To prefer economic values over social ones.
   d) To select values on the basis of self-chosen ideals or ends.

Q.15 The term ethics is derived from:
   a) French word ethos.
   b) Greek word ethos.
   c) English word ethnic.
   d) French word ethnic.

Q.16 Modernization historically refers to the period when:
   a) The Industrial Revolution promised an exciting change in industry.
   b) The French revolution revolutionized society by propagating the principles of
      'liberty, equity and fraternity'.
   c) Charles Darwin with his publication of *Origin of Species* established that all
      species of life have descended over time from common ancestry.
   d) Sigmund Freud developed Psychoanalysis, the study of human psychological
      functioning and behavior.

Q.17 Which among the following is not a characteristic of modernization?
   a) New in appearance and behavior.
   b) Focused on development.
   c) Effectiveness and efficiency.
   d) Strife and turbulence.

Q.18 What is not one of the benefits of modernization?
   a) Convenient and comfortable lifestyle.
   b) Improved health, sanitary and safety conditions.
   c) Schism and alienation.
   d) Enhanced credibility of institutions.
Q.19 Individualism is:
   a) An ideology.  
   b) Political and moral philosophy. 
   c) Social outlook.  
   d) All of the above. 

Q.20 The word *ethos* means:
   a) Morality.  
   b) Sensibility.  
   c) Character.  
   d) Integrity. 

Q.21 Which of the following statements about values is not correct?
   a) All values are equal in merit.  
   b) Values are the powerful force affecting human thoughts, feelings and actions.  
   c) Values contain a judgmental element i.e. a person’s sense of right and wrong.  
   d) Values are relative in their worth. 

Q.22 The negative emotions like anger, ill-will, lust, jealousy and so on, may most appropriately be termed as:
   a) A-values.  
   b) Non-values.  
   c) Anti-values.  
   d) Negative-values. 

Q.23 Scientism does not refer to:
   a) Inadequacy of science while dealing with the realm of supernatural.  
   b) Authority of natural science over all other interpretations of life.  
   c) The capacity of science in solving all human problems and all aspects of human endeavor.  
   d) The use of the style, assumptions and techniques, specifically displayed by scientists. 

Q.24 Who among the followings are not concerned with defining or interpreting the term Scientism?
   a) Jurgen Habermas.  
   b) Gregory R. Peterson.  
   c) Karl Jung.  
   d) Mikael Stenmark. 

1
Q.25 When applied appropriately individualism does not imply?
   a) An individual’s independence.
   b) An individual’s self reliance.
   c) An individual’s persistent clash with society.
   d) Opposition to undue societal interference by the individual.

Q.26 Individualism refers to the:
   a) Moral worth of an individual.
   b) Quality of being an individual.
   c) A tendency towards self creation and experimentation.
   d) All of the above.

Q.27 What among the following is not correct?
   a) Individuality is the state or quality of being an individual.
   b) Individual will is always against social norms.
   c) Individuality of a person separates him/her from other persons.
   d) Individuality of a person means possessing his / her own needs, goals and desires.

Q.28 Competition is a phenomenon that occurs between different:
   a) Living organism.
   b) Non-living objects.
   c) Neither of the above.
   d) Both of the above.

Q.29 What among the following is not correct about competition?
   a) Competition is a natural phenomenon.
   b) Competition occurs between two or more parties.
   c) Competition always arouses ill-will between the rival parties.
   d) Competition may give incentives for self improvement.

Q.30 Competition may be classified as:
   a) Destructive and co-operative competition.
   b) Comparative and commanding competition.
   c) Ordinary and specific competition.
   d) Moral and immoral competition.
Q.31 Evolutionary biologists take competition as:
   a) The driving force of adaptation and ultimately of evolution of species.
   b) A mechanism for determining the best suited group - politically, economically and ecologically.
   c) Both of the above.
   d) Neither of the above.  

Q.32 What among the following is not correct about cyber ethics?
   a) Cyber ethics is a part of cyber laws.
   b) Cyber ethics applies to online environment.
   c) Cyber ethics cannot be enforced by police.
   d) It includes concept of net etiquettes. 

Q.33 Which of the following organizations is not related to cyber ethics?
   a) International Federation for Information Processing (IFIP).
   b) The Centre for Computing and Social Responsibility (CCSR).
   c) International Engineering Task Force (IETF).
   d) International Center for Information Ethics (ICIE).

Q.34 What is not a benefit of modernization?
   a) Drive Innovation.
   b) Improved relationship.
   c) Liberty of roaming around.
   d) Liberty to harm others. 

Q.35 Challenges to modernization are:
   a) Knowledge about it.
   b) Social meetings.
   c) Planning and implementing change.
   d) None of the above. 

Q.36 Stress is:
   a) Physical strain.
   b) Emotional strain.
   c) External strain.
   d) Emotional and physical strain. 

Q.37 In the modern corporate context TQM stands for:
   a) Team quotient.
   b) Team quality management.
   c) Total quality management.
   d) Total quotient management. 

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Q.38 The *Darshanas* are based on:
   a) The Vedas. 
   b) The Upanishads. 
   c) Both of the above. 
   d) None of the above. 1

Q.39 An engineer is a vital link between:
   a) Machine and Man. 
   b) Man and Manners. 
   c) Science and Society. 
   d) Man and Society. 1

Q.40 A good life may be described as:
   a) A life of dignity and honour. 
   b) A life of health and well being. 
   c) A life of utilization of all opportunities. 
   d) All of the above. 1

Q.41 What is not a feature of *Gurukul System*?
   a) Pursuit of knowledge and wisdom at the feet of the guru. 
   b) Duties of Shishya. 
   c) Government control. 
   d) Practice of *Brahmacharya*. 1

Q.42 What among the following is not a negative consequence of competition?
   a) Drain of valuable resources and energy. 
   b) Harm and injury to the organism involved. 
   c) Compromise of ethical standards in order to gain an advantage. 
   d) Natural selection and evolution of species. 1

Q.43 Man started working in teams:
   a) From the primitive days of hunting and gathering food. 
   b) From the time of Industrial revolution. 
   c) From the beginning of the 20th century. 
   d) With the commencement of the Corporate Age. 1

Q.44 A "whistle blower" is a person who:
   a) Blows a whistle to organize a crowd.
b) Blows a whistle to please himself.

c) Tells the public or someone in authority about alleged illegal activities occurring in an organization.

d) Is a professional who blows whistles in an orchestra.

Q.45 Which among the following statements is incorrect?
   a) In direct competition products which perform the same function compete against each other.
   b) In direct competition products compete with their close substitutes.
   c) In indirect competition products compete with their close substitutes.
   d) Direct competition may be taken as the narrowest form of competition.

Q.46 What among the following is not a quality possessed by a professional?
   a) Proficient in use of knowledge and expertise.
   b) Value orientation to services for the welfare of society.
   c) Adaptability to situation.
   d) An autocratic approach.

Q.47 What is not a professional style?
   a) Ethical style.
      Responsible style.
   b) Legal style.
      Committed style.

Q.48 A professional:
   a) Contests elections.
   b) Participates in social festivities.
   c) Distinguishes right from wrong.
   d) Participates in unified professional developments.

Q.49 *Darshanas* are believed to be written by:
   a) Ved Vyás.
      Valmíki.
   b) Kalídás.
      d) None of the above.

Q.50 What is not a component of emotional intelligence?
   a) Self awareness and self management.
   b) Financial management.
   c) Social awareness.
d) Relationship management.
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
PROFESSIONAL COMMUNICATION-II (HM-204)

Time: 3 hrs
Max Marks: 50

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any five:
   a) What do you mean by LSRW in the context of language learning?
   b) Point out the major differences between verbal and non-verbal communication.
   c) Write down the different stages of communication process.
   d) What is decoding in the communication process?
   e) What is feedback? Why is it important in communication?
   f) What are netiquettes? What is its importance?

2x5

PART-A

Q.2 a) Fill in the blanks with appropriate options of phrasal verbs.
   i) Learn to _________ (bear with / bear out) the slow strides of your grandparents.
   ii) There was excessive rain, so the umpire had to _________ (call off/ call at) the match.
   iii) A boy on his bicycle was _________ (knocked out/ knocked down) by the truck.
   iv) The CBI has been asked to _________ (look forward to / look) into the match fixing in India.
   v) It is advisable not to _________ (put off/ put on) a decision for the next day.

1x5

b) Make sentences with the given foreign expressions to bring out their meaning. Attempt any five:
   i) Ad hoc
   ii) Agenda
   iii) Alma mater
   iv) Bon jour
   v) Debut
vi) De facto

Q.3 What are barriers of communication? Explain the types of barriers in detail.
10

Q.4 What do you understand by the term: cross cultural sensitivity? Explain in detail with examples.
10

PART-B

Q.5 Express your views on the topic “internet revolution has changed our life”.
10

Q.6 Prepare a formal report on the Hostel Mess of your college. Assume that you have been assigned this job by the Executive Director, Administration in the position of team leader of the Expert Committee appointed for the task.
10

Q.7 Write a letter to the HP Computers Pvt. Ltd., ordering 50 computers for your new office. Assume the other details.
10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
CAREER SKILLS-I (HM-302)

Time: 2 hrs
Max Marks: 50
No. of pages: 4

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Tick (√) the correct answer. Attempt all questions. All questions are of ONE marks each. There is no negative marking.

Q.1. A person starting with 64 rupees and making 6 bets, wins three times and loses three times, the wins and loses occurring in random order. The chance for a win is equal to the chance for a loss. If each wager is for half the money remaining at the time of the bet, then the final result is:
   a. a gain of Rs 27
   b. a loss of Rs 37
   c. neither gain nor a loss
   d. a gain or a loss depending upon the order in which the wins and losses occur

Q.2. Nine persons went to a hotel for taking their meals. Eight of them spent Rs.12 each on their meals and the ninth spent Rs.8 more than the average expenditure of all the nine. What was the total money spent by them.
   a. Rs.115
   b. Rs. 116
   c. Rs. 117
   d. Rs. 118

Q.3. Ten different letters of alphabet are given, words with 5 letters are formed from these given letters. Then, the number of words which have at least one letter repeated is:
   a. 69760
   b. 30240
   c. 99748
   d. 42386

Q.4. There are 12 yes or no questions. How many ways can these be answered?
   a. 4096
   b. 2048
   c. 1024
   d. 144

Q.5. A special lottery is to be held to select a student who will live in the only deluxe room in a hostel. There are 100 Year-III, 150 Year-II and 200 Year-I students who applied. Each Year-III's name is placed in the lottery 3 times; each Year-II's name, 2 times and Year-I's name, 1 time. What is the probability that a Year-III's name will be chosen?
   a. 1/8
   b. 2/9
   c. 2/7
   d. 3/8

Q.6. Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:
   a. 2:5
   b. 3:5
   c. 4:5
   d. 5:4

Q.7. Without stoppages the average speed of a train is 75 kmphr and with stoppages its average speed is 60 kmphr. How many minutes does the train stopped in an hour?
   a. 10
   b. 12
   c. 14
   d. 18

Q.8. A train starts from Delhi at 6:00 am and reaches Ambala cantt. at 10am. The other train starts from Ambala cantt. at 8am and reached Delhi at 11:30 am. If the distance between Delhi and Ambala cantt is 200 km, then at what time did the two trains meet each other?
   a. 8:46am
   b. 8:40am
   c. 8:56am
   d. 8:50am

Q.9. A and B together can do a piece of work in 12 days, which B and C together
can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days C alone will do the work?

a. 16 b. 24 c. 36 d. 48

Q.10. 12 buckets of water fill a tank when the capacity of each tank is 13.5 ltrs. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 ltrs?

a. 8 b. 15 c. 16 d. 18

Q.11. An accurate clock shows 8 o'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?

a. 144º b. 150º c. 168º d. 180º

Q.12. One morning after sunrise, Sumesh and Ratheesh were standing on a lawn with their backs towards each other. Sumesh’s shadow fell exactly towards his left hand side. Which direction was Ratheesh facing?


Q.13. Ten years ago, the ages of the members of a joint family of eight people added up to 231 years. Three years later, one member died at the age of 60 years and a child was born during the same year. After another three years, one more member died, again at 60, and a child was born during the same year. The current average age of this eight member joint family is nearest to:

a. 23 yrs b. 22 yrs c. 21 yrs d. 24 yrs

Q.14. Last year, there were three sections in the catalyst, a placement company recruitment paper. Out of them 33 students cleared the cut-off in section 1, 34 students cleared the cut off in section 2 and 32 students cleared the cut off in section 3. 10 in students cleared the cut off in section 1 and 2, 9 students cleared the cut off in section 2 and 3, 8 students cleared the cut off in section 1 and 3. The number of students who cleared each section alone was equal and was 21 for each section. How many cleared all the three sections?

a. 3 b. 6 c. 5 d. 7

Q.15. A turtle is crossing a field. What is the total distance (in meters) passes by the turtle? Statement X: The average speed of the turtle is 2 meters per minute. Statement Y: Had the turtle walked 1 meter per minute faster than his average speed it would have finished 40 minutes earlier.

a. Statement X alone is enough to get the answer
b. Both statements X and Y are needed to get the answer
c. Statement Y alone is enough to get the answer

Q.16. A, B, C and D go for a picnic. When A stands on a weighing machine, B climbs on, and the weight shown was 132 kg. When B stands, C also climbs on, and the machine shows 130 kg. Similarly the weight of C and D is found as 102 kg and that of B and D is 116 kg. What is D’s weight?

a. 58 kg b. 78 kg c. 44 kg d. 34 kg

Q.17. In a tournament, there are n teams T₁, T₂, ..., Tₙ with n > 5. Each team consists of k players, k > 3. The following pairs of teams have one player in common: T₁ & T₂, T₂ & T₃, ..., Tₙ₋₁ & Tₙ, and Tₙ & T₁. No other pair of teams has any player in common. How many players are participating in the tournament, considering all the n teams together?

a. n(k – 1) b. k(n – 1) c. n(k – 2) d. k(k – 2)

Q.18. Suppose n is an integer such that the sum of the digits of n is 2, and 10¹⁰ < n < 10¹¹. The number of different values for n is

a. 11 b. 10 c. 9 d. 8

Q.19. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is:

a. 9000 b. 9400 c. 9600 d. 9800
Q.20. Determine the rth term of an A.P. whose 6th term is 12 and 8th term is 22
a. 3r-7   b. 5r-18   c. 2r-6   d. 5r-9

Q.21. A trader marked the selling price of an article at 10% above the cost price. At the time of selling, he allows certain discount and suffers a loss of 1%. He allowed a discount of?
 a. 9%   b. 10%   c. 10.5%   d. 11%

Q.22. P₅QR, P₆QS, P₇QT, _____, P₁₀QV
a. PQW   b. PQV₂   c. P₂QU   d. PQ₃U

Q.23. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, it had:
 a. 588   b. 672   c. 600   d. 700

Q.24. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?
 a. ½   b. ¾   c. 3/8   d. 5/16

Q.25. Find the Odd Man Out 10, 25, 45, 54, 60, 75, 80
a. 10   b. 45   c. 54   d. 75

Q.26. In covering a distance of 30 km, Arun takes 2 hours more than Anil. If Arun doubles his speed, then he would take 1 hour less than Anil. What is Arun’s speed?
 a. 8   b. 5   c. 4   d. 7

Q.27. A man rides his bicycle 10 km at an average speed of 12 km/hr and again travels 12 km at an average speed of 10 km/hr. What is his average speed for the entire trip approximately?
 a. 11.2   b. 10   c. 10.2   d. 10.8

Q.28. Raj travelled from a point X straight to Y at a distance of 80 m. He turned right and walked 50 m, then again turned right and walked 70 metres. Finally he turned right and walked 50 m. How far is he from the starting point?
 a. 20 m   b. 50 m   c. 70 m   d. 10 m

Q.29. At what time between 5.30 and 6 will the hands of a clock be at right angles?
 a. 43 5/11 min past 5   b. 43 7/11 min past 5   c. 40 min past 5   d. 45 min past 5

Q.30. Bob, Peter, Oliver and 2 girls –Raven Chelsey are to be seated in a row. Raven often gets sits to left of Bob. No girl sits at ts extreme positions and middle positions. Peter always sits at the extreme position. Who sits to the right of Chelsey?
 a. Oliver   b. Bob   c. Peter/Oliver   d. Peter

Q.31. In the word ORGANISATION if we exchange first with the second, second with the third, third with fourth and so on... till last then what will the 10 letter from right?

Q.32. The original price of a car was $23600. Because the car owner thought he could get more money for the car, he increased the price of the car to 160% of its original price. After a week, the car had not sold, so the owner then discounted the price by 20%, the car was finally sold. What price was the car sold for?
 a. 30208$   b. 37760$   c. 23600$   d. 7552$

Q.33. There are two water tanks A and B. A is much smaller than B. While water fills at the rate of one litre every hour in A, it gets filled up like 10, 20, 40, 80, 160...in tank B. (At the end of first hour, B has 10 litres, second hour it has 20, and so on). If tank B is 1/16 filled after 11 hours, what is the total duration required to fill it completely?
 a. 4 hrs   b. 15 hrs   c. 14 hrs   d. 16 hrs

Q.34. For school children a software was designed. In that software one monkey has to choose balloons. If a monkey chooses 2 at a time
and continues picking then 1 balloon is left. If it picks 5 at a time then the remaining is zero, if it picks 6 at a time then remaining is 3. What is the total number of balloons?

a. 72   b. 75   c. 79   d. 80

Q.35. If 3y+x>2 and x+2y<3, what can be said about the value of y?
   a. y=-1   b. y>-1   c. y<-1   d. y=1

Q.36. In a city, the bus route numbers consist of a natural number less than 100, followed by one of the letters A, B, C, D, E and F. How many different bus routes are possible?
   a. 594   b. 623   c. 524   d. 624

Q.37. The probabilities that drivers A, B and C will drive home safely after consuming liquor are 2/5, 3/7 and 3/4, respectively. What is the probability that they will drive home safely after consuming liquor?
   a. 2/7   b. 9/10   c. 3/10   d. 5/7

Q.38. 4/15 of 5/7 of a number is greater than 4/9 of 2/5 of the same number by 8. What is half of that number?
   a. 315   b. 325   c. 335   d. 370

Q.39. If the number 481 * 673 is completely divisible by 9, then the smallest whole number in place of * will be:
   a. 2   b. 5   c. 6   d. 7

Q.40. Which natural number is nearest to 8485, which is completely divisible by 75?
   a. 8475   b. 8500   c. 8550   d. 8525

Q.41. The LCM of two numbers is 280 and their ratio is 7:8. The two numbers are
   a. 70,80   b. 35,40   c. 42,48   d. 28,32

Q.42. A certain number when divided by 222 leaves a remainder 35, another number when divided by 407 leaves a remainder 47. What is the remainder when the sum of these two numbers is divided by 37?
   a. 8   b. 9   c. 12   d. 17

Q.43. How many ways can 4 prizes are given away to 3 boys, if each boy is eligible for all the prizes?
   a. 256   b. 24   c. 12   d. None of these

Q.44. How many words can be formed by rearranging the letters of the word ASCENT such that A and T occupy the first and last position respectively?
   a. 5!   b. 4!   c. 6!-2!   d. 6!/2!

Q.45. A number X is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3. What is the probability that |X|<2?
   a. 5/7   b. 3/7   c. 3/5   d. 1/3

Q.46. Two brothers X and Y appeared for an exam. The probability of selection of X is 1/7 and that of B is 2/9. Find the probability that both of them are selected.
   a. 1/63   b. 2/35   c. 2/63   d. 9/14

Q.47. 2 trains starting at the same time from 2 stations 200 km apart and going in opposite direction cross each other at a distance of 110 km from one of the stations. What is the ratio of their speeds?
   a. 11 : 9   b. 7 : 3   c. 18 : 4   d. None of these

Q.48. A train covers a distance in 50 min, if it runs at a speed of 48 kmph on an average. The speed at which the train must run to reduce the time of journey to 40 min will be.
   a. 45 kmph   b. 60 kmph   c. 75 kmph   d. None of these

Q.49. To complete a piece of work A and B take 8 days, B and C 12 days. A, B and C take 6 days. A and C will take:
   a. 7 Days   b. 7.5 Days   c. 8 Days   d. 8.5 Days

Q.50. Two pipes can fill the cistern in 10 hr and 12 hr respectively, while the third empty it in 20 hr. If all pipes are opened
simultaneously, then the cistern will be filled in
a. 7.5 hr     b. 8 hr     c. 8.5 hr
d. 10 hr
Q.1   If the price of an item is decreased by 10% and then increased by 10%, the net effect on the price of the item is:
   a) A decrease of 99%  
   b) No change  
   c) A decrease of 1%  
   d) An increase of 1%  

Q.2   What was the day of the week on 17th June, 1998?
   a) Monday  
   b) Tuesday  
   c) Wednesday  
   d) Thursday  

Q.3   Given that on 10th November 1981 is Tuesday, what was the day on 10th November 1581.
   a) Monday  
   b) Thursday  
   c) Sunday  
   d) Tuesday  

Q.4   If (5x - 3y)/(5y - 3x) = ¾, then the value of x:y is
   a) 2:9  
   b) 7:2  
   c) 7:9  
   d) None of these  

Q.5   In a mixture, R is 2 parts, S is 1 part. In order to make S to 25% of the mixture, how much R is to be added.
   a) 1/2 part  
   b) 2/3 part  
   c) 1 part  
   d) 11/4 part  

1
Q.6 A can do a piece of work in 4 hours; B and C together can do it in 3 hours, while A and C together can do it in 2 hours. How long will B alone take to do it?
   a) 8 hours
   b) 10 hours
   c) 12 hours
   d) 24 hours

Q.7 A machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. All the machines are started at 9 A.M. while machine P is closed at 11 A.M. and the remaining two machines complete work. Approximately at what time will the work (to print one lakh books) be finished?
   a) 11:30 AM
   b) 12 Noon
   c) 12:30 PM
   d) 1:00 PM

Q.8 A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank in the same time during which the tank is filled by the third pipe alone. The second pipe fills the tank 5 hours faster than the first pipe and 4 hours slower than the third pipe. The time required by the first pipe is:
   a) 6 hours
   b) 10 hours
   c) 15 hours
   d) 30 hours

Q.9 The smallest possible value of n, for which 2n+1 is not a prime number is:
   a) 3
   b) 4
   c) 5
   d) None of these

Q.10 When n is divided by 4, the remainder is 3. What is the remainder when 2n is divided by 4?
   a) 1
   b) 2
   c) 3
   d) 6

Q.11 The least multiple of 7, which leaves a remainder of 4, when divided by 6, 9, 15 and 18 is:
   a) 74
   b) 94
Q.12 Twelve people need to be photographed, but there are only five chairs. (The rest of the people will be standing behind and their order does not matter.) How many ways can you sit the twelve people on the five chairs?
   a) 9540  
   b) 95060  
   c) 95040  
   d) 96040  
   **1**

Q.13 After the typist writes 12 letters and addresses 12 envelopes, she inserts the letters randomly into the envelopes (1 letter per envelope). What is the probability that exactly 1 letter is inserted in an improper envelope?
   a) $\frac{1}{12}$
   b) 0
   c) $\frac{12}{212}$
   d) $\frac{11}{12}$  
   **1**

Q.14 The probability of the success of three students X, Y and Z in an examination are $\frac{1}{5}$, $\frac{1}{4}$ and $\frac{1}{3}$ respectively. Find the probability of the success of at least two.
   a) $\frac{1}{6}$
   b) $\frac{1}{4}$
   c) $\frac{1}{8}$
   d) $\frac{1}{3}$  
   **1**

Q.15 If a flight of 600 km an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 kmph and the time of flight increased by 30 mints. The duration of the flight is:
   a) 1 hr
   b) 2 hr
   c) 3 hr
   d) 4 hr  
   **1**

Q.16 A man can row 15 km/h in still water. If it takes him twice as long as to row up as to row down the river. Find the rate of stream.
   a) 4 km/h
   b) 5 km/h
   c) 6 km/h
   d) 2 km/h  
   **1**

Q.17 Two discounts of 40% and 20% equal to a single discount of
   a) 50
   b) 45
Q.18 Kunal bought a suitcase with 15% discount on the labelled price. He sold suitcase for Rs 2880 with 20% profit on the labelled price. At what price did he buy the suitcase? (2040Rs)

a) 1040  
b) 2040  
c) 4040  
d) 3040

Q.19 A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26%. The quantity of whisky replaced is:

a) 1/3  
b) 2/3  
c) 2/5  
d) 3/5

Q.20 For school children a software was designed. In that software one monkey has to choose balloons. If a monkey chooses 2 at a time and continues picking then 1 balloon is left. If it picks 5 at a time then the remaining is zero, if it picks 6 at a time then remaining is 3. What is the total number of balloons?

a) 72  
b) 75  
c) 79  
d) 80

Q.21 New town is straight to the north of New York. A high way M runs from newtown making an angle of 61 degree south east from New York there is also an high way N which runs northeast 61 degrees. If high ways M and N are straight then find out the acute angle made at their intersection point.

a) 50  
b) 52  
c) 55  
d) 58

Q.22 There are 7 meetings A, B, C, D, E, F, G .one meeting should happen in one day. Meeting A is on Sunday C and D meetings should happen after B. Then E, F, G meetings should occur in three consecutive days. And meeting G is on Saturday. Then meeting D should occur on which day?

a) Sunday  
b) Monday
Q.23 A hollow space on earth surface is to be filled. Total cost of filling is Rs20000. The cost of filling per mt\(^3\) is Rs 225 . how many times a size of 3 mt\(^3\) soil is required to fill the hollow space?

a) 23  
b) 30  
c) 28  
d) 32  

Q.24 Which of the following diagrams indicates the best relation between Pigeon, Bird and Dog?

a)  
b)  
c)  
d)  

Q.25 Direction: There are two statements and a question. Choose A if the question can be answered by using either one. Choose B if the question can be answered using both the statements. Choose C if the question cannot be answered using these two statements. Choose D if question can be answered by using one but not other.

Question: If pritam spends more than avinash on foods who spends more on children’s education?

The question can be answered by
Statement 1: Avinash spends 30% on house rent, 20% on children’s education, 40% on foods.
Statement 2: Pritam spends 20% on house rent, 45% on children’s education, 20% on food.

Q.26 The sequence \( \{A_n\} \) is defined by \( A_1 = 2 \) and \( A_{n+1} = A_n + 2n \). What is the value of \( A_{100} \).

a) 9902  
b) 9900  
c) 10100  
d) 9904  

Q.27 Find two positive numbers whose difference is 12 and whose A.M exceeds the G.M by 2?

a) 16,4  
b) 4,16
Q.28 Find the odd man out
1. 3, 5, 11, 14, 17, 21
   a) 21
   b) 17
   c) 14
   d) 3

Q.29 A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?
   a) 2: 1
   b) 3:2
   c) 25:18
   d) 27:20

Q.30 A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?
   a) 34
   b) 40
   c) 68
   d) 88

Q.31 Which of these is not a part of Career planning process?
   a) Research
   b) Decision Making
   c) Referencing
   d) Self Assessment

Q.32 Which of these is a pre - requisite to be self reflective?
   a) Curious
   b) Patient
   c) Open minded
   d) All of the above

Q.33 The process of gaining initial employment, maintain it & obtaining new employment is called:
   a) Decision Making
   b) SWOT
   c) Employability
   d) PEST

Q.34 Self Awareness is a function of:
a) Intrapersonal Intelligence
b) Spiritual Intelligence
c) Interpersonal Intelligence
d) Rhythmic Intelligence

Q.35 When making reference to an author’s work in your text, the sequence should be
a) Name of the author followed by the year of publication.
b) Year of publication followed by the name of the author.
c) Both
d) None

Q.36 When making reference to a work whose author is not known, for citing we use
a) Anon
b) n. d
c) Unknown
d) Unnamed

Q.37 An effective presenter is one who:
a) Uses jargons
b) Reads from the script
c) Has an eye contact with the audience
d) Stands still

Q.38 A back stage presentation would include:
a) Defining Objectives
b) Understanding audience
c) Developing effective visuals
d) All of the above

Q.39 The full form of SWOT is:
a) Skills, Weaknesses, Opportunities, Threats
b) Strength, Weaknesses, Opportunities, Threats
c) Strengths, Weaknesses, Opportunities, Time bound
d) Strengths, Winning, Opportunities, Threats

Q.40 Which of these is a zero tolerance area?
a) Integrity
b) Communication skills
c) Problem solving
d) Time management

Q.41 For an effective cross cultural communication, one has to be particular about
a) Non verbal signals
b) Kinds of gifts that can be exchanged
c) Topics of discussion
Q.42 The biggest barrier to cross cultural communication is:
  a) Inability to accept another culture’s view.
  b) Different accent
  c) Different style of clothing
  d) An understanding of diverse market

Q.43 Effective team building needs to happen
  a) During appraisals
  b) Continuously
  c) Every month
  d) During presentations

Q.44 One of the best ways of improving people’s performance is:
  a) Salary increment
  b) Having lunch together
  c) Providing timely feedback
  d) Documenting

Q.45 The practice of carrying out less urgent tasks in preference to more urgent ones is called
  a) Prioritization
  b) Progression
  c) Procrastination
  d) All of the above

Q.46 During a cross cultural communication it is important that one
  a) Speaks fast
  b) Asks negative questions
  c) Uses a slang
  d) Summarizes & paraphrases to verify

Q.47 An effective team member should be
  a) Competent
  b) Quick learner
  c) Coachable
  d) All of the above

Q.48 Referencing & citing your sources is an important part of your academics because it demonstrates that
  a) You have read relevant background literature
  b) You are aspiring to become an educator
  c) You are good in grammar
  d) You read a lot of fiction
Q.49  Self awareness makes you more effective by:
   a) Giving you stress
   b) Knowing your strengths & weaknesses
   c) Enabling you to write
   d) None of the above

Q.50  In a career planning process the stage of action means:
   a) Planning how to achieve your career goals.
   b) Researching on the internet.
   c) Doing a self assessment
   d) Doing a SWOT analysis
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
CAREER SKILLS-II (HM-402)

Time: 2 hrs

Max Marks: 50

No. of pages: 3

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Tick (√) the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.
Q.1. The salary of a person was reduced by 10%. By what percent should his reduced salary be raised so as to bring it at par with his original salary?
A. 100/11%  B. 100/9%
C. 100/7%  D. 100/13%

Q.2. What was the day of the week on 28th May, 2006 if 28<sup>th</sup> May 2007 was Friday?
A. Thursday  B. Friday
C. Saturday  D. Sunday

Q.3. Given that on 10th November 1981 is Tuesday, what was the day on 10th November 1581?
A. Monday  B. Thursday
C. Sunday  D. Tuesday

Q.4. 4,* 9, 13 ½ are in proportion. Then * is:
A. 6  B. 8  C. 9  D. None of these

Q.5. (112 x 5<sup>4</sup>) = ?
A. 67000  B. 70000  C.76500  D. 77200

Q.6. If 0.75 : x :: 5 : 8, then x is equal to:
A. 1.12  B. 1.2  C. 1.25  D. 1.30

Q.7. A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in:
A. 5  B. 6  C. 10  D. 10.5 days

Q.8. A and B can fill a tank in 20 and 30 minutes respectively. If both the pipes are used together, how long will it take to fill the tank?
A. 12 min  B. 15 min  C. 25 min  D. 50 min

Q.9. The smallest three digit prime number is:
A.103  B.107  C.109  D. None of these

Q.10. A number when divided by 6 leaves a remainder 3. When the square of the same number is divided by 6, the remainder is:
A.1  B.2  C.3  D.0

Q.11. The product of two numbers is 7168 and their HCF is 16. How many pairs of numbers are possible such that the above condition are satisfied?
A. 2  B.3  C.4  D.6

Q.12. Charles has four coins in his pocket and pulls out three at one time. How many different amounts can he get?
A. 4  B. 6  C. 2  D. None of these

Q.13. What is the probability of getting a sum 9 from two throws of a dice?
A. 1/6  B. 1/8  C. 1/9  D. 1/12

Q.14. A bag contains 5 red and 3 green balls. Another bag contains 4 red and 6 green balls. If one ball is drawn from each bag. Find the probability that one ball is red and one is green.
A. 3/10  B. 9/10  C. 6/10  D. 7/10
Q.15. If a flight of 600 km an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 kmph and the time of flight increased by 30 mints. The duration of the flight is:
A. 1 hr  B. 2 hr  C. 3 hr  D. 4 hr
Q.16. A man can row 15 km/h in still water. If it takes him twice as long as to row up as to row down the river. Find the rate of stream.
A. 4 km/h  B. 5 km/h  C. 6 km/h  D. 2 km/h
Q.17. If selling price is doubled, the profit triples. Find the profit percent.
A.300  B.200  C.150  D.100
Q.18. After successive discounts of 12% and 5% an article was sold for Rs. 209. What was the original price of the article?
A.200  B.250  C.300  D.150
Q.19. Three unbiased coins are tossed. What is the probability of getting at most two heads?
A. ¾  B. ¼  C. 3/8  D. 7/8
Q.20. Which one of the following is not a prime number?
A. 31  B. 61  C. 71  D. 91
Q.21. New town is straight to the north of New York. A highway M runs from newtown making an angle of 61 degree south east from New York there is also a high way N which runs northeast 61 degrees. If highways M and N are straight then find out the acute angle made at their intersection point.
A. 50  B. 52  C. 55  D. 58
Q.22. There are 7 meetings A, B, C, D, E, F, G. One meeting should happen in one day. Meeting A is on Sunday C and D meetings should happen after B. Then E, F, G meetings should occur in three consecutive days. And meeting G is on Saturday. Then meeting D should occur on which day?
A. sun  B. mon  C. wed  D. fri
Q.23. A hollow space on earth surface is to be filled. Total cost of filling is Rs20000. The cost of filling per m³ is Rs 225. How many times a size of 3 m³ soil is required to fill the hollow space?
A. 23  B. 30  C. 28  D. 32
Q.24. Which of the following diagrams indicates the best relation between Earth, Sea and Sun?
A.  B.  
C.  D.
Q.25. The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?
A. 4  B. 8  C. 10  D. None of these
Q.26. The sequence \{A_n\} is defined by \(A_1 = 2\) and \(A_{n+1} = A_n + 2n\). What is the value of \(A_{100}\)?
A. 9902  B. 9900  C. 10100  D. 9904
Q.27. What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?
Q.28. Find the odd man out
1. 3, 5, 11, 14, 17, 21
A. 21  B. 17  C. 14  D. 3

Q.29. A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?

Q.30. A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?
A. 34  B. 40  C. 68  D. 88

Q.31. To make a presentation impressive and effective you should use:
A. Jargons
B. Complex sentences
C. Passive sentences
D. A simple and active form of sentences

Q.32. To be able to give a good presentation, a full rehearsal is:
A. Useful
B. Optional
C. Necessary
D. Audience based

Q.33. Self assessment in career planning helps you to know
A. What your talents & strengths are
B. The activities you get most satisfaction from
C. The talents you achieve most with
D. All of the above

Q.34. Which of these behaviors in a team obstructs the achievement of the team’s goal?
A. Conflict
B. Compliance
C. Brainstorming
D. Commitment

Q.35. Which of these is a characteristic of high performance team where members believe in the integrity, character and ability of each other?
A. Loyalty
B. Worthiness
C. Openness
D. Trust

Q.36. Creativity is good only when it leads to:
A. Lethargy
B. Divinity
C. Trespassing
D. Productivity

Q.37. I pass others’ work as in my own work I am indulging in:
A. Compassion
B. Plagiarism
C. Altruism
D. Benevolence

Q.38. Which of the following is the correct example to cite more than four authors for a work?
A. Green, et al. (1995)
B. (Green, et al., 1995)
C. Both
D. None
Q.39. Which of these is the fundamental pattern of cultural differences?
A. Communication styles  B. Clothing Styles
C. Decision making style  D. All of the above

Q.40. Stress can be defined as a negative emotional experience accompanied by
A. Bio chemical & physiological changes  B. Behavioral changes
C. Cognitive changes  D. All of the above

Q.41. Which of the following could be considered as a stress?
A. Noise  B. Commuting to work
C. Crowd  D. All of the above

Q.42. The idea of effective cross cultural communication is to:
A. Respecting cultural differences & working together  B. Stereo typing a culture
C. Delegate work to the other person  D. Changing oneself as per the other culture

Q.43. Which of these is an unhealthy way of coping with stress?
A. Listen to music  B. Physical exercise
C. Over eating or under eating  D. Talking it out with family & friends

Q.44. During a presentation what can one do to establish rapport with the audience?
A. Giving relevant examples  B. Sharing relevant facts
C. Maintain eye contact  D. All of the above

Q.45. Effective teams can
A. Be bought  B. Be faked
C. Be created through trust and competency  D. Exist without having a common goal

Q.46. Diversity in teams are caused best by
A. Religion  B. Gender
C. Educational background  D. Competencies

Q.47. In a self awareness process, research can be done by
A. Speaking with people involved in your area of interest  B. Shopping
C. Joining a dance school  D. Participating in GD

Q.48. To cite several works by one author in different years, the reference is cited in which way?
C. Both A and B  D. None of these

**Q.49.** The visual aids used in a presentation need to be -
A. Simple  B. Have an impact
C. Easy to read  D. All of the above

**Q.50.** Good presenters will
A. keep their hands on the podium
B. Gesture with their hands
C. keep their hands in their pockets
D. Does not make a difference
Q.1 Briefly define / explain the following:
   a) Nature of management
   b) Span of control
   c) Recruitment
   d) Plant layout
   e) Work study
   f) Standard time
   g) Inventory
   h) Industrial relations
   i) Inspection
   j) Five R's (components) of efficient purchase.

   2x10

**PART-A**

Q.2 Explain the functions of management. How is control function said to be contained in the planning function?

   20

Q.3 Describe the steps in finding plant location. What are the merits and demerits of each plant site?

   20

Q.4 Define work study. Explain in details the steps involved in carrying out method study.

   20

**PART-B**

Q.5 What are the objectives of materials management? Discuss the costs associated with materials management and derive an expression for economic order quantity.

   20
Q.6 What is the importance of good industrial relations? Discuss the concept of workers’ participation in management.  

Q.7 What is the meaning of quality control? Discuss the methods of quality control.
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth Semester
INDUSTRIAL MANAGEMENT (HM-501)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
a) Discuss the nature of management.
b) What are the factors determining location of a factory?
c) Draw a store ledger account.
d) What are the objectives of industrial relations?  
5x4

PART-A

Q.2 What is organizing? Discuss the principles of organizing.  
20

Q.3 a) What is the importance of a plant layout?  
5
   b) Discuss the types of layout with their merits and demerits.  
15

Q.4 Define method study. Explain the procedure of method study with the help of a diagram.  
20

PART-B

Q.5 a) What are the objectives of material management?  
5
   b) Explain the EOQ model of inventory management technique and find the value of q.  
15

Q.6 Discuss the concept and scope of employee welfare.  
20

Q.7 Define quality control. Explain the methods associated with it.  
20
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
CAREER SKILLS-III (HM-503 / HM-503A)

Time: 2 hrs
Max Marks: 60
No. of pages: 6

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions of PART-A are of 1½ marks each and all questions of PART-B are of 1 marks each. There is no negative marking.

PART - A

Q.1 If A’s salary is 25% higher than B’s salary, then how much present is B’s salary lower than A’s?
a. 15%  b. 20%  c. 25%  d. 33 1/3%

Q.2 In planet OZ planet there are 8 days, Sunday to Saturday and 8th day is Oz day. There is 36 hours in a day. What is angle between 12.40?
a. 80  b. 81  c. 87  d. 89

Q.3 The ratio of boys and girls in a class of 72 is 7:5. How many more girls should be admitted to make the number of boys and girls equal?
a. 9  b. 12  c. 220  d. 240

Q.4 A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?
a. Rs.375  b. Rs. 400  c. Rs.600  d. Rs. 800

Q.5 A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely?
a. 3 hrs 15 min  b. 3 hrs 45 min  c. 4 hrs  d. 4 hrs 15 min

Q.6 Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?
a. 10 min 20 sec  b. 11 min 45 sec  c. 12 min 30 sec  d. 14 min 40 sec

Q.7 Find the remainder when 51^{203} is divided by 7
a. 4  b. 2  c.1  d. 6

Q.8 A number when divided by a divisor leaves a remainder of 24. When twice the original number is divided by the same divisor, the remainder is 11. What is the value of the divisor?
a. 13  b.59  c.35  d. 37
Q.9 The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:
   a. 1  b. 2  c. 3  d. 4

Q.10 A 6x6 grid is cut from an 8x8 chessboard. In how many ways can we put two identical coins, one on the black square and one on a white square on the grid, such that they are not placed in the same row or in the same column?
   a. 216  b. 324  c. 144  d. 108

Q.11 A person leaves his house and travelling at 4kmph reaches his office 10 minutes late. Had he travelled at 7 kmph he would have been 20 minutes early. Find the distance from his house to the office (in km).
   a. 14/3  b. 13/3  c. 11/3  d. 10/3

Q.12 Two trains pass each other on parallel lines. Each train is 100 m long. When they are going in the same direction, the faster one takes 60 secs to pass the other completely. If they are going in the opposite directions they pass each other completely in 10 seconds. Find the speed of the slower train in kmph?
   a. 30  b. 42  c. 48  d. 60

Q.13 I but 15 pens and sells 12 of them at the cost price of 18 pens. What is my profit percentage?
   a. 25%  b. 50%  c. 60%  d. 75%

Q.14 There would be 15% loss if sugar is sold at Rs 10.2 per kg. if a profit of 10% is to be earned, at what price per kg should sugar be sold?
   a. Rs 14.50  b. Rs 13.20  c. Rs 15.10  d. Rs 16

Q.15 There are two vessels which are filled only with the pure components. Vessel I contains 20L brandy and vessel II contains 20L water. From vessel I, 5L brandy is taken and placed in vessel II. Then 4L mixture is transferred from vessel II to vessel I. Find the ratio of water in vessel I to brandy in vessel II?
   a. 7:8  b. 8:7  c. 1:1  d. None of these

Q.16 Amar, Akbar, and Anthony came from the same public school in the Himalayas. Every boy in that school either fishes for trout or plays Frisbee. All fishermen like snow while no Frisbee player likes rain. Amar dislikes whatever Akbar likes and likes whatever Akbar dislikes. Akbar likes rain and snow. Anthony likes whatever the other two like. Who is a fisherman but not a Frisbee player?
   a. Amar  b. Akbar  c. Anthony  d. None of them

Q.17 Along a road lie an odd number of stones placed at intervals of 10 m. These stones have to be assembled around the middle stone. A person can carry only one stone at a time. A man carried out the job starting with the stone in the middle, carrying stones in succession, thereby covering a distance of 4.8 km. Then the number of stones is:
   a. 35  b. 15  c. 29  d. 31
Q.18 Find four numbers forming a G.P in which the third term is greater than the first term by 9 and second term is greater than the 4th by 18?
   a. 3, -6, 12, -24  b. 3, 6, 12, 24  c. -3, 6, -12, 24  d. None of these

Q.19 How many sides a regular polygon has with its interior angle eight times its exterior angles?
   a. 16  b. 24  c. 18  d. 20

Q.20 In a shower, 5 cm of rain falls. The volume of water that falls on 1.5 hectares of ground is:
   a. 75 cu. m  b. 750 cu. m  c. 7500 cu. m  d. 75000 cu. m

PART - B

Q.21 Scheduling is a term related to
   a. Problem Solving
   b. Time Management
   c. Delegation
   d. Stress Management

Q.22 Facebook is
   a. Urgent/ Important
   b. Urgent/ Not Important
   c. Not Urgent/ Not Important
   d. Not Urgent/ Important

Q.23 Not Urgent and Not Important activities will find place in your Schedule as
   a. Could  b. Must  c. should  d. None of these

Q.24 Which of the following activities deserve some of your time?
   a. Urgent/ Important
   b. Urgent/ Not Important
   c. Not Urgent/ Not Important
   d. Not Urgent/ Important

Q.25 Hobby persuasion is
   a. Urgent/ Important
   b. Urgent/ Not Important
   c. Not Urgent/ Not Important
   d. None of these

Q.26 Which of the following techniques is not a part of problem solving process?
   a. 5 Why Technique
   b. Root Cause Analysis
   c. Fish bone diagram
   d. Zorbing

Q.27 5 Why Technique helps in
   a. Solution Implementation
   b. Generating Alternatives
   c. Root Cause Analysis
   d. Alternative Selection
Q.28 Pareto’s rule is also called

Q.29 If I am trying to minimize obstacles then I am
   a. Managing time b. Decision Making c. Problem Solving d. None of the Above

Q.30 Which of the following techniques helps in generating alternatives?
   a. 5 Why Technique b. Root Cause Analysis c. Fish bone diagram d. Pareto’s Rule

Q.31. __________ drives demand for the product or service

Q.32 In Relationship selling what is a salesperson chasing
   a. Profit b. Customer loyalty c. Life time value d. All of the above

Q.33 If I am selling 3 GB of RAM instead of 1 GB, I am
   a. Up selling b. Cross Selling c. Mis-selling d. None of the Above

Q.34 If I sell a trolley with a washing machine then I am
   a. Up selling b. Cross Selling c. Mis-selling d. None of the Above

Q.35 In SPIN Sales model, P stands for
   a. Probable Questions b. Potential Questions c. Problem Questions d. None of the above

Q.36 BANTing is a part of

Q.37 Summarize the list of benefits that the other person will receive, telling them completely what they are going to get in exchange of their money is what type to closing technique
   a. Trial Close b. Inducement Close
Q.38 When you are explicit about wanting an order in return for the concession, closing technique is called
a. Trial Close  
 b. Inducement Close  
 c. Alternative Close  
 d. Summary Close

Q.39 You display a product function and give a proof to the customer there and then and immediately make a close. This closing technique is called
a. Action Close  
 b. Inducement Close  
 c. Alternative Close  
 d. Summary Close

Q.40 “It looks like you really like this. Is that true?” What type of closing technique is this?
 a. Action Close  
 b. Inducement Close  
 c. Alternative Close  
 d. Trial Close

Q.41 Customer Service is provision of service
 a. Before Purchase  
 b. During Purchase  
 c. After Purchase  
 d. All of the above

Q.42 Customer satisfaction is
 a. Meeting Promises  
 b. Exceeding Promises  
 c. Both  
 d. None of the above

Q.43 First Impression is
 a. 55% Body Language  
 b. 38% Verbal Tone  
 c. 7% Verbal Content  
 d. All of the above

Q.44 I am not familiar with the topic in a GD. However I listen to other participants in the first few minutes and create my content by changing the language. This makes me a
 a. Initiator  
 b. Moderator  
 c. Loan Taker  
 d. Concluder

Q.45 I am a participant in a GD and I am the first one to speak. By doing so I am pitching myself as a
 a. Leader  
 b. Good Communicator
c. Good Listener
d. None of the Above

Q.46 Group discussions are conducted to test the following
a. Knowledge
b. Communication
c. Leadership
d. All of the above

Q.47 Chronology of events in a CV is
a. First to Current   b. Current to First   c. Both   d. None of the above

Q.48 Cover Letter and CV are best when
a. Standard   b. Customized   c. Both   d. None of the above

Q.49 Which of the following is okay to do at an interview?
a. Ask the employer questions
b. Answer your cell phone
c. Be a few minutes late
d. None of the Above

Q.50 Your interviewer asks you what you think about your previous boss. You didn’t get along with your previous boss. You answer
a. “He was a good leader and really kept the team focused and on-task.”
b. “He was alright, but we weren’t that close.”
c. “We didn’t exactly get along because he made a lot of impossible demands and was constantly on the phone.”
d. None of the Above
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP (HM-504)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the importance of planning as a management function?
     b) Mention important steps in finding a suitable site for plant location.
     c) Write a few techniques of inventory control.
     d) Write is the importance of workers participation in management?
     e) What are DICs? What is their role towards industrial development?

   4x5

   PART-A

Q.2  What are the functions of management? Explain in brief, each of these functions.  20

Q.3  Explain the nature, objectives and importance of plant layout.  20

Q.4  Mention briefly the key aspects of effective management of inventory. How does it help towards reduction of operational costs and better profitability?  20

   PART-B

Q.5  Explain industrial relations. Explain their importance and objectives.  20

Q.6  What is the role of development financial institutions towards entrepreneurship development?

   20

Q.7  “Entrepreneurship is a viable career option for young engineers”. Do you agree with this statement? Justify your answer with reasons.  20
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
CAREER SKILLS-IV (HM-602)

Roll No: __________________________

Semester: ________________________

Branch: _________________________

Date: ___________________________

Signature of Invigilator: __________

End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
CAREER SKILLS-IV (HM-602)

Semester: ________________________

Date: ___________________________

Total Marks Obtained: _____________

Marks (in words): __________________

Signature of Examiner: ______________
End Semester Examination, Dec. 2014
B. Tech. – Sixth Semester
CAREER SKILLS-IV (HM-602)

Time: 1 hrs
Max Marks: 50

No. of pages: 6

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 Tarun got 30% concession on the labelled price of an article and sold it for Rs 8750 with 25% profit on the price he bought. What was the labelled price?
   a) Rs 10000  b) Rs 12000  c) Rs 16000  d) None of these

Q.2 A group of seven singers, facing the audience, are standing in a line of the stage.
   i) D is to the right of C.
   ii) F is near G.
   iii) B is to left of F
   iv) E is to the left of A
   v) C and B have one singer between them
   vi) A and D have one singer between them
   Who is on the extreme right?
   a) D  b) F  c) G  d) E

Q.3 One evening before sunset Rekha and Hema were talking to each other face to face. If Hema’s shadow was exactly to the right of Hema, which direction was Rekha facing?
   a) North  b) South  c) East  d) Data is inadequate

Q.4 It takes 12 hrs for a bus to cover the distance between the cities X and Y. A bus leaves X for Y at 6pm and another bus Y for X at 8 pm. At what time will the two buses meet? (Assume both travel with same speed)
   a) 1 am  b) 2 am  c) 4 am  d) 6 am

Q.5 A is thrice as good as workman as B and therefore is able to finish a job in 60 days less than B. Working together, they can do it in:
   a) 20 days  b) 222/3 days  c) 25 days  d) 30 days
Q.6 If \( V = 10! + 11! + 12! + 13! + 14! + \ldots + 999! + 1000! \), then what is the unit digit of \( V \)?
   a) 0  b) 3  c) 1  d) 8

Q.7 What is the last digit of the number \( 23457^{199321} \)?
   a) 9  b) 1  c) 3  d) 7

Q.8 10 yrs ago, the average age of a family of 4 members was 24 yrs. Two children having been born (with age difference of 2 yrs), the present average age of the family is the same. The present age of the youngest child is:
   a) 1 yr  b) 2 yrs  c) 3 yrs  d) 5 yrs

Q.9 In a certain code, “down sky” is written “zoc pun” and “on top sky” is written “pun ta rop”, how will “down on” be written in that code?
   a) zoc ta  b) pun rop  c) rop zoc  d) Cannot be determined

Q.10 The questions below consists of a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and Give answer
   a) If the data in statement I alone are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question
   b) If the data in statement II alone are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question
   c) If the data either in statement I alone or in statement II alone are sufficient to answer the question
   d) If the data given in both statements I and II together are not sufficient to answer the question and
   e) If the data in both statements I and II together are necessary to answer the question.

   Question: If \( xy = 30 \), then what is the value of \( x \) ?
   I. \( x \) and \( y \) are positive integers ; \( y \) is odd and \( y > x \).
   II \( x \) and \( y \) are positive integers ; \( y \) is even and \( x \) is odd

Q.11 An empty fuel tank of a car was filled with A type petrol. When the tank was half-empty, it was filled with B type petrol. Again when the tank was half-empty, it was filled with A type petrol. When the tank was half-empty again, it was filled with B type petrol. What is the percentage of A type petrol at present in the tank?
Q.12 On which dates of July 2003 did Monday fall
a) 7, 14, 21, 28  
b) 6, 13, 20, 27  
c) 5, 12, 19, 26  
d) 1, 8, 15, 22, 29

Q.13 A watch which gains uniformly is 2 min slow at noon on Wednesday and is 3 min fast at 2 pm on the following Wednesday. When does it show correct time.

a) 8 am Friday  
b) 10 pm Friday  
c) 8 am Saturday  
d) 8 pm Saturday

Q.14 What is the probability that when 3 cards are pulled from a pack of 52 cards, without replacement that we get one king, one queen and one jack
a) 16/35139  
b) 16/5525  
c) 1/2179  
d) None of these

Q.15 The sum of the first four terms of an A.P is 56. The sum of the last four terms is 112. If its first term is 11, then find the number of terms
a) 13  
b) 11  
c) 12  
d) 14

Q.16 If \( \log \left( \frac{u+v}{2} \right) = \frac{1}{2} \left( \log u + \log v \right) \), then
a) \( u = v \)  
b) \( u > v \)  
c) \( u < v \)  
d) \( u^2 = v^2 \)

Q.17 How many pairs of natural numbers satisfy the condition that the sum of their reciprocals is 1/12?

a) 16  
b) 6  
c) 8  
d) 15

Q.18 If 4 isosceles right-angled triangles of smaller sides 10m each are removed from the corners of a rectangular plot 40m * 20m, then find the area of the remaining portion

a) 750 sq m  
b) 600 sq m  
c) 525 sq m  
d) 7500 sq m

Q.19 If one of the angles of cyclic quadrilateral is 4 times its opposite angle, then what is the value of the larger angle?

a) 108°  
b) 120°  
c) 144°  
d) 180°

Q.20 There are 5 Rock songs, 6 Carnatic songs and 3 Indi pop songs. How many different albums can be formed using the above repertoire if the albums should contain at least 1 Rock song and 1 Carnatic song?

a) 15624  
b) 16384  
c) 6144  
d) 240
Q.21 There are 12 pipes that are connected to a tank. Some of them are fill pipes and the others are drain pipes. Each of the fill pipes can fill the tank in 8 hours and each of the drain pipes can drain the tank completely in 6 hours. If all the fill pipes and drain pipes are kept open, an empty tank gets filled in 24 hours. How many of the 12 pipes are fill pipes?

a) 6   b) 8   c) 7   d) 5

Q.22 A, B and C start simultaneously from X to Y. A reaches Y, turns back and meet B at a distance of 11 km from Y. B reached Y, turns back and meet C at a distance of 9 km from Y. If the ratio of the speeds of A and C is 3:2, what is the distance between X and Y?

a) 99m   b) 100m   c) 120m   d) 142m

Q.23 The ratio of spirit and water in a mixture is 1:3. If the volume of the solution is increased by 25% by adding spirit only, what is the resultant ratio of spirit and water?

a) 2:3   b) 1:4   c) 1:2   d) 3:4

Q.24 A container contains 80kg milk. From this, 8 kg milk was taken out and replaced by water. This process is repeated thrice. What is the ratio of the quantity of milk after the first draw to quantity of milk left after the third draw?

a) 10:9   b) 100:81   c) 100:64   d) None of these

Q.25 **Statement:** Some trees are horses. Some ships are trees.

**Conclusions:**

I. Some horses are ships.
II. Some trees are neither ships nor horses.

a) If only (1) conclusion follows  
b) If only (2) conclusion follows  
c) If either (1) or (2) follows  
d) If neither (1) nor (2) follows

Q.26 The amounts on a certain principal for 3 yrs and for 4 yrs at a certain rate of CI are Rs 18250.50 and Rs 20988.10. What is the rate of interest?

a) 10%   b) 12%   c) 13%   d) 15%

Q.27 Which one will replace the question mark?
Q.28 Find the number of triangles in the given figure.

\[
\begin{array}{c}
\text{a)} \quad 5 \\
\text{b)} \quad 6 \\
\text{c)} \quad 8 \\
\text{d)} \quad 9
\end{array}
\]

Q.29 Find the statement that must be true according to the given information.
Georgina is older than her cousin Marsha. Marsha's brother Bart is older than Georgia. When Marsha and Bart are visiting with Georgia, all three like to play a game of Monopoly. Marsha wins more often than Georgia does.

\[
\begin{array}{c}
\text{a)} \quad \text{When he plays Monopoly with Marsha and Georgia, Bart often loses.} \\
\text{b)} \quad \text{Of the three, Georgia is the oldest.} \\
\text{c)} \quad \text{Georgia hates to lose at Monopoly.} \\
\text{d)} \quad \text{Of the three, Marsha is the youngest.}
\end{array}
\]

Q.30 In a survey of people, it was found that 56% people read magazine A and 62% people read magazine B. What is the percentage of people according to the survey who read both?

\[
\begin{array}{c}
\text{a)} \quad 36\% \\
\text{b)} \quad \text{Between 18\% and 56\%} \\
\text{c)} \quad \text{Between 18\% and 62\%} \\
\text{d)} \quad 18\%
\end{array}
\]

Q.31 Which of the following statements is NOT correct, regarding an appropriate look during an interview?

\[
\begin{array}{c}
\text{a)} \quad \text{Minimal make up} \\
\text{b)} \quad \text{Tone down the body spray/perfume} \\
\text{c)} \quad \text{Dress professionally & conservative} \\
\text{d)} \quad \text{Wear every piece of jewellery you own}
\end{array}
\]

Q.32 In order to be an effective listener you should not:

\[
\begin{array}{c}
\text{a)} \quad \text{Maintain eye contact} \\
\text{b)} \quad \text{Resist distractions} \\
\text{c)} \quad \text{Paraphrase} \\
\text{d)} \quad \text{Interrupt}
\end{array}
\]

Q.33 The various qualities and skills that get tested in a GD are

\[
\begin{array}{c}
\text{a)} \quad \text{Group behavior} \\
\text{b)} \quad \text{Both} \\
\text{c)} \quad \text{Communication skills} \\
\text{d)} \quad \text{None}
\end{array}
\]
Q.34 While placing the caller on hold it’s very important to:
   a) Play good songs
   b) Let the caller know how long it would take
   c) Put the hold tune
   d) None of the above

Q.35 Making eye contact is a way of communicating:
   a) Interest
   b) Involvement
   c) Attention
   d) All of the above

Q.36 For long email messages it is preferable to
   a) Use attachments
   b) Use the font color as red
   c) Write the message in big font
   d) Use a lot of abbreviations

Q.37 The process of effective communication is complete when:
   a) Sender has sent the message
   b) When both the sender and receiver nod
   c) Receiver has received the message
   d) When the receiver has given a feedback to the sender

Q.38 For an effective communication the subject should be:
   a) Complex
   b) Unfamiliar
   c) Known
   d) None of the above

Q.39 Non verbal signals:
   a) Complement a verbal message
   b) Both complement or regulate
   c) Regulate verbal communication
   d) Neither complement nor regulate

Q.40 In a mixed message the non verbal communication (NVC) is usually more reliable than the verbal message because:
   a) Verbal messages are more likely to show
   b) NVC is much harder to control your feelings & manipulate
   c) The cultural setting has a greater impact on NVC
   d) All of the above

Q.41 Which of the following is not an aspect of paralanguage?
   a) Facial expressions
   b) Pitch of voice
   c) Rate of speech
   d) Volume of voice
Q.42 Do not use the official email for:
   a) Personal conversations
   b) Job hunts
   c) Racy jokes
   d) All of the above

Q.43 What does not need to be a consideration before you make a phone call?
   a) Who you are calling
   b) The best time to call
   c) The purpose of the call
   d) A brief joke to break the ice

Q.44 If you generally answer your business phone within 2-3 ring, it means?
   a) You are a professional
   b) You have a readiness for work
   c) You have a sense of urgency
   d) All of the above

Q.45 Why should you keep a note pad and a pen near the phone for use during business calls?
   a) To jot down things your colleagues’ say so you remember them
   b) To jot down notes about other things you need to do
   c) To jot down ideas to suggest to your colleagues
   d) To note down anything important that requires an action from your end

Q.46 In order to be an influential participant in a GD one should be:
   a) Assertive yet humble
   b) Speak continuously even if it’s irrelevant
   c) Dominating
   d) Keep looking at the Jury/ Panel

Q.47 Which of these is not a myth about a GD?
   a) The initiator is the sure winner
   b) Good communication is about speaking in stylish accent
   c) Speaking a lot is influencing
   d) Start only when you are aware of the subject

Q.48 Which of the following should be avoided in a CV?
   a) Skills
   b) Education
   c) Hobbies
   d) Religious affiliation

Q.49 A personal interview stresses on the following areas
   a) Goal clarity
   b) Knowledge
   c) Personality trait
   d) All of the above

Q.50 Which of the following is a strict NO during an interview?
a) Making excuses
b) Making negative comments
c) Taking a cell phone call
d) All of the above
End Semester Examination, Dec. 2014  
B. Tech. – Sixth Semester  
CAREER SKILLS-IV (HM-602)

Time: 1 hrs  Max Marks: 50  
No. of pages: 4

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

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A. Rs 10000  B. Rs 12000  
C. Rs 16000  D. None of these

Q.2. A group of seven singers, facing the audience, are standing in a line of the stage.  
i) D is to the right of C.  ii) F is near G.  
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v) C and B have one singer between them  
vi) A and D have one singer between them  
Who is on the extreme right?  
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C. East  D. Data is inadequate

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A. 1 am  B. 2 am  C. 4 am  D. 6 am

Q.5. A is thrice as good as workman as B and therefore is able to finish a job in 60 days less than B. Working together, they can do it in:  
A. 20 days  B. 22$\frac{1}{2}$ days  
C. 25 days  D. 30 days

Q.6. If $V = 10! + 11! + 12! + 13! + 14! + \ldots + 999! + 1000!$, then what is the unit digit of $V$?  
A. 0  B. 3  C. 1  D. 8

Q.7. What is the last digit of the number: $2555^{255}$?  
A. 9  B. 5  C. 3  D. 7

Q.8. The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?  
A. 4  B. 8  C. 10  D. None of these

Q.9. In a certain code, “down sky” is written “zoc pun” and “on top sky” is written “pun ta rop”, how will “down on” be written in that code?  
A. zoc ta  B. pun rop  
C. rop zoc  D. Cannot be determined

Q.10. A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?  
A. 3.6  B. 7.2  C. 8.4  D. 10

Q.11. A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is:  
A. $\frac{1}{4}$  B. $\frac{1}{10}$  C. $\frac{7}{15}$  D. $\frac{8}{15}$

Q.12. What was the day on 20 July 2003 if 20 July 2001 was Saturday?  
A. Saturday  B. Sunday  
C. Monday  D. Friday

Q.13. How many times do the hands of a clock coincide in a day?  
A. 20  B. 21  C. 22  D. 24
Q.14. What is the probability that when 3 cards are pulled from a pack of 52 cards, without replacement that we get one king, one queen and one jack
A. 16/35139   B. 16/5525
C. 1/2179       D. None of these

Q.15. Today is Monday. After 61 days, it will be:
A. Wednesday   B. Saturday
C. Monday       D. Sunday

Q.16. Look at this series: 7, 10, 8, 11, 9, 12, ...
What number should come next?
A. 7       B. 10       C. 12     D. 13

Q.17. Look at this series: F2, __, D8, C16, B32, ...
What number should fill the blank?
A. A16     B. G4     C. E4   D. E3

Q.18. If 4 isosceles right-angled triangles of smaller sides 10m each are removed from the corners of a rectangular plot 40m * 20m, then find the area of the remaining portion?
A. 750sq m   B. 600 sq m
C. 525 sq m   D. 7500 sq m

Q.19. If one of the angles of cyclic quadrilateral is 4 times its opposite angle, then what is the value of the larger angle?
A.108°   B.120°   C.144°   D.180°

Q.20. There are 5 Rock songs, 6 Carnatic songs and 3 Indi pop songs. How many different albums can be formed using the above repertoire if the albums should contain at least 1 Rock song and 1 Carnatic song?
A.15624   B.16384   C.6144
D.240

Q.21. The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:
A. 15   B. 16   C. 18   D. 25

Q.22. A, B and C start simultaneously from X to Y. A reaches Y, turns back and meet B at a distance of 11 km from Y. B reached Y, turns back and meet C at a distance of 9 km from Y. If the ratio of the speeds of A and C is 3:2, what is the distance between X and Y?
A.99m  B.100m  C.120m
D.142m

Q.23. The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:

Q.24. 1397 x 1397 = ?
A. 1951609   B. 1981709
C. 18362619   D. 2031719

Q.25. Statement: Some trees are horses. Some ships are trees.
Conclusions:
I. Some horses are ships.
II. Some trees are neither ships nor horses.
(A) If only (1) conclusion follows
(B) If only (2) conclusion follows
(C) If either (1) or (2)
(D) If neither

Q.26. The amounts on a certain principal for 3 yrs and for 4 yrs at a certain rate of CI are Rs 18250.50 and Rs 20988.10. What is the rate of interest?
A.10%   B.12%   C.13%
D.15%

Q.27. The ratio of boys and girls in a class of 72 is 7:5. How many more girls should be admitted to make the number of boys and girls equal?
A.9   B.12   C.220
D.240   E.24

Q.28. If a carton containing dozen mirrors is dropped, which of the following cannot be the ratio of broken mirrors to unbroken mirrors?
A.2:1   B.3:1   C.3:2
D.1:1   E.4:2

Q.29. Find the statement that must be true according to the given information. Georgia is older than her cousin Marsha. Marsha's brother Bart is older than Georgia. When Marsha and Bart are visiting with Georgia, all three like to play a game of Monopoly. Marsha wins more often than Georgia does.
A. When he plays Monopoly with Marsha and Georgia, Bart often loses.
B. Of the three, Georgia is the oldest.
C. Georgia hates to lose at Monopoly.
D. Of the three, Marsha is the youngest.

Q.30. In a survey of people, it was found that 56% people read magazine A and 62% people
Q.30. What is the percentage of people according to the survey who read both?
A. 36%  
B. Between 18% and 56%  
C. Between 18% and 62%  
D. 18%

Q.31. Which of the following statements is NOT correct, regarding an appropriate look during an interview?
A. Minimal make up  
B. Tone down the body spray/perfume  
C. Dress professionally & conservative  
D. Wear every piece of jewellery you own

Q.32. In order to be an effective listener you should not:
A. Maintain eye contact  
B. Resist distractions  
C. Paraphrase  
D. Interrupt

Q.33. The various qualities and skills that get tested in a GD are
A. Group behavior  
B. Communication skills  
C. Both  
D. None

Q.34. While placing the caller on hold it’s very important to:
A. Play good songs  
B. Let the caller know how long it would take  
C. Put the hold tune  
D. None of the above

Q.35. Making eye contact is a way of communicating:
A. Interest  
B. Involvement  
C. Attention  
D. All of the above

Q.36. For long email messages it is preferable to
A. Use attachments  
B. Use the font color as red  
C. Write the message in big font  
D. Use a lot of abbreviations

Q.37. The process of effective communication is complete when:
A. Sender has sent the message  
B. When both the sender and receiver nod  
C. Receiver has received the message  
D. When the receiver has given a feedback to the sender

Q.38. For an effective communication the subject should be:
A. Complex  
B. Unfamiliar  
C. Known  
D. None of the above

Q.39. Non verbal signals:
A. Complement a verbal message  
B. Both complement or regulate  
C. Regulate verbal communication  
D. Neither complement nor regulate

Q.40. In a mixed message the non verbal communication (NVC) is usually more reliable than the verbal message because:
A. Verbal messages are more likely to show  
B. NVC is much harder to control your feelings  
C. The cultural setting has a greater impact on NVC  
D. All of the above

Q.41. Which of the following is not an aspect of paralanguage?
A. Facial expressions  
B. Pitch of voice  
C. Rate of speech  
D. Volume of voice

Q.42. Do not use the official email for:
A. Personal conversations  
B. Job hunts  
C. Racy jokes  
D. All of the above

Q.43. What does not need to be a consideration before you make a phone call?
A. Who you are calling  
B. The best time to call  
C. The purpose of the call  
D. A brief joke to break the ice

Q.44. If you generally answer your business phone within 2-3 ring, it means?
A. You are a professional  
B. You have a readiness for work  
C. You have a sense of urgency  
D. All of the above

Q.45. Why should you keep a note pad and a pen near the phone for use during business calls?
A. To jot down things your colleagues’ say so you remember them  
B. To jot down notes about other things you need to do  
C. To jot down ideas to suggest to your colleagues  
D. To note down anything important that requires an action from your end
Q.46. In order to be an influential participant in a GD one should be:
A. Assertive yet humble
B. Speak continuously even if it’s irrelevant
C. Dominating
D. Keep looking at the Jury/Panel

Q.47. Which of these is not a myth about a GD?
A. The initiator is the sure winner
B. Good communication is about speaking in stylish accent
C. Speaking a lot is influencing
D. Start only when you are aware of the subject

Q.48. Which of the following should be avoided in a CV?
A. Skills
B. Education
C. Hobbies
D. Religious affiliation

Q.49. A personal interview stresses on the following areas
A. Goal clarity
B. Knowledge
C. Personality trait
D. All of the above

Q.50. Which of the following is a strict NO during an interview
A. Making excuses
B. Making negative comments
C. Taking a cell phone call
D. All of the above
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
TOTAL QUALITY MANAGEMENT (HM-623)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain in brief:
   a) Need of quality.
   b) Objectives of quality.
   c) Leadership concept.
   d) Employee’s involvement-motivation.
   e) Performance appraisal.

   4x5

PART-A

Q.2 What is Total Quality Management? Explain it as ‘total teamwork’.
   20

Q.3 a) Explain with sketches quality and cost relationship.
   10
   b) Explain quality of design.
   10

Q.4 Explain the various conditions under which ‘process may be out of control’ in FMEA (Failure mode effect analysis).
   20

PART-B

Q.5 What is quality policy? How is it planned and modified in the benefit of an organization?
   20

Q.6 Explain what is supplier-customer partnership? When is it required and how it helps in organizational growth?
   20

Q.7 Explain:
   a) Quality system-elements.
b) Documentation.
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
MARKETING MANAGMENT (HM-821)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Positioning.
   b) Four Ps in marketing.
   c) Order to payment cycle.
   d) Customer relationship management.
   e) Freud motivation theory.
   f) Behavioural segmentation.
   g) Product life cycle.
   h) The product hierarchy.
   i) Hybrid level channel marketing.
   j) Corporate social responsibility.

   2x10

PART-A

Q.2 a) What is marketing? Explain briefly the core marketing concepts associated with it.

   10

   b) Explain in detail the corporate and divisional strategic planning.

   10

Q.3 a) Explain about the major forces that are being considered while analyzing the macro-environment.

   10

   b) Explain the following terms:
      i) Sales information system.
      ii) Data warehousing.
      iii) Datamining.
      iv) Total customer satisfaction.

   2½x4
Q.4  
a) What is motivation? Explain the motivation theories as given by “Maslow” and Herzberg".

b) Compare the business markets with consumer markets.

10

PART-B

Q.5  
a) Explain geographic, demographic and psychographic segmentation with suitable examples.

12

b) Explain in brief product life cycle marketing strategies.

8

Q.6  
a) Write in details the product characteristics and classifications.

10

b) Explain the basic difference between price discounts and allowances; promotional and differentiated pricing.

10

Q.7  
a) What is the role of marketing communications in marketing management?

10

b) Discuss difference between hybrid channels and multi-channel marketing.

10
End Semester Examination, Dec. 2014
B. Tech. – Seventh Semester
HUMAN RESOURCE MANAGEMENT (HM-822)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
a) Explain the various components of HRM.
b) Explain different sources of recruitment.
c) What is refresher training?
d) What is HR outsourcing?
e) Explain the importance of training evaluation.
f) What is 360 degree appraisal?
g) Discuss the role of HR in virtual organizations.
h) What is international HRM?
i) Discuss internal/ external influences on planning process.
j) Discuss employee appraisal v/s employee development.

2x10

PART-A

Q.2 Distinguish between personnel and HRM functions in a modem business organization. Does HRM have a role in leadership building in an organization?

20

Q.3 What is HR planning? What are the advantages of HR planning for a large business organization?

20

Q.4 What is meant by recruitment? Discuss the role of a recruitment manager in a hard-core engineering company.

20

PART-B

Q.5 Explain the purpose of training with examples from experiences in the context of business organizations.

20
Q.6 What is the difference between performance appraisal and performance management? Which is more comprehensive and why?

Q.7 Explain with a few examples, the relevance and importance of information technology in modern business/service organizations.
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
HUMAN RESOURCE MANAGEMENT (HM-822)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) What are various sources of recruitment?
   b) How is pay for performance beneficial for the employees?
   c) What is the need for outsourcing HR functions?
   d) Why are career planning and management important?

   5x4

   PART-A

Q.2 Discuss the strategic importance of HRM with suitable examples.

   20

Q.3 Define HRP. Explain the process of HRP in detail.

   20

Q.4 What are the purposes of recruitment? Discuss the process of recruitment and tell the difference between recruitment and selection.

   20

   PART-B

Q.5 What is training? How would you design and administer a training program?

   20

Q.6 How would you determine a compensation structure in an organization?

   20

Q.7 a) What is the role of HR in knowledge industry?

   10

b) How is employee leasing important?

   10
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
PROJECT MANAGEMENT (HM-823)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Project management.
   b) Backward integration project.
   c) Project formulation.
   d) Project risk analysis.
   e) Components of capital cost of a project.
   f) Characteristics of critical path.
   g) Forward pass computation.
   h) Activity float analysis.
   i) Optimistic time and pessimistic time.
   j) Tender documents

2x10

PART-A

Q.2 a) Explain management principles applied to project management.
   10
   b) What qualities are expected from a good project manager?
   10

Q.3 a) Explain the points required to be kept in mind while signing collaboration agreements.
   10
   b) Explain the points considered for project scheduling.
   10

Q.4 Draw a PERT network for the following data. Arrive at the critical path and find out the estimated project duration along the critical path. G and I are the last activities.
   Find the probability that project can finish 4 weeks earlier than the estimated duration:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Proceeding</th>
<th>Optimistic time</th>
<th>Most likely time</th>
<th>Pessimistic time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activity</td>
<td>(weeks)</td>
<td>(Weeks)</td>
<td>(weeks)</td>
</tr>
<tr>
<td>----</td>
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<td>A</td>
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<td>B</td>
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<td>4</td>
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<td>8</td>
</tr>
<tr>
<td>C</td>
<td>A</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>B</td>
<td>1</td>
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<td>5</td>
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<td>E</td>
<td>C&amp;D</td>
<td>2</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>C,D</td>
<td>3</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>G</td>
<td>E</td>
<td>4</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>H</td>
<td>H</td>
<td>4</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>I</td>
<td>F,H</td>
<td>5</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

**PART-B**

Q.5  a) How is the selection of project organization structure done?  
     10  
     b) List of types of contracts and explain them in detail.  
     10

Q.6  a) Explain the various causes due to which projects gets terminated.  
     10  
     b) Explain the procedures and strategies for project completion and review.  
     10

Q.7  a) Define inventory and, types of inventory. Why are they maintained?  
     8  
     b) With the help of a neat diagram explain the following terms:  
        i) Order quantity.  
        ii) Lead time.  
        iii) Safety stock.  
        iv) Reorder point.  
        2½x4  
     c) Describe cost associated with the inventories.  
     2
End Semester Examination, Dec. 2014
B.Tech. (Integrated) – Sixth Semester
ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT (HM-I-601)

Time: 3 hrs
Max Marks: 100

No. of pages: 1
Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from Part A and **TWO** questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Role of entrepreneurship in India’s economic development.
   b) Role of SISI in promoting entrepreneurship.
   c) Importance of market survey before launching a business project.
   d) Nature and functions of an effective business leader.
   e) What is meant by excise duty?
   f) Importance of industrial safety.
   g) Various types of bank accounts.
   h) Key factors important for job satisfaction.
   i) Role of a marketing manager in a business organization.
   j) Key aspects of financial management of a business company.

   **2x10**

**PART-A**

Q.2 If you were to set up your own business after completing your engineering course, give details of such a business idea and the key steps that you would take to set up that business.

   **20**

Q.3 What is the role of financial institutions like IDBI, SIDBI, IFCI, etc in promoting entrepreneurship in India?

   **20**

Q.4 What is meant by a project report? Draft a suitable project report for starting a business in any one of the areas like: IT support services / restaurant business / an auto workshop / a coaching institute.

   **20**

**PART-B**

Q.5 What do we mean by the term: Motivation? How does a supervisor motivate his / her team of employees to perform better? What are the key factors in motivating people at work?

   **20**

Q.6 What is meant by industrial pollution? Which are the various types of such pollution and the major preventive measure for the same?

   **20**
Q.7 Explain the meaning and importance of labour welfare. What is the role of worker participation in management towards labour welfare in a large business organization?
End Semester Examination, Dec. 2014
B. Tech. – Eighth Semester
MULTIMEDIA AND ANIMATION (IT-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Give advantages and disadvantages of ADSL.
     b) What are monochrome images?
     c) Explain an intelligent multimedia system.
     d) Explain sampling theorem.
     e) Explain anti-aliasing.
     f) Explain cycle animation.
     g) What are vector images?
     h) What are the various modes of operation in JPEG?
     i) What is a sound?
     j) Explain multimedia presentation devices.

2x10

PART-A

Q.2  a) What are authoring tools? Explain various types of authoring tools.

     10

     b) Explain framework for multimedia systems in detail.

     10

Q.3  a) Explain different file format in detail.

     10

     b) Explain the objectives and architecture of JPEG.

     10

Q.4  Write short notes on:
     a) Virtual reality operating system.
     b) Visually coupled system requirement.

     10x2

PART-B

Q.5  a) What are the components of an MIDI system?

     10
b) How analog sound is converted into digital sound? What are the advantages and disadvantages of digital signals?

Q.6 What are the principles of MPEG? Explain the architecture of an MPEG file format.

Q.7 Write short notes on:
   a) Animation file formats
   b) Maya
   c) Director X
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
MULTIMEDIA AND ANIMATION (IT-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain the use of multimedia in education.
b) What are additive and subtractive color mixing?
c) Mention the pros and cons for using anti-aliasing.
d) What are visually coupled systems?
e) Explain SNR ratio.
f) Explain morphing.
g) Explain interactive and non-interactive multimedia.
h) Explain kinematics.
i) List few applications where animations are being used.
j) What are the advantages of CD-I?

2x10

PART-A

Q.2 Explain multimedia devices. What are the drawbacks of CD-R and CD-audio over CD-I?

20

Q.3 List various type of image file formats. Differentiate between BMP and Tiff in detail.

20

Q.4 a) What is virtual reality? Explain its area of application.

10

b) Explain intelligent multimedia system with block diagram.

10

PART-B

Q.5 Write short notes on:
a) Sampling rate
b) Quantization error
c) MIDI
d) Problems with speech recognition  

Q.6  
   a) How DVI system is implemented? Explain the concept of PLV and RTV. How does the communication between them take place?  
      10  
   b) What are the principles of MPEG?  
      10  

Q.7  
   a) Explain cell animation techniques. How cell animation is different from computer animation?  
      10  
   b) What are the principles of animations?  
      10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
DATA COMMUNICATION AND COMPUTER NETWORKS (IT-401A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Mention advantages of fibre optics over twisted pair and coaxial cable.
b) Name some services provided by application layer in the TCP/IP reference model.
c) Name three types of transmission impairments.
d) What kind of arithmetic is used to add data items in checksum calculation?
e) Define pure ALOHA.
f) What is difference between a unicast, multicast and broadcast address?
g) Name four basic network topologies and cite an advantage of each.
h) What is the purpose of cladding in an optical fibre?
i) Describe the need for switching and define a switch.
j) List five functions of network management.

2x10

PART-A

Q.2 a) What is data communication? What is the need of a data communication? Also discuss data communication components.

b) What do you mean by term: topology? Explain five network topologies.

10

Q.3 a) What does Shannon limit have to do with data communication? What is the capacity of a noisy telephone line channel having bandwidth of 3000 Hz and signal-to-noise ratio of 3162?

b) Differentiate between guided and unguided media. Explain the classes of wireless media in detail along with their applications.

10

Q.4 Write short notes on:
a) Circuit switched network.

8
b) Time division multiplexing

c) Secret key cryptography

**PART-B**

Q.5  
  a) Explain TCP/IP reference model.  
      10  
  b) What is CSMA? How can it be categorized? Give flow diagram for all types of 
      persistence methods.  
      10

Q.6  
  a) What do you mean by routing? How distributed routing can be differentiated 
      from hierarchical routing?  
      10  
  b) Compare and contrast distance vector routing with link state routing.  
      10

Q.7  
  a) Write notes on:
      Firewall and its types.  
      10  
  b) Polling and traps.  
      10
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
JAVA PROGRAMMING (IT-402)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is inheritance?
b) Write a command to set fonts in applet.
c) Explain ‘super’ keyword.
d) Write four methods of graphics class.
e) What are arrays?
f) Write SQL query to update a record.
g) What are JAR files?
h) Explain character streams in Java.
i) What are inner classes? Give example.
j) What is exception?

2x10

PART-A

Q.2  a) What do you mean by polymorphism? Explain it with an example. Explain different access specifiers available in Java.

10

b) What is a package? What are the benefits of using packages? Write steps in creating a package and explain it with a program.

10

Q.3  a) What is an applet? Explain the life cycle of applet. Write an applet with blue background and red foreground that displays a smiley.

10

b) Explain the following:
   i) Try.        ii) Catch.       iii) Finally.  iv) Throw.  
   v) Throws.  2x5

Q.4  a) What type of event is generated while interacting with checkboxes? Explain how to handle the event generated by a checkbox with an example.

10

b) Explain different layout managers in Java.

10
PART-B

Q.5  a) Explain remote method calls with SOAP.  
    b) What is RMI? Explain the role of stub and skeletons in RMI.  
    c) Write steps for making connection between client and server using RMI.

Q.6  a) What is multithreading? What are the methods available in Java for inter thread communication? Discuss with an example.
    b) Write a program in Java to read a file through random access.

Q.7  a) Write a program using JDBC to retrieve all the students who have scored marks more than 80 percent.
    b) Explain:
       i) Scrollable resultset.
       ii) Transactions.
End Semester Examination, Dec. 2014
B. Tech. – Fifth Semester
INTERNET AND WEB TECHNOLOGY (IT-501)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a gateway? On which layer does it work?
b) What are the different strategies used for searching WWW?
c) Compare features of HTML and DHTML.
d) Differentiate between FRAME and FRAMESET tag.
e) What is an XML document? Explain with syntax.
f) Explain in brief about the interaction between web server and servlet.
g) What is the need of server side scripting?
h) What is a web server? How a web server is different from an application server?
i) What is CSS? What is its need?
j) How do we create a table in HTML?

2x10

PART-A

Q.2 a) Explain the modes of connecting to Internet in detail.
   10
b) Differentiate between TCP/IP model and OSI model.
   5
c) Write a note on feature of Apache web server.
   5

Q.3 a) Differentiate between search engine and meta-search engine.
   5
b) What is URL? Explain the structure of URL. Also discuss its types.
   10
c) Write a note on how web works.
   5

Q.4 a) Explain the following HTML tags:
i) <P>.
ii) <BR>.
b) Write HTML code to design a form for validating the user with the field’s username, password and ok which should receive input from user and response as authorized and invalid username and password.

10

Q.5 a) Discuss the ways of storing and accessing information using cookies.

5

b) Write a program in JavaScript to develop arithmetic calculator.

5

c) Define event and event handler. Discuss any five types of events defined by JavaScript.

10

Q.6 a) Differentiate between PWS, IIS, and Apache web server.

5

b) What are drawbacks of client-side scripting? Explain.

5

c) What are servlets with diagram?

10

Q.7 a) What is a firewall? How does it work? Also mention its advantages and disadvantages.

10

b) Write short notes on:

i) Secure web document.

ii) Software complexity.

5x2

End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh / Eighth Semester
NETWORK PROGRAMMING AND ADMINISTRATION (IT-701)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.
Q.1
a) Change the IP address 114.34.2.8, from dotted-decimal notation to binary notation.
b) What is the usage of “finger” and “tracert” troubleshooting command?
c) Give any two socket options along with their function.
d) Describe echo service for TCP and UDP both.
e) What is single process concurrent connection-oriented server’s main function?
f) Give the concept of mutual exclusion for procedures in a remote program.
g) How do we configure a proxy server?
h) How VLAN is beneficial in network management?
i) Give atleast 4 ways which help in security planning.
j) Find the net-id and the host-id of the 132.56.8.6 IP address.

2x10

**PART-A**

Q.2
a) What is link state routing? How OSPF implements it? Discuss in detail.

10

b) What is ARP? Describe ARP operation. Also discuss the cases in which services of ARP can be used.

10

Q.3
a) What do you mean by elementary UDP sockets? How communication is carried on between client and server using sockets? Give complete syntax of all socket calls involved in it.

10

b) Select() and poll() functions define which scenario of socket programming. Also give complete syntax of functions and their macro details.

10

Q.4
a) How concurrent servers differ from iterative servers? Describe concurrent connection-less server algorithm with the help of a diagram. Also give syntax of all the function calls involved in this algorithm.

10

b) What is a multiservice server? How do an iterative connectionless and connection-oriented multiservice server differ from each other? Use diagram to explain.

10

**PART-B**

Q.5
a) How do remote program and procedure differ? What happens if a multiple version program is to be implemented?

8

b) Write short notes on:
   i) RPC retransmission.
ii) Dynamic port mapping.

Q.6 a) Describe static and dynamic routing with the help of an example. PPP protocol is used on which layer of TCP/IP. Discuss its transition phases.

b) Configure following:
   i) DNS server.
   ii) Windows as router.

Q.7 a) Explain C1, C2, C3, and C4 categories of security with the help of examples.

b) What is a firewall? How it has been categorized? Explain its types in detail.
End Semester Examination, Dec. 2014
B. Tech. – Fifth / Sixth / Seventh Semester
SOFTWARE ENGINEERING (IT-702)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the drawbacks of RAD model?
b) Mention the goal of software requirement.
c) Define measures, metrics and indicators.
d) What is KLOC?
e) What are the different types of cohesion?
f) List the principles of a software design.
g) What is load testing?
h) Write advantages of white box testing.
i) Define software quality.
j) Write the advantages of CASE tool.

2x10

PART-A

Q.2 a) Discuss the merits and demerits of various model of software engineering.

10
b) Explain the term incremental model with a neat diagram.

10

Q.3 a) Discuss the characteristics of a good SRS document.

10
b) What do you understand by data modeling?

5
c) What is control flow model? Give an example also.

5

Q.4 Write short notes on:
 a) Size estimation techniques.
b) COCOMO.
c) Staffing level estimation.
d) Risk management.

5x4
PART-B

Q.5  a) Explain the design guidelines that can be used to produce a good quality system design.

      b) What problems are likely to arise if two modules have high coupling?.

Q.6  a) State four characteristics of software testing.

      b) Explain the basic path testing in details.

Q.7  a) Discuss how the reliability changes over the life time of a software product and hardware product.

      b) Explain SQA activities in detail.
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
MANAGEMENT INFORMATION SYSTEMS (IT-721)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define MIS.
     b) Determine the components of MIS.
     c) How information can be classified in an organization?
     d) Describe an MIS team.
     e) What is an organization structure?
     f) Define system control.
     g) What is the need of strategic planning in MIS?
     h) What are the characteristics of information?
     i) Differentiate between hacking and cracking.
     j) What are the services provided by MIS in service sector?

2x10

PART-A

Q.2  a) Explain the application of MIS in the organizational sectors:
     i) Service sector   ii) Production sector
     iii) Business sector 10
     b) What are database and database management system? Explain the role of MIS in DBMS.

10

Q.3  a) What are the methods of data and information collection? Explain with an example.

10

b) Explain the design of MIS as a system.

10

Q.4  a) What is the need of information for an organization? Explain the methods for determining the information requirement.

10

b) Explain in detail:
i) Architecture of MIS

ii) Implementation of MIS

10

PART-B

Q.5 Write short notes on:
a) DSS as a determination system.
b) Types of decision support system with an example.
c) Strategic tools of planning.

20

Q.6 Explain the following:
a) Electronic business system.
b) Supply chain management systems.
c) Objectives of MIS in service sector.

20

Q.7 a) Discuss about security in MIS.

10

b) Describe the ethics in MIS.

10
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
MANAGEMENT INFORMATION SYSTEMS (IT-721)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is the need of automated MIS?
b) What is data warehouse?
c) Differentiate between data and information.
d) What is the need of staff training in an organization?
e) Why information is required for MIS?
f) What is a decision support system?
g) What is computer crime?
h) Why MIS is required in a service sector?
i) What are the various attacks to the information security?
j) What are the various types of decisions in the management?

2x10

PART-A

Q.2
Write short notes on:
a) Role of MIS in data warehouse.
b) Role of MIS in data mining.
c) Hardware and software requirements of MIS.

20

Q.3
a) How the quality of information can be measured? What are the parameters for a good quality information?

10

b) Discuss in detail:
   i) General model of information processing
   ii) Attributes of information.

5x2

Q.4
a) What is system development life cycle? Explain any two such models.

10

b) How testing is done in MIS?

10
**PART-B**

Q.5  a) Explain the following:
   i) Herbert Simon model for decision making.
   ii) Strategies used for management of organization.  

    5x2

b) Explain the types of DSS models with example.  

    10

Q.6  Write short notes on:
   a) Enterprise business system
   b) Supply chain management system
   c) Various activities of service sector into MIS.  

    20

Q.7  a) What are the security and privacy threats in MIS?  

    10

b) What are the methods to control and protect against security attacks in MIS?  

    10
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh Semester
E-COMMERCE AND ERP (IT-722)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) What do you mean by content management and call center?
   b) Difference between smart card and a debit card.
   c) List disadvantages of ERP.
   d) What are the various ways of making payment electronically?
   e) What do you understand by digital currency?
   f) What do you mean by home shopping?
   g) Why is business process redesign needed?
   h) Compare E-marketing and Tele-marketing.
   i) What are the four C’s of E-commerce?
   j) Explain the role of firewalls in E-commerce.

2x10

PART-A

Q.2 a) What do you understand by E-commerce? Also explain the model based on transaction party:
   iv) C2C

10

b) What do you mean by E-commerce with their limitations and scope? 10

Q.3 a) Explain in detail the role of digital certificates and digital signature in E-commerce security standards. 10

b) Explain difference between E-cash, E-cheque and E-payment with their suitable examples. 10

Q.4 a) What is electronic payment system and explain role of digital payment system? 10

b) Write short notes on:
i) Servers and commercial environments.
ii) First virtual internet payment system.

**PART-B**

**Q.5**

a) Explain the whole process involved in supply chain management.

b) List various advantages and disadvantages of ERP.

c) What are the ERP feature and capabilities? Also explain the role of ERP in supply chain management.

**Q.6**

Explain various functions and applications of resource management. Also explain the resource management in global scenario.

**Q.7**

a) Explain in detail ERP life cycle model.

b) Write short notes on:
   i) Customer relationship management.
   ii) Product life cycle management.
End Semester Examination, Dec. 2014
B. Tech. – Sixth / Seventh / Eighth Semester
ADVANCED JAVA PROGRAMMING (IT-801)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; **Q.1 is compulsory**. Attempt any **TWO questions from Part A** and **TWO questions from Part B**. Each question carries equal marks.

Q.1  

a) How platform independent feature of Java is implemented? Explain the role of main method in execution of Java program.  
5  
b) Differentiate between static query and dynamic query.  
5  
c) What are beans? Explain bean writing process in detail with the help of an example.  
5  
d) Explain transparency, composition and clipboard.  
5  

**PART-A**

Q.2  

a) With reference to sockets, explain how client / server communication is accomplished in Java. Write a program to print the protocol, port host, and file components of a URL.  
10  
b) Explain the following terms in detail:  
   i) Socket time-outs.  
   ii) Half close.  
   iii) URI and URL.  
10  

Q.3  

a) What is the usage of a prepared statement? Discuss with an example.  
5  
b) Write a program to update the salary of an employee whose empid is passed by command line.  
10  
c) What are different types of statements?  
5  

Q.4  

a) How do you add and delete rows in JTable?  
5  

1050/4
b) How are the elements of different layouts organized?  
5

c) Write an application to implement list and progress indicators.  
10

**PART-B**

Q.5  
a) What are AWT components? How image manipulation is accomplished using AWT components?  
10

b) How printing is done using AWT components in Java? Explain with the help of an example.  
10

Q.6  
a) Describe different bean-info classes.  
10

b) Discuss different types of properties of bean.  
10

Q.7  
a) Is Java secure? What are the risks associated with Java?  
5

b) Differentiate between symmetric and asymmetric key encryption techniques.  
10

c) Explain the algorithm for DSA.  
5
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
SOFTWARE PROJECT MANAGEMENT (IT-821)

Time: 3 hrs
Max Marks:  100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are the goals of project management?  
b) What is quality control in respect of software projects?  
c) What is risk mitigation?  
d) What is the advantage to use RAD model?  
e) Write down a few roles of a project manager.  
f) Give the significance of cost benefit analysis.  
g) What do you understand by checklist?  
h) Give the names of a few models used to estimate project cost.  
i) What is the difference between ISO and CMMI standards?  
j) Illustrate a few problems associated with software projects.

\[2x10\]

PART-A

Q.2  
a) Explain capability maturity model along with various kPAs.  
\[10\]

b) Explain the steps required to follow in change management process.  
\[10\]

Q.3  
a) Explain spiral model with the help of a diagram.  
\[10\]

b) What are the characteristics of a good software test plan? Explain.  
\[10\]

Q.4  
a) What is CPM scheduling? Explain with the help of an example.  
\[12\]

b) Write a short note on various well known team structures.  
\[8\]

PART-B

Q.5  
a) Write down activities associated with defects prevention in a software.  
\[10\]
b) Explain what are the importance and significance of quality control and quality assurance? 10

Q.6  a) What are the principles of project scheduling? 10
     b) How will you track the schedule of a project? 10

Q.7  a) Explain with the help of a diagram how Pareto chart analysis is useful in quality control. 12

        b) Give a short note on critical change management. 8
End Semester Examination, Dec. 2014
B. Tech. – Seventh / Eighth Semester
DATA WAREHOUSING AND DATA MINING (IT-822)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten. Answer the following questions in brief:
   a) Differentiate between operational systems and informational systems.
   b) What is meant by slice and dice? Give an example.
   c) What is the significance of metadata in a data warehouse?
   d) How are the users of data warehouse classified?
   e) Differentiate between data warehouse and data mart.
   f) What are the requirements of cluster analysis?
   g) Discuss various OLAP operations that can be performed on multidimensional data cube.
   h) What are the characteristic of strategic information?
   i) What is KDD? What are the steps involved in a KDD process?
   j) Briefly discuss multimedia database.

   2x10

PART-A

Q.2 a) What are the different components of a data warehouse? Explain with the help of a diagram.

   10

   b) What are the various models of OLAP? Explain each in detail.

      10

Q.3 a) Suppose a data warehouse of sales consists of four dimensions, namely, time, item, branch and location and two measures: Dollars sold and units sold. Draw a star schema and snowflake schema for the given data warehouse.

      10

   b) What are different extraction and data cleaning techniques? What is a multidimensional data model?

      10

Q.4 a) Discuss the data warehouse architecture with all its components.

      10
b) How are top-down and bottom-up approaches for building a data warehouse different? Discuss the merits and demerits of each.

10

PART-B

Q.5 a) Write short notes on:
   i) Market basket analysis
   ii) Data mining tools.

5x2

b) How does clustering differ from classification? What are outliers? Explain how clustering helps determine outliers.

10

Q.6 a) What is a decision tree? Where they can be used? Why is tree pruning useful in decision tree induction?

10

b) Suppose your task as a software engineer at MRIU is to design a data mining system to examine their university course database, which contains the following information: the name, address and status (e.g. undergraduate or graduate) of each student, the courses taken, and their cumulative grade point average (GPA). Describe the architecture you would choose. What is the purpose of each component of this architecture?

10

Q.7 a) What is distance / similarity measure generally used for test documents? What is the measure generally used for multimedia documents?

10

b) Describe some applications of classification and clustering for multimedia documents.

10
End Semester Examination, Dec. 2014
B. Sc. (Information Technology) - First Semester
PERSONALITY DEVELOPMENT-I (IT.103)

Time: 3 hrs

Max Marks: 50

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. All questions carry equal marks.

Q.1 Write about any one of the following topic (approx 250 words):
a) Favorite sport.
b) Role model.
c) Inspirational moment.
d) Favorite cuisine.

PART-A

Q.2 What do you mean by listening? Differentiate between listening and hearing.

Q.3 Write down any five qualities of a good professional.

Q.4 What are the important attributes for writing skills?

PART-B

Q.5 Write down any five differences between skimming and scanning in reading.

Q.6 Do you think that art of note taking is important in professional life? Explain your views.

Q.7 Explain the difference between intensive and extensive reading.
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) State first law of thermodynamics and also write its mathematical expression.
    b) Define priming and throttling.
    c) Define clearance volume and compression ratio.
    d) What is necessity of compounding a steam turbine?
    e) What are the methods of power transmission?
    f) Define dedendum circle and module.
    g) Define stress and strain.
    h) What are different types of loads?
    i) State and explain parallelogram law of forces.
    j) What is difference between pattern and casting?

2x10

PART-A

Q.2  a) Discuss in detail ‘Second law of thermodynamics’.
    10
    b) What is meant by thermodynamics equilibrium?
    5
    c) What factors are involved in selection of boilers?
    5

Q.3  a) How does two stroke engine differ from four stroke engine?
    10
    b) Describe the working principle of a pelton turbine.
    10

Q.4  a) How power is measured using a dynamometer? Explain.
    10
    b) Describe different types of gears along with neat sketches.
    10

PART-B
Q.5  a) Explain the stress-strain diagram for a ductile material.

b) A steel bar 1.5\(m\) long and of 50\(mm\) width with 20\(mm\) thickness is subjected to an axial tensile load of 120\(kN\). If the extension in the length of the bar is 0.9\(mm\), make calculation for intensity of stress, strain and modulus of elasticity.

Q.6  a) Discuss the composition, properties and uses of cast iron.

b) Differentiate between soldering and brazing.

Q.7  a) Two forces one of which is double the other has resultant of 260\(N\). If direction of the larger force is reversed and other remains unaltered, the resultant reduces to 180\(N\). Determine the magnitude of force and angle between the forces.

b) A flywheel rotates freely on frictionless bearings at 240\(r.p.m\). How many revolutions will it make in 10 seconds after the start. Also determine the angular speed if wheel turns 500 revolutions in 15 seconds.
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101A)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) State first law of thermodynamics.
b) Differentiate between refrigeration and air conditioning.
c) Name different types of water pumps.
d) What is function of a steam turbine?
e) How power is transmitted from driver to driven?
f) Define gear train.
g) State Hooke’s law.
h) What are different types of plain carbon steels?
i) What are the methods of joining two pieces?
j) What is triangle law of forces?

2x10

PART-A

Q.2
a) State and explain second law of thermodynamics.

10

b) How will you classify boilers? Differentiate between water and fire tube boilers.

10

Q.3
a) With a neat sketch show the various parts of a four-stroke diesel or a petrol engine.

10

b) Explain the working principle of Pelton turbine.

10

Q.4
a) What is function of a gear? What are different types of gears? Write the various terminology used in gear.

15

b) Write a short note on dynamometer.

5

PART-B
Q.5  a) Define Young’s modulus, bulk modulus and modulus of rigidity. Also derive relationship among them.  
     b) Define a beam. What are different types of beams?  

Q.6  a) Differentiate among gas welding, arc welding and resistance welding and explain in detail about any one of the above weldings.  
     b) What is casting? Write the steps of a casting/foundry process.  

Q.7  a) Define vibrations. What are the causes and effects of vibrations?  
     b) Define a free body diagram and write the general equation of equilibrium under concurrent and coplanar force system.
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define system, boundary and surrounding.
b) State polygon law of forces.
c) What is pure substance?
d) Name different strokes of four stroke petrol engine.
e) What is $P_2$g Iron?
f) Define stress.
g) What do you understand by alloy steels?
h) Define matter, particle and body.
i) State Hook’s law.
j) Why is V-belt drive preferred over other forms of mechanical drive?

2x10

PART-A

Q.2
a) Describe the working of a four stroke diesel engine with the help of suitable sketch.

10

b) Explain how does a hydraulic reaction turbine differ from hydraulic impulse turbine?

10

Q.3
a) State the first law of thermodynamics. Write its mathematical expression for a process.

10

b) Define internal energy and show that it is a property of the system.

10

Q.4
a) What is slip? How it affects the velocity ratio of belt drive?

10

b) What is meant by gear train? Name the different types of gear trains and state its use.
PART-B

Q.5  a) Sketch stress-strain diagram for ductile material and explain its salient features. 10
    b) Draw the shear force and bending moment diagrams for the beam loaded and supported as shown in figure:

Q.6  a) Define casting and write basic steps of casting process. 10
    b) Briefly describe the following mechanical properties.
       i) Elasticity          ii) Ductility           iii) Britteness
       iv) Hardness

Q.7  a) Explain the principle of transmissibility of forces. Differentiate between resolution and composition of forces. 10
    b) A force of 200 N is resolved into two components. If one of the component is equal to 120 N and makes an angle 30° with 200 N. Find the other component and the angle between the components. 10
End Semester Examination, Dec. 2014  
B. Tech. – First/Second Semester  
ELEMENTS OF MECHANICAL ENGINEERING (M-101B)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What do you mean by triple point?  
b) Draw the Carnot cycle on T-S and P-V diagram.  
c) What is Poisson's ratio?  
d) Name the different types of gear train.  
e) What do you mean by point of concurrency?  
f) Explain the terms: stress, strain, and elastic limit.  
g) What is soldering?  
h) Draw diesel cycle on P-V and T-S diagram.  
i) What are the different types of beam?  
j) What is the composition of cast iron?

2x10

PART-A

Q.2  
a) Explain second law of thermodynamic.

10

b) A weight of 2000 N is supported by two chains AC and BC as shown in the figure. Determine the tension in each chain.

10

Q.3  
a) What is critical point? What process is possible below the critical point?

10
b) What is the principle of operation of a steam turbine? State fundamental difference between impulse and reaction turbines.

Q.4  
a) What is the difference between two stroke and four stroke engines?  
   
   b) Derive an expansion for air standard efficiency of a diesel cycle.

PART-B

Q.5  
a) Derive an expression for the length of the belt of crossed belt system.
   
   b) Define circular pitch, diametral pitch and modules in relation to tooth gear.

Q.6  
a) Give the broad classification of engine using materials.
   
   b) State the principle of gas welding process. Mention the main characteristics of the different types of flame of oxy-acetylene mixture.

Q.7  
a) List the various types of loads to which a beam can be subjected.
   
   b) A circular rod of 100 mm diameter and 500 mm length is subjected to a tensile force of 1000 kN. Determine the modules of rigidity, bulk modulus and change in volume it Poisson’s ratio=0.3 and Young’s modulus=2x10^5 N/mm^2.
End Semester Examination, Dec. 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101B)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly the following questions:
   a) Name operations involved in Carnot cycle.
   b) What is an ideal gas?
   c) Differentiate between saturated and superheated steam.
   d) What do you mean work done by steam?
   e) Define scavenging in two stroke engine.
   f) What is working principle of Francis turbine?
   g) What is mechanical power transmission?
   h) Where is flat belts used?
   i) What is Poisson ratio?
   j) Write applications of soldering.

2x10

PART-A

Q.2 a) At constant pressure, explain the formation of steam process from water.
   5
   b) Work out the tensile forces in the cables AB and BC as shown in the figure. You may assume pulleys used as frictionless.

\[\text{Diagram with forces and pulleys}\]

15
Q.3  a) Discuss simple impulse turbine (steam) with the help of a diagrams.  

   15  

b) What is thermal efficiency? Explain.  

   5  

Q.4  a) Describe otto cycle on P-V diagram.  

   10  

b) Compare otto and diesel cycle.  

   10  

   PART-B  

Q.5  a) What is chain drive? What are its advantages over belt and rope drive?  

   10  

b) What do you know about gear drive? Briefly explain types of gears with figures.  

   10  

Q.6  a) Discuss the terms: Stress, Strain Elastic limit, Hooke’s law, Modulus of elasticity.  

   10  

b) A cantilever 6m long carries point loads of 4kN, 2kN and 3kN at a distance 2m, 5m and 6m respectively from its fixed end. Draw SFD and BMD.  

   10  

Q.7  a) Define the following mechanical properties: strength, elasticity, plasticity, malleability, ductility.  

   10  

b) What is welding? Explain electric arc welding with a basic circuit diagram.  

   10  

1066/4
End Semester Examination, Dec. 2014
B. Tech. – Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101C)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Differentiate between heat and work.
b) Draw Carnot cycle on PV and T-S diagrams.
c) Calculate the efficiency of Otto cycle when compression ratio is 7.
d) Name different refrigerants used in vapour compression refrigeration cycle.
e) Define Poisson’s ratio. Give its value for any two engineering materials.
f) Write the relationship between E, C and µ.
g) Define complimentary shear stress.
h) Explain sagging and hogging.
i) Name different procedures used in resistance welding.
j) What is hydraulic stress?

2x10

PART-A

Q.2
a) A reversible heat engine delivers 0.6 kW power and rejects the heat energy to a reservoir at 300 K at the rate of 24 kJ / minute. Calculate the following:
i) Engine efficiency.
ii) Temperature of heat source.
iii) Entropy changes during heat addition process.

10

b) Discuss clearly the second law of thermodynamics with neat diagrams.

10

Q.3
a) Explain diesel cycle on P-V and T-S diagrams. Derive an expression for its efficiency.

10

b) Draw a block diagram of window type air conditioner and explain its working.

10

Q.4
a) Explain gear terminology with the help of a diagram.

10

b) Derive an expression for length of belt in an open belt system.

10
**PART-B**

Q.5  a) Derive the relationship between:
   i) $E, C, K$.  
   ii) $E, K, \mu$.  

   b) A steel bar, 1.5 m long, 50 mm wide and 20 mm thick is subjected to an axial tensile load of 120 kN. If the extension in the length of the bar is 0.9 mm, calculate stress, strain and modulous of elasticity of the bar material.

Q.6  a) A 10 m long simply supported beam has a uniformly distributed load of 4 kN / m across its full length. Draw SFD and BMD.

   b) What are different types of beams? Mention units of load, shear force and bending moment.


   b) Define the mechanical properties: strength, hardness, elasticity, plasticity toughness.
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
ENGINEERING MECHANICS (M-301)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define component of forces.  
b) Define rigid body.  
c) State the conditions of equilibrium of a system of coplanar concurrent forces.  
d) State some of the engineering applications of moment.  
e) Distinguish between the hinged support and the roller support.  
f) Explain the law of conservation of energy.  
g) Explain the term: radius of gyration.  
h) Explain polar moment of inertia.  
i) Define the moment of a force.  
j) State Varignon's principle of moments.

2x10

PART-A

Q.2  
a) Find the resultant using the resolution method for the coplanar, concurrent force system as shown in the figure.

b) State and explain the law of polygon of forces.

Q.3  
Determine the forces in the members AB, FE and AF of the truss as shown in the figure.
Q.4  a) Determine the centroid of area as shown in the figure.

b) State and prove the Parallel axis theorem for the moment of inertia of a plane lamina.

**PART-B**

Q.5  a) A particle travel 40 m during its 4 s and 42 m during its 6 s. Find its initial velocity and uniform acceleration. Also find the total distance travelled by the particle in 6s.

b) Derive the relation for the distance travelled by a body in the n\(^{th}\) second by a particle moving with uniform acceleration and with an initial velocity.
Q.6 An elevator has a down-ward acceleration of 0.75 m/s$^2$. What pressure will be transmitted to the floor of the elevator by a man weighing 800 N travelling in the lift? Find the pressure if the elevator had an up-ward acceleration of 0.75 m/s$^2$.

Q.7 A simple supported beam AB of span 5 m is loaded as shown in the figure. Determine the reaction using the virtual principle.
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
ENGINEERING MECHANICS (M-301A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) State Lami’s theorem.
b) Briefly explain resultant force.
c) Distinguish between a particle and a rigid body.
d) Define the moment of a force.
e) Distinguish between a deficit frame and a redundant frame.
f) State D’Alembert’s principle.
g) Explain polar moment of inertia.
h) Draw velocity-time graph and explain the same.

2½x8

PART-A

Q.2
a) Find the magnitude and direction of the resultant of two forces 40 kN and 60 kN acting at a point with an included angle of 40° between them. The force of 60 kN acts in the horizontal direction.

15

b) Prove Lami’s theorem.

5

Q.3
a) Determine the force acting on all the members of the truss subjected to the forces as shown in the figure.
b) Describe method of joint with a suitable example.

Q.4 Determine the position of the centroid of the area as shown in the figure.

**PART-B**

Q.5 A boy throws a ball so that it may just clear a wall 4.0 m high. The boy is at a distance of 5.0 m from the wall. The ball was found to hit the ground at a distance of 3.8 m on the other side of wall. Find the least velocity with which the ball can be thrown.

Q.6 a) A train of weight 2000 kN is pulled by an engine on a level track at a constant speed 35 km/h. The resistance due to friction is 10 N/kN of the train. Calculate the power of the engine.

b) An electric train travelling at 36 km/h is pulled up gradually, the retardation being 0.5 m/s$^2$.
Determine:
   i) How far will it travel before coming to rest?
ii) If the retarding force is $6kN$, what is the weight of the train.

10

Q.7 A uniform ladder of $5m$ long and weighing $200N$ rest on a smooth floor at $A$ and against a smooth wall at $B$ as shown in figure. A horizontal rope $PQ$ prevents the ladder from slipping. Using the method of virtual work to determine the tension in rope.

![Diagram of a uniform ladder resting on a smooth floor and against a smooth wall, with a horizontal rope PQ preventing it from slipping.]
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
THERMAL ENGINEERING-I (M-302)

Time: 3 hrs
Max Marks: 100

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1  a) What parameters are needed to be specified to define a thermodynamic system?
    b) Define an adiabatic process.
    c) How are fossil fuels formed?
    d) Why the excess air is required for ‘combustion’ in a fossil fuel fired thermal system?
    e) What do you mean by C.O.P.?
    f) Define the latest heat of vaporization.
    g) What are laws of perfect gases?
    h) What kind of steam is called dry saturated steam?
    i) What is the Gibb’s function?
    j) Define the adiabatic flame temperature.

2x10

**PART-A**

Q.2  a) Explain the open system, closed system and isolated system.  
     7
    b) Define path, process and cycle.  
     6
    c) Define mechanical, thermal and chemical equilibrium.  
     7

Q.3  a) i) What is the importance of second law of thermodynamics?
    ii) Define the internal energy.
    iii) Define the quality of steam.
    iv) Define the quasistatic process.
    v) What is a pure substance? Define the triple point and critical point.

2x5

b) A non-flow reversible process occurs for which the pressure and volume are correlated by the expression \( p = \left( \frac{v^2}{6} + \frac{6}{v} \right) \), where \( p \) is in bar and \( v \) is in \( m^3 \).
What amount of work will be done when volume changes from 2 to 4 \( m^3 \)?

10

Q.4  a) Derive an expression for the steady flow energy equation. State the assumptions made before the derivation.

10

b) Determine the amount of heat required to generate 5\( \text{kg} \) of steam at a pressure of 10 bar and temperature of 250 \( ^\circ C \) from water at 25 \( ^\circ C \). Take the specific heat for saturated water as 4.186 \( \text{kJ/kg} \) and specific heat for superheated steam as 2.1 \( \text{kJ/kg} \).

(Data from the steam table corresponding to 10 bar pressure, \( \text{trat.} = 179 \ ^\circ C \), \( h_t = 762.6 \text{kJ/kg} \) and \( h_{fg} = 2013.6 \text{kJ/kg} \))

10

**PART-B**

Q.5  a) Describe the constructional and operational aspects of an Orsat apparatus used for analyzing the gases from a boiler trial.

10

b) A sample of coal supplied to a boiler has the following composition by mass: carbon = 88\%, hydrogen = 5\%, oxygen = 3\%, nitrogen = 1\%, sulphur = 0.5\%, incombustible matter = 2.5\%.

Calculate:

i) Mass of air required for complete combustion of 1\( \text{kg} \) of coal.

ii) Dry analysis both by mass and volume of the products of combustion when 15\% excess air is supplied.

10

Q.6  a) A lump of steel of mass 8\( \text{kg} \) at 1000 \( K \) is dropped in 80\( \text{kg} \) of oil at 300 \( K \).

Make calculations for entropy change of steel, the oil and the universe. Take the specific heat of steel and oil as 0.5 \( \text{kJ/kg}K \) and 3.5 \( \text{kJ/kg}K \), respectively.

10

b) The cannot cycle ensures the maximum efficiency of any heat engine. Still it cannot be implemented in practice. Why? Define the performance of heat engine, refrigerator and heat pump. Prove that a heat pump is more efficient than a refrigerator.

10

Q.7  a) Derive an expression for the available energy for an infinite energy source at temperature \( T \) when the ambient temperature is \( T_0 \).

8
b) State and explain the Avogadro’s law. Derive an expression for the Vanderwals equation of state.

c) Define and explain the Zeroth law of thermodynamics. Why it is so called?
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
MANUFACTURING TECHNOLOGY-I (M-303 / M-303A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the main constituents of molding sand?
   b) What do you mean by dry sand and green sand?
   c) What are the functions of risers?
   d) What are chaplets?
   e) What is indirect extrusion?
   f) What is blanking operation?
   g) State the principle of rolling.
   h) What is embossing?
   i) What is resistance welding?
   j) What is soldering?

2x10

PART-A

Q.2 a) Explain the procedure of making a mold using a split pattern.
    10
   b) What are common allowances provided to the pattern?
    10

Q.3 a) Sketch and explain the construction and operation of a hot chamber die casting machine.
    10
   b) What are the causes and remedies of the following casting defects?
      i) Blow holes
      ii) Hot tears
      5
   c) Explain in brief the cleaning of castings (Fettling).
      5

Q.4 a) Distinguish between hot working and cold working.
    5
   b) What are the different types of forging? Explain drop forging and press forging. 10
c) Sketch and explain tube drawing process.  

**PART-B**

Q.5 a) Sketch and explain the following press tools:
   i) Progressive die  
   ii) Compound die  

   5x2

b) Sketch and explain stretch forming.  

   5

c) Sketch and explain bending and forming.  

   5

Q.6 a) Explain the characteristics and uses of three basic oxy-fuel welding flame patterns.  

   10

b) Explain the different type of welding positions with a neat sketch.  

   5

c) Write short notes on the following:
   i) Electrode  
   ii) Flux  

   5

Q.7 a) Explain TIG welding with its applications.  

   10

b) Explain submerged arc welding with its application.  

   10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
FLUID MECHANICS (M-304)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the importance of fluid mechanics?
     b) What is the pressure intensity inside a soap bubble?
     c) What is a potential line?
     d) What are different types of fluid flow?
     e) What is a pitot tube?
     f) Define the equation of continuity.
     g) What is turbulent flow?
     h) Define hydrodynamical smooth boundaries.
     i) How is the flow in pipeline classified?
     j) What is a branched pipe?

2x10

PART-A

Q.2  a) Explain Newton’s law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?

10

b) A rectangular plane surface 2 m wide and 3 m deep lies in water in such a way that its plane makes an angle of 30° with the free surface of water. Determine the total pressure and position of centre of pressure when the upper edge is 1.5 m below the free water surface.

10

Q.3  a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.

10

b) The velocity potential function (\( \phi \)) is given by an expression:

\[
\phi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2
\]

i) Find the velocity components in x and y direction.
ii) Show that \( \phi \) represents a possible case of flow.

\[ 5x2 \]

Q.4  

a) State Bernoulli’s theorem. Mention the assumptions made. How is it modified while applying in practice? List out its engineering applications.

\[ 10 \]

b) A 25 mm diameter nozzle discharges 0.76 m\(^3\) of water per minute when the head is 60 m. The diameter of the jet is 22.5 mm. Determine:

i) The values of coefficients \( C_e \), \( C_v \) and \( C_d \).

ii) The loss of head due to fluid resistance.

\[ 5x2 \]

**PART-B**

Q.5  

a) Explain uniform flow with source and sink. Obtain expressions for stream and velocity potential functions.

\[ 10 \]

b) A fluid of viscosity 0.7 Ns/m\(^2\) and specific gravity 1.3 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is given as 196.2 N/m\(^2\). Find:

i) The pressure gradient

ii) The average velocity

\[ 5x2 \]

Q.6  

a) Obtain expression for the velocity distribution for turbulent flow in smooth pipes.

\[ 10 \]

b) Hydrodynamically smooth pipe carries water at the rate of 300 l/s at 20\(^\circ\)C (\( P = 1000 \text{ kg/m}^3 \), \( v = 10^{-6} \text{ m}^2/\text{s} \)) with a head loss of 3 m in 100 m length of pipe. Determine the pipe diameter:

Use \( f = 0.0032 + \frac{0.221}{(Re)^{0.237}} \), \( h_f = \frac{f \times L \times V^2}{D \times 2g} \) and \( Re = \frac{\rho Vd}{\mu} \)

\[ 10 \]

Q.7  

a) What do you mean by equivalent pipe? Obtain an expression for equivalent pipe.

\[ 10 \]

b) State Buckingham’s \( \pi \)-theorem. What do you mean by repeating variables? How are the repeating variables selected in dimensional analysis?
End Semester Examination, Dec. 2014  
B. Tech. – Third Semester  
FLUID MECHANICS (M-304)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the terms:
   a) Viscous flow  
   b) Coefficient of contraction  
   c) Discharge measuring devices  
   d) Path line  
   e) Mouthpiece  
   f) Kinematic viscosity  
   g) Surface tension  
   h) Centre of pressure  
   i) Losses in pipes  
   j) Newtonian fluid

2x10

**PART-A**

Q.2  
a) Explain the concept of surface tension and derive an expression for surface tension on liquid jet.  

b) A circular plate 4 m dia is immersed in water in such a way that its greatest and the least depth below the free surface are 7 m and 3.5 m, respectively. Determine the total pressure on one face of the plate and position of centre of pressure.

10

Q.3  
a) Derive continuity equation in cylindrical polar coordinate.

b) Define stream function. A stream functions is given by:
   \[ \psi = 4x - 5y \]
   Calculate the velocity components and also magnitude and direction of the resultant velocity at any point.

8
Q.4  
a) Explain different conditions of equilibrium for a floating body.  
10  
b) Define the term stream function and explain its physical significance.  
10

**PART-B**

Q.5  Derive an expression for velocity distribution for viscous flow between two parallel plates when both plates are fixed. Also sketch the velocity distribution and shear stress distribution across a section of parallel plates.  
20

Q.6  
a) Explain the following:  
   i) Prandte mixing length hypothesis  
   ii) Separation and control  
5x2  
b) What is displacement thickness ($\delta^*$)? Derive an expression for it.  
10

Q.7  
a) Show by dimensional analysis that the power $P$ developed by a hydraulic turbine is given by  
   $$ P = \rho N^3 D^5 f \left[ \frac{N^2 D^2}{gH} \right] $$  
   Where $\rho$ is the mass density of liquid, $N$ is rotational speed, $D$ is the diameter of runner, $H$ is the working head and $g$ is the gravitational acceleration?  
12  
b) Explain importance of Buckingham’s $\pi$ theorem.  
8
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
FLUID MECHANICS (M-304A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) How does viscosity of a fluid vary with temperature?
b) What will be loss of head when pipes are connected in series?
c) What is pressure head?
d) What do you mean by dimensionless numbers?
e) What are the conditions of equilibrium of a floating body and a submerged body?
f) Define momentum correction factor.
g) What do you mean by Prandtl mixing length theory?
h) Define vena-contracta.
i) What is a velocity defect?
j) Define laminar flow and give one practical example.

2x10

PART-A

Q.2  a) Define surface tension. Prove that the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure is given by \( p = \frac{4\sigma}{d} \).

8

b) A triangular plate of base width 2 m and height 3 m is immersed in water with its plan making an angle of 60° with the free surface of water. Determine the hydrostatic pressure force and the position of centre of pressure when the apex of the triangle lies 5 m below the free water surface.

12

Q.3  a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.

12
b) The stream function for a two-dimensional flow is given by $\Psi = 2xy$, calculate the velocity at the point $P(2,3)$. Find the velocity potential function $\phi$.

Q.4 a) Define an orifice meter. Prove that the discharge through an orifice meter is given by the relation:

$$Q = C_d \frac{a_0 a_1}{\sqrt{a_1^2 - a_0^2}} \times \sqrt{2gh}$$

Where, $a_1 = area$ of pipe in which orifice-meter is fitted

$a_0 = area$ of orifice

b) A 2 m long pipeline tapers uniformly from 10 cm diameter to 20 cm diameter at its upper end. The pipe centre line slopes upwards at an angle of 30° to the horizontal and the flow direction is from smaller to bigger cross section. If the pressure gages installed at the lower and upper ends of the pipeline read 200 kPa and 230 kPa respectively, determine the flow rate and the fluid pressure at the mid-length of the pipeline. Assume no energy losses.

10

PART-B

Q.5 a) Prove that the velocity distribution for viscous flow between two parallel plates when both plates are fixed across a section is parabolic in nature. Also prove that maximum velocity is equal to one and a half times the average velocity.

b) Define the terms: kinetic energy correction factor and momentum correction factor.

5

Q.6 a) Obtain an expression for velocity distribution in turbulent flow for (i) smooth pipes and (ii) rough pipes.

b) A plate of 600 mm length and 400 mm wide is immersed in a fluid of specific gravity 0.9 and kinematic viscosity $10^{-4}$ m²/s. The fluid is moving with a velocity of 6 m/s. Determine:

i) Boundary layer thickness

ii) Shear stress at the end of the plate and

iii) Drag force on one side of the plate.

10

Q.7 a) For laminar flow in a pipe the drop in pressure $\Delta p$ is a function of pipe length $l$, its diameter $d$, mean velocity of flow $v$, and viscosity of fluid $\mu$. Using
Rayleigh’s method obtain an expression for $\Delta \rho$.

b) Find an expression for the power transmission through pipes. What is the condition for maximum transmission of power and corresponding efficiency of transmission?
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
MATERIAL SCIENCE (M-305)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Which of the following materials has FCC structure?
   i) Zinc ii) Gold iii) Magnesium iv) Cadmium
   b) Atomic packing factor of metals having BCC structure is _______.
   c) Bronze is an alloy of ________ and ________.
   d) Define Lever rule.
   e) Why normalising process gives less ductility as compared to annealing?
   f) What purpose does carbon serve in steel and CI?
   g) Define strain ageing.
   h) What do you understand by work hardening of a metal when it is being plastically deformed?
   i) Name three common methods to minimize corrosion.
   j) Separate out polymers from following materials:

PART-A

Q.2  a) Define atomic radius and find its relation with lattice parameter for simple cubic structure.

10

b) What are point defects? Sketch and show these defects.

10

Q.3  a) Define and classify solid solutions. Describe each briefly.

10

b) Sketch phase diagram for two metals which are completely soluble in liquid state and partially soluble in solid state without formation of chemical compound. 10
Q.4  a) Classify surface hardening processes.  
   b) Describe process of induction hardening. 

   **PART-B**

Q.5  a) Differentiate elastic deformation from plastic deformation.  
   b) Draw the relation between true stress and conventional stress as well as true strain and conventional strain.  

Q.6  a) Write different ways by which creep can be minimized.  
   b) What is the effect of corrosion? What is its mechanism? 

Q.7  a) What different additives are added to make plastics from polymer?  
   b) Differentiate particle-strengthened composites from dispersion strengthened composite. 

End Semester Examination, Dec. 2014
B. Tech. – Third Semester
MATERIALS AND HEAT TREATMENT (M-307)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are types of high speed steels? State their applications.
b) State the composition and applications of white cast iron.
c) What is fibre phase and matrix phase?
d) What is an endurance limit?
e) What is plasticity? State the materials/metals having this property.
f) Define an alloy. How is it different from metals?
g) What do you understand by a heat treatment process?
h) What is stress relieving annealing? State some of its applications.
i) What do you understand by temper britleness?
j) What is skin effect? In which case hardening process it is evident?

2x10

PART-A

Q.2
a) Briefly classify the engineering materials and explain them in detail.
   10
b) What are the alloying elements added in alloy steel? Discuss the effect of alloying elements on the properties of alloy steel.
   10

Q.3
a) What is a composite material? Explain its classification.
   5
b) Explain in brief the particle reinforced composite material.
   5
c) What are the benefits gained by using composite materials?
   5
d) Write a short note on advanced ceramic materials.
   5

Q.4
a) What is mechanical failure? Explain the mechanism of failure with help of stress-strain curves.
   10
b) Explain in detail the tensile and compressive tests with their importance in mechanical industries.  

**PART-B**

Q.5  

a) Draw a neat diagram of $Fe - Fe_3C$ equilibrium diagram. Mark each line, phase area and transition points on the diagram.  

12  

b) Discuss the transformation of austenite into coarse and fine pearlite using cooling curves.  

8  

Q.6  


10  

b) Explain interrupted quenching. How it is related to martempering?  

10  

Q.7  

a) What is flame hardening? Explain the process in detail and also suggest the applications.  

10  

b) What do you understand by case depth in case hardened steel? Explain any one of them.  

10
End Semester Examination, Dec. 2014
B. Tech. – Third Semester
METROLOGY (M-308)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) What is hole basis system?  
(b) What are different grades of slip gauges?  
(c) What are unilateral and bilateral tolerances?  
(d) What do you mean by selective assembly?  
(e) Write down the principle and use of sine bar.  
(f) What are primary and secondary textures?  
(g) What is rake correction in the measurement of effective diameter of screw thread?  
(h) What is the best size wire?  
(i) What are different types of irregularities found in circular parts?  
(j) What is base pitch of a spur gear?

Q.2  
(a) Define the following:  
   i) Tolerance  
   ii) Basic size  
   iii) Allowance  
   iv) Upper deviation  
   v) Lower deviation
   
(b) Determine the dimensions, tolerances and allowances for 20 mm hole and shaft pair designated as $H_7h_8$.
   
  Given:  
  i) $20 \text{ mm}$ lies in the diameter steps of $18 \text{ mm}$ to $30 \text{ mm}$.  
  ii) $IT_7 = 16i$  
  iii) $IT_8 = 25i$  
  iv) Fundamental deviation of $H$ and $h$ is 0.

Q.3  
(a) Explain briefly line standard and end standard.

(b) Explain the working principle of an optical comparator.
Q.4  a) Define the following with reference to surface roughness:
   i)  Ra value
   ii) RMS (Rq) value
   iii) Rz value
   iv) Sampling length
   v) Lay

   b) Describe the working principle of a Taylor Hobson Talysurf roughness
       instrument for the measurement of surface roughness.

Q.5  a) Name the various types of pitch errors found in a screw thread.

   b) Describe with a neat sketch the two-wire method of measuring the effective
       diameter of an external thread.

Q.6  a) Define straightness error. Name commonly used methods of measuring
     straightness.

   b) Describe the spirit level or autocollimator method of measuring straightness
       of a surface.

Q.7  a) Describe circular pitch, diametral pitch and module of a gear.

   b) Explain the checking of chordal tooth thickness of a spur gear by gear tooth
       vernier.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
THERMAL ENGINEERING-II (M-401)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) In what respects, 4-stroke cycle compression ignition process differs from that of spark ignition process?
b) What is the importance of delay period? Should the delay period be zero?
c) Why in practice a throttle value is used in vapour compression refrigerator rather than an expansion cylinder to reduce pressure between the condenser and the evaporator?
d) What are the different types of losses in steam turbine?
e) What is the significance of draught in boiler practice?
f) When is multi-stage compression used for air? What are its advantages?
g) Why Carnot cycle cannot be considered as the theoretical cycle for steam power plants even though its efficiency is maximum?
h) What are the effects of supersaturation on discharge and heat drop?
i) Differentiate between low pressure boiler and high pressure boiler.
j) Why governing is necessary in steam turbines?

2x10

PART-A

Q.2 a) A steam turbine receives steam at 15 bar and 350°C and exhausts to the condenser at 0.06 bar. Determine the thermal efficiency of the ideal Rankine cycle operating between these two limits.

10

b) Prove that the discharge will be maximum for a given height of the chimney when

\[ T_g = 2T_a \left( \frac{m+1}{m} \right) \]

10

Q.3 The data pertaining to impulse turbine is as follows. Steam velocity=500 m/s, blade speed=200 m/s, exit angle of moving blade=25°, speed Nozzle angle=20°. Neglecting the effect of friction when passing through the blade passages: Calculate:
a) Inlet angle of moving blade.
b) Exit velocity and direction  
c) Work done per kg of steam  
d) Axial trust and power for a steam flow rate of 5 kg/s.

Q.4  
a) What factors contribute to less of efficiency in a surface condenser?

10

b) In a surface condenser, the vaccum maintained is 70 cm of Hg. The barometer reads 75.4 cm of Hg. If the temperature of condensate is 18\(^{\circ}\) C, calculate:  
i) Partial pressure of air  
ii) Mass of air per kg of steam  
iii) Vaccum efficiency  
Take R=0.237 kJ/kg K

10

PART-B

Q.5  
In a single stage acting air compressor, the index of compression and expansion may be taken as 1.2 and it may be assumed that the area of the indicator diagram that obtained is increased 10\% by valve action. The clearance volume may be assumed as \(\frac{1}{19}\) th of the swept volume. A compressor of this type is required capable of compressing 7.6 m\(^{3}\) of free air per minute. Compressor works from 100 KPa to 900 KPa. It runs at 240 rpm with a mean piston speed of 220 m/min. Find the bore and stroke of the cylinder and work done per revolution.

20

Q.6  
a) Draw a circuit diagram and describe the working of battery ignition system used for a four-cylinder petrol engine.

10

b) What is meant by scavenging? What are the different types of scavenging?

10

Q.7  
a) Define the process of sensible heating and cooling of moist air.

10

b) 12 tonnes of fish are stored in a cold storage plant. The fish is supplied at a temperature of 27\(^{\circ}\) C. The fish is stored in cold storage which is maintained at -9\(^{\circ}\) C. The freezing point of fish is – 4\(^{\circ}\) C. Specific heat of fish above freezing point is 2.93 kJ/kg K and that below the freezing point in 1.256 kJ/kg K. Latent heat of fish is 235 kJ/kg K. The power required to drive the plant is 100 kW.
Determine:

i) The time required to achieve the cooling

ii) Capacity of the plant.

Assuming the actual C.O.P. of the plant as 0.5 of the Carnnot C.O.P.
End Semester Examination, Dec. 2014
B. Tech. – Fourth Semester
THERMAL ENGINEERING (M-401A)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) What is meant by cylinder row and cylinder bank?
(b) Why rich mixtures are required for starting and during idling of an engine?
(c) What do you understand by solid injection?
(d) Establish a relation between \( m_{bt} \) and \( \eta \).
(e) Define degree of saturation and relative humidity.
(f) Which refrigerants are used for the following applications?
   i) Hotel air-conditioning
   ii) Meat-Packing plant
   Justify your answers giving the reasons.
(g) Where centrifugal compressors are preferred over reciprocating compressors in a refrigerating system? Why?
(h) What are the properties of working fluid for Rankine cycle.
(i) Show with the help of a P-V diagram, the effect of reducing back pressures on
   i) Steam engine
   ii) Steam turbines.
(j) Define degree of reaction.

2x10

PART-A

Q.2  
(a) An engine working on diesel cycle is to run at full load condition for which it is designed. The minimum and maximum temperature of the cycle are limited to \( T_1 \) and \( T_2 \). If such engine is to be designed for maximum power, find the expression for the compression ratio in terms of given parameters considering all ideal conditions of the air standard cycle.

12

(b) Draw actual valve timing diagram for petrol engine. Give reasons for early opening of exhaust and late closing of inlet-valve.

8

Q.3  
(a) Describe the stages of combustion in S.I. engines with help of \( p-\theta \) diagram.

14
b) What are the factors which should be taken into account to avoid knocking?

Q.4 a) How does the mixture of air and fuel in the combustion of C.I. engine differ from that of S.I. engine?

b) A single cylinder 4-stroke cycle oil engine works on diesel cycle. The following readings were taken when the engine was running at full load.
Area of indicator=3 cm$^2$,
Length of the diagram= 4 cm
Spring constant=10 bar/cm$^2$ m,
Speed of engine=400 rpm,
Load on the brake=380 N,
Spring reading=50 N,
Dia of the brake drum=120 cm,
Fuel consumption=2.8 kg/hr,
Colorific valve of fuel=42,000 kJ/kg,
Diameter of the cylinder=16 cm
Stroke of the piston=20 cm
Determine:
 i) Brake Power
 ii) Brake Specific Fuel Consumption
 iii) Brake Thermal Efficiency

PART-B

Q.5 a) Steam 15 bar and 300$^0$ C is supplied to an engine working on Rankine cycle. The exhaust takes place at 0.8 bar. Calculate:
 i) The condition of steam after isentropic expansion.
 ii) Rankine cycle efficiency.
 iii) The mean effective pressure.
 iv) The steam consumption per kWh.

b) What is meant by compounding of steam turbine? Explain the velocity compounding in details.

Q.6 The sling psychrometer reads 40$^0$ C DBT and 20$^0$ C WBT. Calculate the followings:
 i) Specific humidity
 ii) Relative humidity
 iii) Vapours density in air
 iv) Dew-point temperature
v) Enthalpy of the mixture per kg of dry air. 
Assume atmospheric pressures to be 1.03 bar. Also find the above quantities if the pressure at a height of 1000 metres is 0.95 bar.

Q.7  a) Explain the working of evaporative condenser with a neat diagram.

10

b) An air refrigerator working on Bell-Coleman cycle takes the air into the compressor at 1 bar and -70°C and it is compressed isentropically is 5.5 bar and it is further cooled to 18°C at the same pressure. It is then expanded in an expansion cylinder to 1 atm and it is discharged into the refrigerating chamber. Find the C.O.P. of the system if
i) The expansion is isentropic
ii) The expansion fellow the law $PV^{1.28} = C$
Take $\gamma = 1.4$ and $C_p = 1kJ/kgK$ for air.
End Semester Examination, Dec. 2014  
B. Tech. – Fourth Semester  
FLUID MACHINES AND TURBOMACHINERY (M-402)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1 Write short notes on:
   a) Slip  
   b) Air vessel  
   c) Indicator diagram  
   d) Similitude  
   e) Net positive suction head  
   f) Governing of turbine  
   g) Jet propulsion  
   h) Propeller turbine  
   i) Separation  
   j) Manometric head

   2x10

**PART-A**

Q.2 a) A square plate weighing 115 N and of uniform thickness and 30 cm edge is hung so that horizontal jet 2 cm diameter and having a velocity of 15 m/s impinges on the plate. The centre line of the jet is 15 cm below the upper edge of the plate and when the plate is vertical the jet strikes the plate normally and at its centre. Find what force must be applied at the lower edge of the plate in order to keep the plate vertical. If the plate is allowed to swing freely, find the inclination to the vertical which the plate will assume under the action of the jet. 10

b) A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal force exerted on the plate:
   i) When the plate is stationary?
   ii) When the plate is moving with a velocity of 15 m/s in the direction of jet away from the jet?

   Also determine the power and efficiency of system when the plate is moving.

   10
Q.3  a) A Pelton wheel is required to develop 6 MW when working under a head of 300 m. It rotates with a speed of 550 rpm. Assuming jet ratio as 10 and overall efficiency is 85%.

Calculate:
   i) Diameter of wheel
   ii) Quantity of water required
   iii) Number of jets.

Assume suitable values for the velocity coefficients and the speed ratio.

b) Establish a relationship between bucket speed and jet velocity for maximum efficiency of impulse turbine.

Q.4  a) Differentiate between Francis and Kaplan turbine.

b) What are different types of draft tubes and why they are essential in reaction turbines?

**PART-B**

Q.5  a) Define the following terms:
   i) Cavitation
   ii) Specific speed

b) What is Thoma’s cavitation factor and what is its significance for water turbines?

   5

   c) Explain the term unit quantities and what is their importance in water turbines?

   7

Q.6  a) A three stage centrifugal pump has impellers 30 cm diameter and 1.5 cm width at outlet. The velocity of water at inlet is radial, the vanes are curved back at an angle of 30° to the tangent at outlet and occupy 8 percent of the outlet area. While running at 1000 rpm the pump delivers 40 liters/second with 85% manometric efficiency and 75% overall efficiency. Calculate the head generated by the pump and the input power.

   10

b) Derive an expression for minimum starting speed of a centrifugal pump.

   10
Q.7  

a) Derive an expression for pressure head due to acceleration of piston of a reciprocating pump. Assume motion of the piston to be simple harmonic.

b) Show that the work saved in overcoming friction in the pipelines by fitting air vessels is 84.8% for a single acting reciprocating pump and 39.2% for a double acting pump.