Q.1  a) Give the different forms of continuity equations.
b) For flow over a flat plate, discuss the behavior of governing equations used for solving the flow under following cases:
   i) Subsonic flow (M<0.4).     ii) Supersonic flow (M>1.5).
c) What is time marching and space marching? Can a governing equation be both space and time marching? Give an example for the same.
d) Define Jacobians. Give its mathematical form.
e) What are shock capturing and shock fitting techniques? Explain.
f) Define explicit and implicit schemes.
g) What are the differences between RANS, LES and DNS?
h) List out different RANS techniques for flow computation.
i) Define eddy viscosity and eddy diffusivity with relations.
j) Give the vector form of governing equation of CFD.

Q.2  a) Derive the continuity equation in non-conservational form. Convert the relation obtained into conservational form.
b) What is substantial derivative and derive it? Explain its role in governing CFD equations.
c) Give the classification of PDEs with examples. Which are the methods used for classifying a PDE and using them classify the following system of equation:

\[
\begin{align*}
  a_1 \left( \frac{\partial u}{\partial x} \right) + b_1 \left( \frac{\partial u}{\partial y} \right) + c_1 \left( \frac{\partial v}{\partial x} \right) + d_1 \left( \frac{\partial v}{\partial y} \right) &= f_1 \\
  a_2 \left( \frac{\partial u}{\partial x} \right) + b_2 \left( \frac{\partial u}{\partial y} \right) + c_2 \left( \frac{\partial v}{\partial x} \right) + d_2 \left( \frac{\partial v}{\partial y} \right) &= f_2
\end{align*}
\]

d) Define FDM. Briefly write the governing equation for discretization used in FDM.

e) Give the forward, backward and central difference for the following:

\[
\begin{align*}
  &i) \left( \frac{\partial u}{\partial x} \right) \\
  &ii) \left( \frac{\partial u}{\partial y} \right) \\
  &iii) \left( \frac{\partial^2 u}{\partial x^2} \right) \\
  &iv) \left( \frac{\partial^2 u}{\partial x \partial y} \right)
\end{align*}
\]

c) Differentiate explicit and implicit approach with a proper example.

Q.3  a) Define eddy viscosity and eddy diffusivity with relations.
b) Write a short note on types of errors.
c) Write a note on stretched grids. Give the transformed 2D continuity equation for the following stretched grid:

\[
\begin{align*}
  x &= \xi \\
  y &= e^\eta - 1
\end{align*}
\]
**PART-B**

Q.5  
 a) Write note on pressure correction method and list out the step for SIMPLE algorithm.  

 b) Write short notes on:  
   i) MacCormack technique.  
   ii) Lax-wendroff scheme.  
   iii) Give the difference between the above two techniques.  

Q.6  
 a) Describe the methodology for 1D and 2D diffusion. Explain central differencing scheme for the above problem.  

 b) Draw the flow charts for:  
   i) SIMPLE algorithm.  
   ii) PISO algorithm.  

Q.7  
 a) Write short notes on:  
   i) Boundary fitted coordinate systems.  
   ii) Stretch/compressed grid.  

 b) Describe the spatial filtering of unsteady NSE and derive them. Write note on initial and boundary conditions of LES.
Q.1 Answer any five of the following:

a) How do we achieve short take-off and landing of an aircraft? How do the gliders and the powered gliders take off?
b) Plot typical pressure distribution on an airfoil in a subsonic flow at low angle of attack. Show the changes that take place when the angle of attack is increased.
c) What do understand by Frise ailerons, horn balance and mass balance that are used on control surfaces?
d) What do you understand by a hybrid propellant rocket engine?
e) What are the different types of loads that the main landing gear is subjected to during landing?
f) What are different types of construction approaches used in the design of aircraft fuselage?
g) What frequencies are allocated to different navigation and communication systems?
h) Name any two aircraft configurations which can attain vertical take-off.
i) What do you understand by staging of rockets? Why do we need it?
j) Name various types of hydraulic pumps that can be employed to supply hydraulic fluid for operating various services of the aircraft.

**PART-A**

Q.2 a) Explain the features of a transport aircraft, a fighter aircraft, a helicopter and a spacecraft.  
   b) What devices can be used to achieve short take-off run? Explain.  
   c) How does a helicopter move in forward direction and execute turns and climbs?

Q.3 a) What are main sources of drag? What is induced drag? How do finite wings generate induced drag?  
   b) What is difference between static stability and dynamic stability?  
   c) What are conditions of static lateral and directional stability? Draw typical pitching moment vs $\alpha$ plots in case of a statically stable and unstable airplane.

Q.4 a) With the help of schematic diagrams, explain the function of a piston engine, turbo-prop engine, turbo-jet engine and its different variants.  
   b) With the help of simplified diagrams, explain the functions of a typical solid propellant rocket engine and a typical liquid propellant rocket engine.

**PART-B**

Q.5 a) What is the importance of strength / weight ratio in the design of aircraft and its components?
b) Explain the type of loads that are resisted by the following structural components of an aircraft during flying: i) fuselage ii) wings, and iii) tailplane

Q.6 a) Describe instrument landing system with the help of a block diagram and suitable illustrations.
   b) Write short notes on:
      i) DME.
      ii) RMI.

Q.7 a) Explain the need and working of selector valve and sequence valve. Why and how are the hydraulic reservoirs pressurized?
   b) Explain typical low pressure and high pressure pneumatic systems which are used in an aircraft.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
AERODYNAMICS (AE-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 Answer the following questions (Any ten):
   a) Define centre of pressure.
   b) What do you understand by incompressible flows? Under what Mach number do
      we consider a flow to be incompressible?
   c) How does the lift coefficient vary with angle of attack for an airfoil w.r.t. Reynolds
      number?
   d) Explain Kutta Joukowski theorem.
   e) Define Prandtl number and state its importance.
   f) Define pressure coefficient and stagnation point. What is the value of Cp at
      stagnation point?
   g) State Helmholtz vortex theorems.
   h) How is Kutta condition applied in vortex panel method?
   i) Write down the Navier Stokes equation for unsteady, compressible, three
      dimensional viscous flow in the X-direction and state what each term stands for.
   j) Differentiate between laminar and turbulent boundary layers.
   k) State the factors which encourage boundary layer transition. 2x10

PART-A

Q.2 a) Explain the airfoil characteristics and its different methods of nomenclature. 10
     b) Explain the concept of Buckingham pi theorem. Derive the similarity parameter
        with the help of this theorem. 10

Q.3 a) How does a vortex of circulation \( \Gamma \) behave under the influence of the uniform flow
     with free stream velocity \( V_\infty \)? Explain the Kutta Joukowski theorem on the basis
     of its results. Explain mathematically. 10
     b) Drive an expression for induced velocity for a circular ring vortex filament. 10

Q.4 Derive the governing equations of Prandtl’s classical lifting line theory and from there
     obtain the induced angle of attack and the induced drag as functions of aspect ratio. 20

PART-B

Q.5 Explain the numerical nonlinear lifting line method. 20

Q.6 Consider a flat plate at zero angle of attack in an airfoil at standard sea level
     conditions \( (p_\infty = 1.01 \times 10^5 \, N/m^2 \text{ and } T_\infty = 288K) \). The chord length of the plate is 2m.
     The plan form area of the plate is 40m\(^2\). At standard sea level condition, \( \mu_\infty = 1.7894 \times 10^{-5} \, k/\text{ms} \).
     Assume the wall temperature is the adiabatic wall temperature \( T_{aw} \). Calculate the friction drag on the plate when free stream velocity is:
Q.7  

a) What are the different methods used for the prevention of boundary layer separation? Elaborate your answer with the significance of aerodynamics.  

b) Explain the different methods used for the reduction of the Induced drag. Pressure drag and skin friction drag.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
AIRCRAFT STRUCTURE-I (AE-402A)

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) Explain principle of superposition.
   b) Define redundancy.
   c) Explain the role of longerons and stressed skin structure in fuselage design.
   d) State the principle of St. Venant.
   e) Define factor of safety.
   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 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 at its end as shown in the figure.

<table>
<thead>
<tr>
<th>Distance (mm)</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>-0.5</td>
<td>-1.6</td>
<td>-2.5</td>
<td>-1.9</td>
<td>0</td>
<td>2.5</td>
<td>4.9</td>
<td>10.6</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 as shown in the figure.

![Deflected shape of propped cantilever](image)

20

Q.3 A cylindrical vessel having an internal diameter of 2 m is fabricated from plates 20 mm thick. If the pressure inside the vessel is 1.5 N / mm² and in addition, the vessel is subjected to an axial tensile load of 2500 kN, Calculate the direct and shear stresses on a plane inclined at an angle of 60° to the axis of vessel. Calculate also the maximum shear stress.

20

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

![Truss diagram](image)
**PART-B**

Q.5 An aircraft having a total weight of 250 kN and a tricycle undercarriage lands at a vertical velocity of 3.7 m/s, such that the vertical and horizontal reactions on the main wheels are 1200 kN and 400 kN respectively; at this instant the nose wheel is 1.0 m from the ground, as shown in the figure. If the moment of inertia of the aircraft about its CG is $5.65 \times 10^8$ Ns² 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 Calculate the vertical deflection of the point B and the horizontal movement of D in the pin-jointed framework shown below by using complementary energy method: all members are linearly elastic and have cross sectional areas of 1800 mm². E for the material of the members is 200,000N/mm².

Q.7 a) Determine the deflection curve and deflection of the free end of the cantilever beam shown below; the flexural rigidity of the cantilever beam is EI and its section is doubly symmetrical.

Given: $\mu = \frac{M_y}{EI_{yy}}$, $\nu = \frac{M_x}{EI_{xx}}$
b) Determine the shear flow distribution in the thin walled Z-section in the figure below due to shear load $S_y$ applied through the shear centre of the section.

Given:

$$q_x = \left( \frac{S_y I_{xy} - S_x I_{xy}}{I_{xx} I_{yy} - I_{xy}^2} \right) \int_0^s tx \, ds - \left( \frac{S_y I_{yy} - S_x I_{xy}}{I_{xx} I_{yy} - I_{xy}^2} \right) \int_0^s ty \, ds$$
Q.1 a) Define thermal radiation?
b) What is compressibility of a fluid? Write a few lines about control volume approach with the help of diagram.
c) What are the advantages of turbofan engine over turbojet engine?
d) Define isentropic process?
e) Determine the speed of sound in Neon (Ne) at 120°C. (MW=20 kg/kmol).
f) Define Octane number?
g) Write down any four basis of comparison between diesel engine and petrol engine.
h) How heat transfer occurs when water is boiling? Explain a little.
i) How do we calculate the efficiency of the propeller?
j) Why are metals good conductors of heat and electricity?

Q.2 a) Define Conduction heat transfer? One face of a copper plate 3 cm thick is maintained at 4500 degC, and the other face is maintained at 100 degC. How much heat is transferred through the plate?

Thermal Conductivity of copper is 370 w/m.degC at 250 degC.  

b) The convection heat transfer co-efficient is 25 W/m². Calculate the heat transfer?

c) A horizontal steel pipe having a diameter of 5 cm is maintained at a temperature of 50deg.C in a large room where the air and wall temperature are at 20deg.C. The surface emissivity of the steel may be taken as 0.8. Calculate the total heat lost by the pipe per unit length? H=6.5 W/m².deg.C.

Q.3 a) Explain the concept of actuator disc theory for propellers and derive the expression.

b) Explain the blade element theory for propellers and derive the expression.

Q.4 a) The following data was obtained during the trial of a two cylinder, two-stroke engine:

| Bore and stroke=100 mm and 150 mm. |
| Area of positive and negative loops of indicator diagram=6 sq.cm and 0.25 sq.cm. |
| Length of the indicator=6m |
| Spring constant=3.8 bar per cm. |
| Net brake load and effective drum radius=235 N and 0.42 m |
| Fuel consumption =4.5 kg / hr |
| If the engine turns 1600 rev/min and fuel used has a calorific value of 43.5 MJ/kg; determine |

i) Indicated power and brake power.

ii) Mechanical and thermal efficiencies.
b) Explain the different strokes of IC engines? Explain the 2 strokes through a P-V diagram? Also draw the valve timing diagram for a 2 stroke engine?  

**PART-B**

Q.5  

a) A needle nose projectile travelling at a speed of $M=4$ passes 350 above an observer. Find the projectile’s and determine how far beyond the observer the projectile will first be heard. 5  

b) Drive an expression for choked flow condition ($m$ and $A/A^*$). 5  

c) Describe the components of a centrifugal flow compressor along with the diagram. 10

Q.6  

a) Write down the advantages and disadvantages of gaseous fuels. 10  

b) Write the advantages and disadvantages of liquid fuels. 10

Q.7  

a) A 4-stroke six cylinder engine has a bore of 80 mm and stroke of 100 mm. while running at a mean speed of 12.5 m/s, its fuel consumption is 20 kg/hr ad develops a torque of 150 Nm.  
Assuming a clearance volume of 75 cc per cylinder, determine.  

i) Brake power and break mean effective pressure.  
ii) Brake thermal efficiency if calorific value of fuel used is 42.5 MJ/kg.  
iii) Relative efficiency on the basis of brake thermal efficiency. 10  

b) Draw and explain the steps of ideal cycle for Jet engine without afterburner. Draw T-S diagram. 10

11/3
End Semester Examination, Dec. 2015
B. Tech. – Third / Fourth Semester
AIRCRAFT MATERIALS (AE-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) Describe the ductility and elasticity of material.
b) Explain the difference between yield strength and yield point.
c) Describe alloying theory of metals.
d) What is formability and machinability?
e) What are heat treatment processes?
f) Explain the Alclad and duralumin alloys and their properties.
g) Explain the aluminum alloys designation system.
h) Explain the heat treatment for Inconel alloys.
i) Explain the concept of superalloys and their properties.
j) What are composites and how are they classified?

PART-A

Q.2 a) What effects occur on the materials of aerospace vehicles during flight? What are the factors affecting choice of materials for aerospace vehicles?
b) What are the allotropies of Iron? Indicate their crystal structure and properties. At what temperatures do they occur during cooling and heating of Iron-Carbon Alloy?

Q.3 a) Define corrosion. What are corrosion resistant steels? What are different corrosion prevention methods?
b) Describe pickling, polishing and passivating processes used for corrosion resistant steels.

Q.4 a) What is surface hardening of metals? Explain various processes used for surface hardening.
b) What is crevice corrosion, its importance, and how it can be prevented?

PART-B

Q.5 a) Explain the difference between strain-hardened and heat-treatable aluminum alloys and their applications.
b) Explain the heat treatment of magnesium alloys. How magnesium alloy is made non-combustible?

Q.6 a) What are the allotropies of titanium and their significance in titanium alloys? What are the advantages of all alpha and heat treatable beta titanium alloys?
b) Give the composition of Monel and K-Monel alloys and their applications.

Q.7 a) Explain the different types of fibers used in fiber reinforced composites.
b) Explain the different polymer composites.

12/3
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
AIRCRAFT MATERIALS (AE-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 pickling and casehardening.
    b) Draw binary-phase diagram for iron-carbon.
    c) Classify and explain nickel alloys.
    d) What is anisotropic lamina?
    e) What is gun metal alloy?
    f) What are the different aspects that lead to failure of any structure?
    g) What is k-monel?
    h) Draw temperature variation sketch for concorde.
    i) What will be S.A.E steel numbering system for carbon steel and plain carbon steel?
    j) What do you mean by anodic metal (in relation to corrosion of dissimilar metal)?

2x10

PART-A

Q.2  a) Write factors that affects the choice of materials for different parts of aircraft from economic points of view. 10
    b) What is Rockwell hardness and Izod test? 10

Q.3  a) Explain aluminum-copper. Binary diagram. 6
    b) Briefly write the corrosion protection process for different materials in aerospace industry. 6
    c) Arrange magnesium, aluminum, zinc, chromium, iron, nickel, brass, copper in anodic series i.e. element with higher electric potential on top. 4
    d) What is weldability and formability? 4

Q.4  a) Write normalizing steps for mild carbon steel. 7
    b) What is spot welding? Write formula for finding heat energy generated in this welding process. 7
    c) What are the uses of corrosion resisting steel? 6

PART-B

Q.5  a) Explain two varieties of aluminium alloy. 7
    b) Write a note on magnesium alloy and its use. 7
    c) Write various causes of magnesium corrosion. 6

Q.6  a) What is inconel alloy and its use? 10
    b) What are the constituent’s elements of brass and bronze and their uses? 10

Q.7  a) Why do we need composite materials? 6
    b) What are the advanced fibres? 7
    c) What are the functions of a matrix material? 7
End Semester Examination, Dec. 2015
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 five of the following questions:
   a) Which properties of the mesh and structure remain unaltered even after the conformal transformation?
   b) What are the assumptions and basic principle of Polhamus theory for the calculation of drag of delta wing?
   c) How do the pressure, density, temperature, Mach number, velocity, total pressure, total temperature, enthalpy and entropy change behind the normal shock wave?
   d) Explain the concept for Mach reflection for an oblique shock.
   e) What is the major advantage of supercritical airfoil? Explain its aerodynamics.
   f) Explain briefly the method of characteristics.

   4x5

PART A

Q.2 Transform a circle into cambered airfoil using the Kutta Zhukovsky transformation with the principle of conformal transformation. Calculate the velocity and pressure distribution on the Zhukovsky airfoil.

Q.3 a) Explain the subsonic characteristics of delta wing in detail.
   b) Explain the assumptions and derive the relationship between coefficient of lift and drag for low aspect ratio aircraft.

   8

Q.4 a) Using the energy equation, find out the relationships between the actual properties and characteristic properties, i.e. temperature, pressure, density and Mach number?
   b) Consider a point in an airflow where the local Mach number, static pressure and static temperature are 3.5, 0.4 atm and 195 K, respectively. Calculate the local values of $p_0$, $T_0$, $T_*$, $a_*$ and $M_*$ at this point.

   12

PART B

Q.5 Consider an oblique Shock wave generated by a corner having 15° deflection angle. The free stream mach number ahead of the corner is 4, the flow pressure and temperature are standard sea level conditions. The oblique shock wave subsequently impinges on the straight wall opposite to the compression corner. Draw the flow geometry. Calculate the angle of reflected shock wave $\phi$ relative to the straight wall. Also, obtain the pressure, temperature and Mach number behind the reflected wave.
   Note: Use the $\theta - \beta - M$ graph given at the end of question paper.

Q.6 a) What is the critical Mach number? Derive an expression for $C_P$ at critical Mach number.
   b) Explain the concept of sound barrier with the help of the explanation of drag divergence Mach number.
   c) Write a short note on Area Rule.
   d) Explain the use and aerodynamics of supercritical airfoil.

   5x4
Q.7 Describe with all relevant equations, how the method of characteristics can be used to design a supersonic nozzle. State and explain the compatibility relations for characteristics lines.
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
AIRCRAFT PROPULSION-II (AE-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 Briefly explain the following:
   a) Define compressibility of a fluid using control volume approach.
   b) Determine the speed of sound in Helium (He) at 120°C. (MW = 4kg/kmol).
   c) Define degree of reaction of axial flow compressor.
   d) What is bypass ratio in a turbofan engine?
   e) What is Froude efficiency?
   f) What are the thermodynamic parameters used in designing and optimization of turbofan engine?
   g) What are momentum thrust and pressure thrust of a propulsive duct?
   h) What is power input factor and why is it used?
   i) What is the relationship between fan pressure ratio vs SFC and fan pressure ratio vs specific thrust?
   j) What is atomization?

   2x10

PART-A

Q.2 Determine the specific thrust and SFC for a simple turbojet engine having the following component performance at the design point at which the cruise speed and altitude are M 0.8 and 10,000m.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor Pressure Ratio</td>
<td>8.0</td>
</tr>
<tr>
<td>Turbine Inlet Temperature</td>
<td>1200K</td>
</tr>
<tr>
<td>Isentropic Efficiency:</td>
<td></td>
</tr>
<tr>
<td>Of compressor, $\eta_c$</td>
<td>0.87</td>
</tr>
<tr>
<td>Of turbine, $\eta_t$</td>
<td>0.90</td>
</tr>
<tr>
<td>Of intake, $\eta_i$</td>
<td>0.93</td>
</tr>
<tr>
<td>Of propelling nozzle, $\eta_j$</td>
<td>0.95</td>
</tr>
<tr>
<td>Mechanical transmission efficiency $\eta_m$</td>
<td>0.99</td>
</tr>
<tr>
<td>Combustion efficiency $\eta_c$</td>
<td>0.98</td>
</tr>
<tr>
<td>Combustion pressure loss $\Delta p_b$</td>
<td>4% comp. deliv. press.</td>
</tr>
</tbody>
</table>

Note:-From the ISA table, at 10,000m $p = 0.2650 \, \text{bar}$, $T = 223.3K$, and $a = 299.5 \, \text{m/s}$

Q.3 a) Write the factors affecting stage pressure ratio of axial flow compressors.

   10

b) Write a short note on Turbofan Engine along with a basic diagram.

   10
Q.4  a) What are the two types of thrust augmentation methods? Explain.  
     12

b) Explain basic operation of axial flow compressor with diagram.  
    8

    PART-B

Q.5  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 $m_c/m_t$ 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

     Find the thrust under sea level static conditions where the ambient pressure and  
     temperature are 1.0 bar and 288 K.  
     20

Q.6  a) Write about working and parts of axial flow compressor. Also draw a labeled  
     diagram.  
     10

b) Write the differences between turbojet and turbofan engines (at least five).  
   10

Q.7  a) Draw the characteristic curve of the centrifugal compressor and explain in detail.  
   10

b) A needle-shaped nose projectile travelling at a speed of $M=3.5$ passes 450m  
   above an observer. Find the projectile’s velocity and determine how far beyond the  
   observer the projectile will first be heard.  
   5

c) What are the advantages of using convergent nozzle in gas turbine engines?  
   5
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
AIRCRAFT STRUCTURES-II (AE-503A)

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 type of columns are designed to prevent material elastic failure?  
b) Define slenderness ratio.  
c) State the principle of the stationary value of the total complementary energy.  
d) Define aeroelasticity.  
e) Define Buckling.  
f) What are the basic functions of an aircraft’s structure?  
g) Derive the stiffness matrix for an elastic spring.  
h) What are the implications of structural idealization?  
i) Define Margin of Safety?  
j) Why bolt holes are always slightly larger than the bolt diameter?

2x10

PART-A

Q.2  
A pin-ended column of length l and constant flexural stiffness EI is reinforced to give a flexural stiffness 4EI over its central half (see figure below).

Considering symmetric modes of buckling only, obtain the equation whose roots yield the flexural buckling loads and solve for the lowest buckling load.

20

Q.3  
The sheet stringer panel shown in figure below is loaded in compression by means of rigid members. The sheet is assumed to be simply supported at the loaded ends and at the rivet lines and to be free at the sides. Each stringer has an area of 0.1m². Assume E=10,300,000lb/in² for the sheet and stringers. Find the total compressive load P:  
a) When sheet buckles first.  
7  
b) When the stringer stress σc is 15,000 lb/in².  
7  
c) When the stringer stress σc is 35,000 lb/in².  
6  
K=3.62 (given)

18/3
Q.4 An initially untwisted rectangular wing of semi-span 's' and chord 'c' has its flexural axis normal to the plane symmetry, and is of constant cross-section with torsional rigidity GJ. The aerodynamic centre ec ahead of the flexural axis, the lift-coefficient slope is 'a' and the pitching moment coefficient at zero lift is C_{m,0}. At speed V in the air density \( \rho \) the wing root incidence from the zero lift is \( \alpha_0 \).

Using simple strip theory i.e. ignoring downwash effects, show that the incidence at a section distant y from the plane of symmetry is given by:

\[
a_0 + \theta = \left( \frac{C_{m,0}}{ea} + \alpha_0 \right) \frac{\cos \lambda (s - y)}{\cos \lambda s} - \frac{C_{m,0}}{ea}
\]

Where

\[
\lambda^2 = \frac{ea \frac{1}{2} \rho V^2 c^2}{GJ}
\]

Hence, assuming C_{m,0} to be negative, find the condition giving the speed at which the lift would be reduced to zero.

20

PART-B

Q.5 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 figure below is zero, and for that case give the displacements of node 2 and 3.

All members have equally axial rigidity EA.

Given Data:
Q.6  

a) Part of a wing section is in the form of the two-cell box shown in figure below in which the vertical spars are connected to the wing skin through angle sections all having a cross-sectional area of 300mm$^2$. 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 figure below 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 kN acting in a vertical plane through booms 3 and 6, calculate the distribution of shear flow around the section.

Boom areas:

\[
\begin{align*}
B_1 &= B_8 = 200\text{mm}^2, \\
B_2 &= B_7 = 250\text{mm}^2, \\
B_3 &= B_6 = 400\text{mm}^2, \\
B_4 &= B_5 = 100\text{mm}^2.
\end{align*}
\]

Given data:

\[
q_s = -\left(\frac{S_{yzz} - S_{yzz}}{I_{zz}I_{yy} - I_{yy}^2}\right) \left(\int_{0}^{\theta} \tan \theta \, d\theta + \sum_{r=1}^{n} B_r \theta_r \right) - \frac{S_{yzz} - S_{yzz}}{I_{zz}I_{yy} - I_{yy}^2} \left(\int_{0}^{\theta} \tan \theta \, d\theta + \sum_{r=1}^{n} B_r \theta_r \right) + q_{s0}.
\]

Q.7  

The fitting shown in figure 7.a is made of a 2014 aluminium forging, for which $\sigma_{at} = 65,000$, $\tau_a = 39,000$ and $\sigma_{abr} = 98,000$ lb/in$^2$. The bolt and bushing are made of steel for which $\sigma_{at} = 125,000$, $\tau_a = 75,000$ and $\sigma_{abr} = 175,000$ lb/in$^2$. The fitting resists...
limit or applied loads of 15,000-lb compression and 12,000-lb tension. A fitting factor of 1.2 and a bearing factor of 2.0 are used. Find the margins of safety for the fitting for various types of failure:
End Semester Examination, Dec. 2015  
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 any five of the following questions:
   a) Airplanes A and B are flying at different velocity at different height, is it possible for them to have same Mach number? Is it possible for these two to fly at different heights but with same velocity and Mach number? Explain these conditions in detail.
   b) Explain the concept of head wind, tail wind and cross wind with advantages and disadvantages?
   c) Explain the concept and application of drag polar. How is it different for aircraft and wing?
   d) Explain the idea of stalling speed and airfoil’s maximum lift coefficient.
   e) Explain the importance of L/D ratio for steady level flight. How does it affect the performance of an aircraft in every aspect?
   f) Explain the concept for absolute and service ceilings. Explain the V-n diagram to support the limits for aircraft flight.

PART A

Q.2 Draw a graph for temperature distribution in the standard atmosphere. Draw the relations for calculating \( \rho \) and \( T \) in the isothermal and gradient regions of standard atmosphere. Calculate the same for 16 Km and 32 Kms.

Q.3 a) Illustrate a turn and bank indicator and explain its function.
   b) Differentiate between AS, CAS and TAS.
   c) How is IAS obtained?

Q.4 a) How can drag of a body be explained by its profile? How do slender and blunt body shapes affect the aerodynamic drag?
   b) Derive the relationship of lift with lift-dependant drag.
   c) Consider a fighter aircraft, which has wing area 18.43 \( m^2 \). The wing is generating 80,000 N of lift with a flight velocity of 410 kmph at 11 km height from sea level. Calculate the induce drag. Assume \( e = 0.8 \) and wing span=7.7 m.
   d) Explain every aspects and details of V-n diagram.

PART B

Q.5 a) Illustrate various leading and trailing edge high lift devices. Explain how these affect the max lift coefficient.
   b) Explain the advantages of sweep back aircraft.

Q.6 a) For a steady and level flight, show that the aerodynamic condition for minimum power required is that zero lift drag is equal to one third the drag due to minimum power.
b) Calculate the power required at sea level for level flight for an aircraft with weight = 13120 N, wing area = 16 sq m, span = 10.8m, parasite drag co-efficient = 0.025, and Oswald efficiency factor e= 0.81 flying at a speed of 60.96 m/s.  

c) Explain why minimum power required and minimum thrust required are not possible at the same time.

Q.7 Estimate the landing distance for a jet aircraft weighing 62832 N, at sea level. It has a wing area = 27.64 sq m, parasite drag co-efficient = 0.022, coefficient of rolling friction = 0.02. Considering there is no skidding of wheel over the ground to alter the friction. Thrust reversal of 2000N is used. However, spoilers are employed such that Lift is reduced to 1000N on average. The maximum lift coefficient, with flaps fully deployed at touchdown, is 2.5.
Q.1 Explain the following:
a) Octane and performance rating.
b) Pitot static tube ice protection.
c) Anti-skid system.
d) Pressure unloading in a hydraulic system.
e) In-line and integral reservoirs.
f) H.P. and L.P. oxygen cylinders.
g) Humidity control in the environment of aircraft.
h) Differentiate between primary and secondary flight controls.
i) Stick shaker.
j) Ionization type smoke detectors.

\[\text{Q.1} \text{ Explain the following:} \]
\[\text{a) Octane and performance rating.} \]
\[\text{b) Pitot static tube ice protection.} \]
\[\text{c) Anti-skid system.} \]
\[\text{d) Pressure unloading in a hydraulic system.} \]
\[\text{e) In-line and integral reservoirs.} \]
\[\text{f) H.P. and L.P. oxygen cylinders.} \]
\[\text{g) Humidity control in the environment of aircraft.} \]
\[\text{h) Differentiate between primary and secondary flight controls.} \]
\[\text{i) Stick shaker.} \]
\[\text{j) Ionization type smoke detectors.} \]

\[\text{\textbf{PART-A}}\]

Q.2 a) Explain a typical elevator control system in detail. 
\[\text{10}\]

b) Explain the mechanical control linkage used in an aircraft with suitable diagrams.
\[\text{10}\]

Q.3 a) What are different types of hydraulic reservoirs? Explain the working of an inline reservoir with a neat diagram along with purpose of different parts of the reservoir.
\[\text{10}\]

b) Explain the functioning of Gerotor hydraulic pump with a neat diagram.
\[\text{10}\]

Q.4 a) Explain the refueling, defueling and fuel dumping in an aircraft.
\[\text{10}\]

b) Explain the layout for a four engine manifold cross-feed fuel system.
\[\text{10}\]

\[\text{\textbf{PART-B}}\]

Q.5 a) Explain the functioning of Freon vapor cycle cooling system with its components.
\[\text{10}\]

b) Explain the ventilation, distribution and pressurization system.
\[\text{10}\]

\[\text{24/3}\]
Q.6  a) What are the types of oxygen supply available for use in aircraft? Explain the continuous flow oxygen system installed in aircraft.  
   10  
   b) Explain the solid state oxygen generator in detail.  
   10

Q.7  a) Explain the deicing systems used for wings of aircraft.  
   10  
   b) Explain the various flame and smoke detection systems.  
   10
End Semester Examination, Dec. 2015  
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 Briefly explain any five of the following questions:  
   a) Effect of elevator power over longitudinal stability.  
   b) Spoiler control.  
   c) Importance of trim condition for stick free longitudinal stability.  
   d) Rudder lock.  
   e) Dihedral effect.  
   f) Phugoid and short period mode.  
   4x5

PART-A

Q.2 a) Derive fundamental equation of static longitudinal stability with the help of a suitable diagram. Derive and explain the wing contribution in it.  
   5  
   b) Derive the neutral point for the stick fixed static longitudinal stability with wing contribution.  
   5  
   c) Draw and explain the graphical relation of $C_M$ VS $C_L$ for longitudinal stability.  
   10

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) Write a short note on floating and restoring tendencies.  
   3  
   d) What are the different types of aerodynamic balancing methods?  
   5

Q.4 a) Derive an expression for stick free longitudinal stability. Explain it with the help of a diagram.  
   10  
   b) Derive an expression for elevator angle per g; form the basic balancing equation for the accelerated flight making:  
      i) Pull up maneuvering flight, and  
      ii) Horizontal turn maneuvering flight.  
   10
PART-B

Q.5 a) Drive an expression for the static directional stability for rudder fixed aircraft with wing, propeller, vertical and horizontal tail. Explain the stability contribution by each part with the help of a diagram and a graph.

10

b) Draw and explain the typical yawing moment curve with for directional stability.

5

c) Write a short note on Dorsal Fin.

5

Q.6 a) Write equation of equilibrium in rolling. Derive the rolling moment produced due to aileron deflection during roll. Explain with the help of a neat diagram.

15

b) What are dihedral and sweep back? Explain how dihedral and sweep back stabilize the rolling moment.

5

Q.7 Derive the equation of longitudinal motion. Evolve it to the non-dimensional hinge moment and simultaneous equation.

20
Q.1 a) Draw the flight envelope for a supersonic aircraft with proper labeling?
b) Draw the $C_L$ v/s $\alpha$ curves for positive and negative cambered a/c? Describe the
difference in them if present
c) Which aspects a manufacturer should consider before spending money for building
an aircraft?
d) Name and define the airfield requirements that are considered in a/c design.
e) Describe the various terms in airfoil geometry with diagram.
f) List out the different types of drag experienced by an aircraft.
g) Give the difference between conventional tail, T-tail and V-tail.
h) How does placement of engines affect aircraft performance and design? Give your
thoughts on it.
i) Define: Oleo and Drag Brace.
j) Determine the stroke length of an oleo shock absorber which has the following
data:
   Efficiency of tire = 0.47; efficiency of oleo = 0.7; $N_{\text{gear}}$ = 2.8; vertical velocity = 10
   ft/s; dia. of tire = 20 inches; rolling dia. of tire = 17 inches.

\[ 2x10 \]

Q.2 a) What are the basic classifications used for an aircraft? Describe them in detail.
\[ 5 \]
b) Write short notes on following operational criteria parameters:
   i) Payload.
   ii) Payload-range.
\[ 5 \]
c) What is the design wheel? Draw it. Explain the various phases of aircraft design
   with diagram/flow-chart.
\[ 4 \]
d) Write notes on the following:
   i) Economics of design.
   ii) Break Even-point.
   iii) Air-field requirements.
\[ 6 \]

Q.3 a) Calculate the weight fractions for a jet powered combat aircraft with following
input parameters:

<table>
<thead>
<tr>
<th>Input Parameter</th>
<th>Value (Unit 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>------------------</td>
<td>-----</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>

10

b) Compute the various weight fractions for flight segment of an anti-submarine warfare aircraft having the following parameters:
   Loiter = 3 hours
   Max. distance = 2778 km
   Equipment weight = 10000 lb
   Crew weight = 800 lb
   Mach No. = 0.6

Q.4 a) Draw the critical load diagram for L1011 aircraft. Also give the load table mentioning all the loads acting on an aircraft.

6

b) Explain maneuver loads. Draw its V-n diagram and explain it.

6

c) Explain gust loads. Draw its V-n diagram and explain it. Finally draw the combined V-n diagram and explain it.

8

**PART-B**

Q.5 a) Which are the factors that influence the volume considerations in fuselage design? Describe each in detail. Explain how cockpit designing is done.

8

b) Briefly explain the following:
   i) Wing sweep
   ii) Taper ratio
   iii) Twist
   iv) Dihedral

4

c) Write short notes on:
   i) Different inlet locations.
   ii) Propeller locations.
   Draw diagram where necessary.

8

Q.6 a) Describe the oleo shock absorber arrangement. Explain why oleo shock absorber performance must be better than that of the other shock absorber arrangements.

10
b) Describe different landing gear arrangements and shock absorber types. Write briefly on different types of retraction mechanisms used and also the housings for landing gear.

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

b) Write notes on different types of tail arrangements used on aircraft? Draw diagrams where needed.

c) Do vertical tail design using below mentioned parameters:
   i) Cruise Mach number = 0.6
   ii) Cruise altitude = 30,000 ft
   iii) Wing area = 200 ft²
   iv) Wing area = 20 ft
   v) Airfoil used for vertical tail = NACA 4412.
   vi) Aspect ratio for vertical tail = 2
   vii) Taper ratio = 0.
   viii) \( \nu = 0.00034882 \text{ ft}^2/\text{s} \)
   ix) \( \rho = 0.028657 \text{ lb}_m/\text{ft}^3 \)
   x) \( C_{\alpha} = 0.07 \)
   xi) \( L_{\alpha} = 35 \text{ ft} \)
   xii) \( A_{\alpha} = 63 \text{ deg.} \)
End Semester Examination, Dec. 2015
B. Tech. – Seventh / Eighth Semester
BOUNDARY LAYER THEORY (AE-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 do you understand by the concept of an effective body?
b) Define the boundary layer thickness.
c) Define the point of separation.
d) What do you understand by energy thickness, explain briefly?
e) What is the objective of theory of stability?
f) What is the influence of roughness on transition?
g) By using the fundamental equations for boundary layer suction, show that in a region of adverse pressure gradient \( \frac{dp}{dx} > 0 \), the superposition of suction \((v_0 < 0)\) reduces the curvature of the velocity profit at the wall?
h) What determines the scale of turbulence?
i) Why do we need to design wind tunnels of low turbulence intensity?
j) Define thermal boundary layer.

Q.2 a) Using approximate methods for steady equations show that momentum thickness \( \theta = 2\frac{\tau_0}{\rho U_\infty^2}x \), for the flow past a flat plate at zero incidence?

Q.3 a) Using approximate methods for steady equations explain the rotation near the ground with the help of an appropriate diagram.

b) Using the case the of adiabatic wall, explain the flat-plate thermometer problem.

Q.4 Explain the Prandtl’s mixing length theory for the calculation of turbulent flows.

Q.5 a) Write the principles of the theory of stability of laminar flows and obtain the Navier-Stokes equations for \( u' \), \( v' \) and \( p' \).
b) By assuming two-dimensional disturbance, derive the Orr-Somerfield equation.  
10

Q.6 a) Explain any three methods of control for boundary layer with the help of appropriate diagrams.  
10
b) When suction is applied to a wing, what two distinct problems may arise?  
4
c) Show that an asymptotic solution exists for the case of compressible flow along a flat plate at zero incidence in the presence of homogenous suction.  
6

Q.7 a) Deduce the relationship between the mean motion and Reynolds stresses caused by the fluctuations.  
10
b) What do you understand by the Von Karman’s similarity hypothesis?  
10
End Semester Examination, Dec. 2015
B. Tech. – Seventh Semester
BOUNDARY LAYER THEORY (AE-802)

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 the concept of an effective body?
b) Define the boundary layer thickness?
c) Define laminar flow?
d) What do you understand by energy thickness, explain briefly?
e) What is the objective of theory of stability?
f) Define parallel flow?
g) Define turbulent flow?
h) What determines the scale of turbulence?
i) How can one design wind tunnels of low turbulence intensity?
j) Define thermal boundary layer?

2x10

PART-A

Q.2 a) Derive the expression for boundary layer thickness with the help of appropriate diagrams.

b) Write any three general properties of the boundary layer equation.

Q.3 Using approximate methods for steady equations show the importance of boundary layer on a body of revolution with the help of an appropriate diagram.

Q.4 a) Define critical reynolds number.

b) What are the factors that affect the transition?

PART-B

Q.5 a) Explain any three methods of control for boundary layer with the help of appropriate diagrams.

b) Explain the general properties Orr-Sommerfield equation?

Q.6 a) Explain the ‘law of the wall’ and the ‘law of the wake’, in detail.

b) When suction is applied to a wing, what two distinct problems may arise?
Q.7  
   a) Deduce the relationship between the mean motion and Reynolds stresses caused by the fluctuations.  
      10
   b) Explain the two universal velocity distribution laws.  
      10
End Semester Examination, Dec. 2015
B. Tech. – Seventh / Eighth Semester
ROCKET PROPULSION (AE-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) Define Propulsion. What are the different forms of propulsion used in rockets?
b) What is total impulse?
c) Define effective exhaust velocity.
d) What is burn rate of a propellant? Write its expression.
e) Write about burning rate dependency on temperature and also write the expression.
f) What is pyrotechnic igniter? What are its major mounting places?
g) Define sliver and perforation.
h) What is aging and useful life of a propellant?
i) What is the difference between composite and double base propellants?
j) Write the advantages and disadvantages of extruded double base propellant.

2x10

PART-A

Q.2
a) Explain the five types of nozzle configurations used in solid rocket motors with diagrams.

10

b) Define the following grain terminologies: neutral, progressive and regressive burning grain, web thickness and web fraction.

10

Q.3
The following measurements were made in a sea level test of a solid propellant rocket motor:

Burn duration = 40sec
Initial mass before test = 1210kg
Mass of rocket motor after test = 215kg
Average thrust = 62,250N
Chamber pressure = 7MPa
Nozzle exit pressure = 0.070MPa
Nozzle throat diameter = 0.0855m
Nozzle exit diameter = 0.2703m

Determine in $v_2$, $c^*$, $c$, and $I_s$ at sea level, and $c$ and $I_s$ at 1000m and 25,000m altitude. Assume invariant thrust and mass flow rate and negligible short start and stop transients.

20
Q.4  a) What is chemical propulsion? Classify, describe and draw relevant diagrams of each.  
     10

b) Write the differences between solid rocket motor and liquid rocket engine.  
     10

**PART-B**

Q.5  The following requirements are given for a solid propellant rocket motor:

- Sea level thrust = 2000 lbf average
- Duration = 10 sec
- Chamber pressure = 1000 psia
- Operating temperature = Ambient (approx. 70°F)
- Propellant = Ammonium nitrate-hydrocarbon

Determine the specific impulse, the throat and exit areas, the flow rate, the total propellant weight, the total impulse, the burning area, and an estimated mass assuming moderately efficient design. Properties for this propellant are: \( k = 1.26; T_1 = 2700°F = 3160 \text{ R}; r = 0.10 \text{ in/sec at 1000 psia}; c^* = 4000 \text{ ft/sec}; \rho_b = 0.056 \text{ lbm/ft}^3 \), molecular weight = 22 lbm/lb-mol; gas constant = \( \frac{1544}{22} = 70.2 \text{ ft-lbf/lbm-R} \).  

20

Q.6  a) Describe the process of combustion inside a liquid rocket engine.  
     10

b) Write a short note on liquid hydrogen.  
     5

c) Write a short note on resistojets.  
     5

Q.7  a) What are the types of propellant feed systems? Explain and draw suitable diagrams.  
     10

b) Write about propellant tank configurations and also draw the relevant diagrams.  
     10
Q.1 Attempt any five parts.
   a) What are the various constraints that have to be addressed while planning for using a WECS?
   b) What different methods are used for controlling the power output of wind turbines and how do they work?
   c) How do we determine the annual energy density generated by wind turbine system at a site?
   d) What information can be obtained from currently available wind maps? What are the generally referred wind characteristics?
   e) What aspects of wind availability are considered for undertaking a WECS design?
   f) Define energy gain of a WECS and energy payback time.
   g) List out the important parameters used in determining the cost of energy produced.

4x5

PART-A

Q.2 a) Briefly describe the history of the use of wind turbines in various states of India for electrical power generation and other applications.
   10
   b) Explain different variants of HAWT and VAWT with the help of suitable sketches and basic technical features of each type.
   10

Q.3 a) Describe the fixed pitch and variable pitch rotor blades of a wind turbine? How the provision of variable pitch helps in regulating the power output?
   10
   b) Explain the function of a C.S.U. that is used as a mechanism to control the wind turbine performance.
   10

Q.4 a) What is a confined vortex generator? Explain with the help of a sketch how a confined vortex generator helps the ducted turbine to create extremely low pressure and very large speed. Plot the radial variation of pressure, axial velocity, and tangential velocity across the vortex generator.
   15
   b) If $\eta_g$ and $\eta_b$ are the generator efficiency and gear box efficiency respectively, and $C_p$ is the power coefficient, write how is electrical power output from generator is
related to the power available in the wind.

5

PART-B

Q.5  a) What is commonly followed rule of thumb for variation of wind speed with height above the earth’s surface? Show with the help of plots, how the wind velocity is found to vary with height from the ground level, if the site has features like: (i) Tall buildings, (ii) Trees and houses, and (iii) Water surface and plains.

15

b) How do you summarize the features of suitable sites for installing wind machines? Explain with the help of sketches.

5

Q.6  a) What are the major impacts of the use of wind energy systems on the environment? Explain how these can be controlled?

15

b) What electromagnetic influence is caused by the wind machines when in operation?

5

Q.7  a) List out relative advantages in favour of small, decentralized and large, centralized wind energy systems.

10

b) What is the difference between a standby energy facility and a storage energy facility? Give examples of each type in support of your answer.

10
End Semester Examination, Dec. 2015
B. Tech. – Seventh Semester
PRINCIPLES OF HELICOPTER ENGINEERING (AE-826)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: **Q.1 is compulsory.** All parts of Q. No. 1 carry equal marks. Attempt any **TWO** questions from **Part A** and any **TWO** questions from **Part B**. All questions carry equal marks.

**Q.1**

a) Briefly explain the basic parts of the helicopter? 4
b) How lift is generated by the rotor blades? 4
c) Explain the vortex ring state? 4
d) Explain the concept of Autorotation? 4
e) Write the differences between piston engine and gas turbine engine? 4

**PART-A**

**Q.2**

a) With the help of a hinge arrangement, show the flapping, lagging and feathering motion and briefly explain the importance of each motion. 10
b) How the power is transferred from the engine to the rotors? Explain in detail. 10

**Q.3**

a) In actuator-disc analysis why do we assume that the rotor has infinite number of blades? 10
b) Explain the ground effect on the lifting rotor with the help of relevant diagrams? What is the advantage of this effect? 10

**Q.4**

a) Derive the characteristic equation for longitudinal dynamic stability using all the assumptions? 10

Given :

\[
\frac{du}{d\tau} - x_u u - x_w w - x_q q \frac{d\theta}{d\tau} + w_i \theta \cos \tau_c = x_{B1} B_1 + x_{\theta0} \theta_0 \\
-z_u u + \frac{dw}{d\tau} - z_w w - \left(\hat{V} + q \right) \frac{d\theta}{d\tau} + w_c \theta \sin \tau_c = z_{B1} B_1 + z_{\theta0} \theta_0 \\
-m_u u - m_w w - m_q q \frac{d\theta}{d\tau} + \frac{m_{\theta}}{m_{\theta}} \frac{d\theta}{d\tau} - m_q \theta = m_{B1} B_1 + m_{\theta0} \theta_0
\]

b) The longitudinal derivates for the hovering case (e.g. on shaft axis) are : 10

\[
x_u = -0.032, x_w = 0, x_q = 0 \\
z_u = 0, z_w = -0.52, z_q = 0 \\
m_{\theta} = 0.016, m_{\theta} = 0, m_{\theta} = -0.099
\]

Given :

\[
\mu^* = 47.6, \hat{t} = 1.82 \text{ seconds}, w_c 0.0856 \text{ and } i_B = 0.11 \\
m_u = 6.8, m_w = 0, m_q = - 0.90
\]

Calculate the time to halve amplitude and time to double amplitude? Also comment on the stability characteristics?

**PART-B**
Q.5  
(a) What is the advantage of an electromechanical device over the stabilizing bar? 10
(b) Explain in detail the Control Response with the help of $B_1$ derivative? 10

Q.6  
Explain the measurement of vibration in flight? 20

Q.7  
(a) The exciting forces i.e. hub forces and moments from each blade can be resolved into force components $X, Y, Z$ and moment components $L, M, N$ relative to fixed axes in the helicopter. With the help of the information provided, show that:

\[
X = \frac{1}{2} b \sum_{m=1}^{\infty} \left[ P_{mb} + P_{mb+1} - T_{mb+1} \right] \cos mb \phi
\]

\[
-\frac{1}{2} b \sum_{m=1}^{\infty} \left[ Q_{mb} + Q_{mb+1} - S_{mb+1} \right] \sin mb \phi
\]

Given: azimuth angle of $k^{th}$ blade, $\phi_k = \phi + \frac{2\pi k}{b}$

\[
X_k = -R_{1k} \cos \phi_k + R_{2k} \sin \phi_k
\]

Figure 7.a

(b) Why elimination or reduction of vibration in important? 10
End Semester Examination, Dec. 2015  
B. Tech. – Second Semester  
BASICS OF AERONAUTICAL ENGINEERING (AE-201)

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 any five parts:
   a) Define a flight vehicle. What is the difference between an aerodynamic craft and an aerostatic craft?
   b) Name the satellite launch vehicles that have been designed and launched so far by ISRO. What has been the main purpose for designing each one of them?
   c) What is the difference between a 2-D and a 3-D airfoil? Explain the relationship between their lift curve slopes.
   d) How will you recognize an air-cooled engine and a water-cooled engine? Briefly explain the working of a centrifugal compressor and an axial flow compressor.
   e) What are the main structural assemblies of an aircraft? What are the general types of fuselage construction and what are their relative advantages?
   f) Briefly describe the salient functional features of a GPS.
   g) Why do we need an aircraft control system? What is the main aim of having an aircraft fuel system?  

   **PART-A**

Q.2 a) Define an STOL aircraft. What special features can be provided in an aircraft to enable it to acquire STOL capability? Give an example of one such aircraft.  
b) What is the difference between a conventional type undercarriage arrangement and a tri-cycle type undercarriage arrangement? How the landing shock is absorbed if the aircraft has a double cantilever spring leaf main undercarriage? You may draw a diagram to explain this.  
c) Give examples of two vertical takeoff aircraft and explain how vertical takeoff capability is achieved in these aircraft?

Q.3 a) What are lifting and non-lifting surfaces of an aircraft? Write three examples of each kind.  
b) Explain how lift and drag are generated, on an airfoil. Also explain the physical origin of moment on an airfoil.  
c) Define downwash velocity and explain the concept of induced drag.  
d) What is the side slip angle? Explain the meaning of pitching moment coefficient and the term $C_{\beta n}$.  

Q.4 a) With the help of suitable diagram, explain the meaning of blade angle and geometric pitch. How do you classify propellers on the basis of pitch?  
b) Write and explain the thrust equation of a propeller engine, a jet engine and a rocket engine.  

   **PART-B**
Q.5  a) Define axial stiffness, bending, stiffness and torsional stiffness. What are the types of loads that an aircraft is basically required to support?  
   b) What are the traditional materials used in aircraft structures? What are the key material properties that we look for in a structural material for an aircraft?  

Q.6  a) Describe the function of any two basic engine instruments used in an aircraft.  
   b) With the help of a suitable sketch describe briefly the important features of ILS.  

Q.7  a) Draw the diagram of a basic hydraulic system used on an aircraft. What are two main disadvantages of a hydraulic system? What are the advantages of a pneumatic system?  
   b) In a basic hydraulic system, explain is the purpose of the selector valve and an actuating unit.
End Semester Examination, Dec. 2015
B. Tech. – Sixth / 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 benefits of brake by wire technology.
     b) List various types of sensors used in automobile.
     c) What environmental challenges are created because of vehicle emission?
     d) List some alternative driving technologies helping in meeting the challenges of 21st century vehicles.
     e) Discuss briefly hydrogen fuel cell.
     f) How fuel cell is better than battery?
     g) What are the different types of combinations of hybrid vehicle?
     h) What are the main characteristics of an HEV compared to a conventional car?
     i) Briefly describe cylinder deactivation in vehicles engine.
     j) How are ultra capacitors beneficial for electric automobiles?

PART-A

Q.2  a) Explain the terms:
     i) Customer relationship management ii) Quality management 5x2
     b) Why there is a need to switch to alternative mobility sources development to use for future cars? 10

Q.3  a) What advantages do fuel cell-powered vehicles have over battery electric vehicles? Give the current state of the two technologies? 10
     b) What are the various types of fuel cell? Explain them. 10

Q.4  a) Discuss camless engine actuation. 10
     b) What are the various devices used to enhance the performance of a diesel engine? 10

PART-B

Q.5  a) Why are hybrid electric-drive technologies important to our transportation future? 8
     b) How a plug-in hybrid electric vehicle having gasoline engine is better than a conventional gasoline vehicle? 7
     c) Comment on engine size selection of a hybrid electric vehicle. 5

Q.6  a) What is start stop operation? How it can be achieved in a vehicle? List its benefits. 10
     b) Explain:
        i) Advanced lead acid batteries ii) Alkaline and lithium batteries 5x2

Q.7  a) Explain various power assist technologies in vehicles? How it is different from X-by-wire technology? 10
b) Explain electrical assist steering and steer by wire system. Give their advantages and disadvantages.
Q.1 Answer briefly:
a) What are the salient features of saloon cars?
b) What is the function of differential?
c) What do you mean by DTSS technology?
d) Where are multiplate plate clutch used and why?
e) What is scrub radius?
f) Explain turning circle.
g) How tandem master cylinder different from normal master cylinder?
h) How do we designate a tyre?
i) State the advantages of magnesium and aluminium alloy wheels?
j) When does the necessity of bleeding the brakes arise? 

PART-A

Q.2 a) Draw a schematic diagram showing the layout of the transmission system of a rear wheel driven car and explain the importance of each component.
b) Write the short notes on:
   i) Propeller shaft.
   ii) Differential.

Q.3 a) Draw a neat sketch of MPFI system used on today’s car engine and briefly describe its functioning.
b) Describe a battery ignition with a neat sketch.

Q.4 a) Explain the construction and working of constant mesh gear bar.
b) What are the advantages of diaphragm spring clutch over helical coil spring clutch?

PART-B

Q.5 a) Name any four steering gear box. Explain the working of any steering gear box used in the Indian cars.
b) Write a short note on characteristics of coil spring.

Q.6 a) Describe the construction and working of drum brakes. Compare the same in details with the disc brakes.
b) Write short notes on:
   i) Leading and trailing shoe.
   ii) Characteristics of brake fluid.

Q.7 Write short notes on:
i) Wheel balancing.
ii) Tubeless tyres.
iii) Spoke wheel.
iv) Carcass.
Q.1 Short answer type questions.
   a) Name four clutch lining materials along with their coefficient of friction.
   b) What is the function of carburetor?
   c) What is the function of torsional spring in friction plate of a clutch?
   d) Where are multiplate clutches used and why?
   e) Define scrub radius.
   f) What is leading and trailing shoe?
   g) What are the advantages of ABS system?
   h) What are the primary and secondary brakes?
   i) What is aspect ratio of tyre?
   j) What is the purpose of well in the wheel rim?
   2x10

PART-A

Q.2 a) How do you classify automobiles? Explain in detail giving examples.
   10
   b) On a hilly track performance of rear wheel drive vehicle is superior as compared to
      the front wheel type vehicles. Explain the reason for the same.
   10

Q.3 a) What is the necessity of transmission in a vehicle? Explain with the help of total
      resistance-tractive effort curve.
      10
   b) Explain the construction and working of single plate helical coil spring clutch.
      10

Q.4 a) Differentiate between:
      i) Fuel feed pump and fuel injection pump.
      ii) Air cleaner and fuel strainer.
      5x2
   b) Explain briefly with neat sketches:
      i) CRDI system
      ii) D.T.S.S.I. System
      5x2

PART-B

Q.5 a) Explain with sketches the following terms and their effects:
      i) Castor
      ii) Camber
      5x2
b) Name four types of steering gears? Explain working of a rack and pinion type of steering gear.

10

Q.6 a) With the help of neat sketch explain the working of Tandem master cylinder. What are the advantages of Tandem master cylinder as compared to other types of master cylinder?

10

b) Write short notes on:
   i) Characteristics of brake fluid.
   ii) Vacuum assister hydraulic brakes.

5x2

Q.7 a) Draw a neat sketch of tyre section and them explain the importance of each component.

10

b) i) What is wheel balancing? Explain its types?
   ii) A tyre is designated as 145-SR-13. What does the different symbols signify?

5x2
End Semester Examination, Dec. 2015
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 Answer briefly:
   a) Enlist desirable properties of good fuels for I.C. engine.
   b) Define cracking.
   c) Define, viscosity and viscosity index.
   d) Why gaseous fuels are preferred over solid fuels?
   e) What do you mean by abnormal combustion?
   f) Enlist factors influencing flame speed.
   g) Define alternate fuels. Enlist at least five alternate fuels.
   h) Explain alcohol as an alternate fuel.
   i) What are semisolid lubricants?
   j) What is elastohydro dynamic lubrication?

PART-A

Q.2 a) What are different kind of fuels used I.C. engine? Discuss merits and demerits of liquid fuel.  
   b) How I.C. engine fuels are rated?

Q.3 a) Define and discuss:
   i) Fire and flash point.
   ii) Cloud and pour point of lubricant.
   b) Draw a neat labeled sketch of Bomb Calorimeter and explain its working.

Q.4 a) Explain various stages of combustion in SI engine, elaborating the flame front propagation.
   b) What is ignition delay period? Explain the effects of various engine variables on SI engine.

PART-B

Q.5 a) Discuss advantages and disadvantages of using hydrogen as fuel in IC engine.
   b) Discuss use of LPG as an alternate fuel. Compare its advantages and disadvantages with petrol.

Q.6 a) How lubricants are classified? Explain their properties.
   b) Discuss synthetic oils and their important characteristics.

Q.7 Write short notes on:
   a) Boundary lubrication.
   b) Extreme pressure lubrication.
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
AUTO ELECTRICALS AND ELECTRONICS (AU-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) Describe the function of generator, DC generator, and Alternator.  
(b) Draw a wiring diagram of charging system and name its components.  
(c) Define battery ratings. Enlist commonly used battery rating.  
(d) What is the function of commutator and slip rings?  
(e) Define electromagnetic interference and compatibility.  
(f) What do you mean by firing order? Enlist various firing order for 4-stroke, 4-cylinder petrol engines.  
(g) Define OBD and its function.  
(h) What is spark advance mechanism? What are its types?  
(i) What is the function of circuit breaker, printed circuits and plastic fiber optics?  
(j) What is the purpose of horn relay?  

2x10

PART A

Q.2  
(a) What is the primary source of electrical energy in a vehicle? Discuss its principle and working.  
(b) Draw a neat labeled sketch of battery ignition system of 4-stroke, 4 cylinder SI engine and explain functions of each component.  

8

Q.3  
(a) What are the different types of batteries used in automobile? Explain briefly the construction and working of Nickel-Iron battery.  
(b) Discuss the advantages of alkaline batteries over Lead acid battery.  

12

Q.4  
(a) Discuss importance of cranking motor drives mechanism.  
(b) Differentiate between DC generator and alternator.  
(c) Define and discuss principles of simple motor.  

8

PART B

Q.5  
(a) What is the function of ECU? Discuss various inputs and outputs of ECM.  
(b) Explain in brief i) Microprocessor ii) Memory  

12

Q.6  
Explain the following:  
(a) Compare battery coil ignition system and magneto coil ignition system.  
(b) Draw a neat labeled sketch of spark plug and explain its construction and working.  

8

Q.7  
(a) What do you understand by the term cable color code? Classify automobile cables.  
(b) Draw a wiring circuit of horn system and explain its working.  

12

8
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
AUTOMOTIVE COMPONENTS DESIGN (AU-506)

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 endurance limit stress?
     b) What is meant by stress concentration?
     c) Write the expression for the effect of surface factor under bending load.
     d) What are the desired properties of a good lubricant?
     e) What are the different types of bearing, describe shortly each?
     f) Write the Lewis equation?
     g) Define addendum and deddandum.
     h) Why cylinder liners are used?
     i) State the function of piston rings.
     j) What are the different forces acting on connecting rod?

2x10

PART-A

Q.2  a) Derive the expression for Soderberg criterion for combination of stresses under reversed bending loading for brittle materials. 10
     b) Find the maximum stress concentration induced in a rectangular plate $60 \text{ mm} \times 10 \text{ mm}$ with a hole of $12 \text{ mm}$ diameter and subjected to tensile load of $12 \text{ KN}$. The value of theoretical stress concentration factor is 2.5. 10

Q.3  a) Derive an expression for the shafts subjected to combined twisting moment and bending moment. 10
     b) A pair of wheels of a railway wagon carries a load of $50 \text{ kN}$ on each axle box, acting at a distance of $100 \text{ mm}$ outside the wheel base. The gauge of the rails is $1.4m$. Find the diameter of the axle between the wheels, if the stress is not to exceed $100 \text{ MPa}$. 10

Q.4 Design a journal bearing for a centrifugal pump from the following data:
    Load on the journal= $20000 \text{ N}$; Speed of the journal= $900 \text{ rpm}$; type of oil is SAE 10, for which the absolute viscosity at $55^\circ C = 0.017 \text{ kg/m s}$; ambient temperature of oil=$15.5^\circ C$, maximum bearing pressure for the pump=$1.5 \text{ N/mm}^2$. Also calculate the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to $10^\circ C$. Heat dissipation coefficient=$1232 \text{ W/m}^2 \text{/}^\circ C$.
    Take $ZN/P = 28$ and $\frac{C}{d} = 0.0013$  20

PART-B

Q.5  The following particulars of a single reduction spur gear are given: Gear ratio=10:1;
    Distance between centres= $660 \text{ mm}$ approximately; Pinion transmits $500 \text{ kW}$ at $1800$
rpm; involute teeth of standard proportions (addendum = m) with pressure angle of 22.5°; permissible normal pressure between teeth= 175 N per \( \text{mm} \) of width.

Find:

a) The nearest standard module if no interference is to occur;
b) The number of teeth on each wheel;
c) The necessary width of the pinion;
d) The load on the bearings of the wheels due to power transmitted.

Q.6 For a single acting four stroke engine, Max gas pressure= 5 \( \text{N/mm}^2 \); Fuel consumption= 0.15 \( \text{kg} \) per brake power per hour, cylinder bore= 100 \( \text{mm} \); stroke= 125 \( \text{mm} \); Mechanical efficiency= 80\%; HCV of fuel= 42 \( \times \) 103 \( \text{kJ/kg} \); Speed= 2000 rpm. Design a cast iron piston, if any other data required for the design may be assumed.

Q.7 Design for the big end bearing, piston pin or small end bearing and I-section of the connecting rod an I.C. engine running at 1800 rpm and developing a maximum pressure of 3.15 \( \text{N/mm}^2 \). The diameter of the piston is 100 \( \text{mm} \); mass of the reciprocating parts per cylinder 2.25 \( \text{kg} \); length to connecting rod 380 \( \text{mm} \); stroke of piston 190 \( \text{mm} \) 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 \( \text{N/mm}^2 \) and 15 \( \text{N/mm}^2 \). The density of material of the rod may be taken as 8000 \( \text{kg/m}^3 \) and the allowable stress in the bolts as 60 \( \text{N/mm}^2 \) and in cap as 80 \( \text{N/mm}^2 \). The rod is to be of I-section for which you can choose your own proportions. Use Rankine formula for which the numerator constant may be taken as 320 \( \text{N/mm}^2 \) and the denominator constant 1/7500.
Q.1 a) What are various factors affecting fatigue strength?
b) Explain stress concentration phenomenon.
c) What type of stresses are induced in shafts?
d) How shafts are formed?
e) Define the term: static equivalent load.
f) What is the usefulness of gears over the belt and chain drives?
g) What is meant by reliability of bearing?
h) What is splash lubrication system?
i) Define wear tooth and static tooth load.
j) What is the function of connecting rod in an IC engine?

Q.2 a) Write a note on the influence of various factors of the endurance limit of a ductile material.  
b) Explain the terms:
   i) Fatigue  
   ii) Notch sensitively
   iii) Variable loading 

c) Explain the Miner’s equation for finite life design in variable loading.

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

Q.4 a) Enumerate advantages of rolling contact bearings over sliding contact bearings.  
b) The thrust of propeller shaft is absorbed by 6 collars. The rubbing surface of these collars have outer diameter 300 mm and inner diameter 200 mm. If the shaft runs at 120 rpm the bearing pressure amounts to 0.4 N/mm². The coefficient of friction may be taken as 0.05. Assuming that the pressure is uniformly distributed, determine the power absorbed by collars.

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 \( c_v = \frac{4.5}{4.5 + v} \) 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/mm\(^2\); 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 Write short notes on:
  a) Design consideration of a piston.  
  b) Forces acting on a connecting rod.  
  c) Various types of cylinder liners  
  d) Methods and materials used in manufacture of crankshaft.
End Semester Examination, Dec. 2015
B. Tech. – Seventh Semester
VEHICLE MAINTENANCE (AU-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 a) Why is maintenance important?
b) Enumerate importance criteria for a service station layout planning.
c) What is function of a wheel balancer?
d) Define cylinder bore taper and ovality.
e) What is the function of ECU?
f) Describe fuel injection pump calibration.
g) Define clutch slipping and clutch drag.
h) What is the function of gear box? Enlist types of gear box.
i) Define castor, camber, KPI and toe-in.
j) What is tyre rotation and why it is necessary?

2x10

PART-A

Q.2 a) Discuss advantages and disadvantages of a private service station and a company owned service station.

15
b) Explain warranty reimbursement policy in brief.

5

Q.3 a) Explain with the help of a neat sketch functions of 4 hand tools and 4 measuring tools.

8
b) Why wheel balancing is necessary? How a wheel is dynamically balanced on wheel balancing machine?

12

Q.4 Write short notes on:
a) Engine compression test.

6
b) Engine leak test.

6
c) Cylinder boring and honing.

8

PART-B

Q.5 Explain possible fuel fault for the following symptoms:
a) Engine rotates but does not start.
b) Engine difficult to start.
c) Engine starts but stops immediately.
d) Engine runs at irregular idle speed.

Q.6  a) Why clutch free play is necessary? How it is adjusted in a vehicle?

8

b) Discuss dismantling, inspection, repair and assembly of 4 speed synchromesh gear box.

12

Q.7  a) Explain different methods of brake bleeding.

12

b) Explain procedure for service/repair of master cylinder of a vehicle.

8
Q.1  a) What do you mean by global warming?
    b) What are operating variables?
    c) Define dehydrogenation, polymerization and agglomeration.
    d) What is $NO_x$? Enlist other harmful gases present in exhaust gas?
    e) Enlist types of hydrocarbon emission.
    f) Define compression ratio, displacement (piston) crevice zone and combustion
        chamber configuration.
    g) What is noise pollution?
    h) How $A/F$ ratio effect on $NO_x$ emission?
    i) What do you mean by green house effects?
    j) Define FID (Flame ionization detector) and NDIR (Non dispersive infrared
        analyzer).

$2 \times 10$

Q.2  a) What is environment pollution and environmental pollutant?

$10$

b) How pollution affects atmosphere? Explain.

$10$

Q.3  a) Discuss engine design and operating variables affecting pollution.

$10$

b) Discuss $NO_x$ formation in S.I engine.

$10$

Q.4  a) Discuss polynuclear and polycyclic H.C.

$10$

b) Explain cyclic or ring compounds and its types.

$10$

Q.5  What is smoke? Discuss different types of smoke and factors affecting smoke
formation.

$20$

Q.6  What causes $NO_x$ formation in S.I. engine? Explain the effects of following on $NO_x$
emission:
i) $A/F$ ratio  
ii) Spark advance  
iii) Combustion chamber configuration

20

Q.7  

a) Write a short note on smoke meter.  

10  

b) Write a short note on flame ionization detector.  

10
End Semester Examination, Dec. 2015
B. Tech. – Seventh Semester
MEASURING TECHNIQUES (AU-626)

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 following terms in detail with neat sketches wherever required:
   a) Range and span.
   b) Sensitivity and resolution.
   c) Active and passive transducer.
   d) Prony brake dynamometer.
   e) Transfer characteristic of a transducer.
   f) Bourdon tube.
   g) Basic principle of temperature measurement.
   h) Total radiation pyrometer.
   i) Function of ‘Growler’.
   j) ‘Camber’ and ‘Castor’ and its importance.

2x10

PART-A

Q.2 A first order system, when subjected to a step input, has a temperature rise of 25 ºC after one hour and 37.5 ºC after two hours starting from cold conditions. Calculate the final steady state temperature rise and the thermal time constant.

20

Q.3 Explain the construction and working of ‘Linear-variable – differential transformer’ (L.V.D.T.). How the magnitude and direction of the displacement of ‘core’ of an L.V.D.T. is detected.

20

Q.4 What are dynamometers? How are dynamometers classified? Explain the advantages and limitations of each.

20

PART-B

Q.5 Define pressure. What is it due to? How is it different from stress? Define absolute, gauge and vacuum pressures.

20

Q.6 List any five physical properties of matter which are used to measure temperature and explain working principle of any two with neat sketches.

20
Q.7 What instruments are used for linear and angular measurements? Discuss application of few with suitable example.

20
End Semester Examination, Dec. 2015  
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) What is the importance of air fuel cycles used for IC engine?  
b) What are the desirable properties of a good IC engine fuel?  
c) How the car bodies are classified?  
d) Indicate the special features Limousine and Estate cars.  
e) What is meant by lift and pitching?  
f) Name different flow visualization techniques.  
g) Define the term, Rolling Moment.  
h) Describe two practical objective of aerodynamics.  
i) List various body trim items.  
j) What is a F.R.P.? Indicate its merits and demerits as body material.  

2x10

PART-A

Q.2  a) Explain how increasing number of cylinders for same capacity engine affect its performance.  
b) What are the various materials used for manufacturing of IC engine parts? How their selection affects engine’s performance?  

10

Q.3  a) Explain in details various methods of improving visibility of a vehicle.  
b) Explain various safety equipments of a vehicle.  

10

Q.4  a) What are the various aerodynamic forces and moments that act on car body?  
b) Explain how air flow visualization test can be conducted using wind tunnel.  

10

PART-B

Q.5  a) What is top end power? Explain why there is variation in power curve of a vehicle.  
b) How gear ratio of a vehicle can be selected from the performance curve of a vehicle?  

10

Q.6  Discuss pv diagrams of Otto and diesel cycle. Derive efficiency and mean effective pressure for Otto cycle.  

20

Q.7  a) Explain the painting procedure adopted for a car.  
b) Explain the usage of various plastics in vehicle body construction.  

10

10
End Semester Examination, Dec. 2015  
B. Tech. – First / Second Semester  
ELEMENTS OF BIOTECHNOLOGY (BT-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 Briefly answer:  
a) How gene cloning is helpful?  
b) Define cell.  
c) Draw a well labeled diagram of golgi bodies.  
d) Why are chromosomes called hereditary vehicles?  
e) Define bioethics.  
f) Enumerate applications of gene bank.  
g) How genetic disorder occurs in human?  
h) What are the entrepreneurship potentials of biotechnology?  
i) Enlist applications of cryopreservation.  
j) Enumerate the applications of stem cell.

Q.2  
a) Draw a well labeled diagram of animal cell.  
10  
b) Enlist five differences between mitosis and meiosis.  
10  

Q.3  
a) Discuss evolution of life.  
5  
b) What are different theories and evidences?  
15  

Q.4  
a) Describe various types of chromosomal aberrations.  
15  
b) What are induced mutations?  
5  

Q.5  
a) Discuss DNA replication with a suitable diagram.  
15  
b) Enumerate five applications of gene bank.  
5  

Q.6  
a) Describe the procedure for DNA fingerprinting.  
10  
b) How DNA fingerprints helps in crime detection?  
10
Q.7  a) Enlist the importance of biotechnology in human health and its commercial and entrepreneurship potentials.  

12  
b) Elaborate the biosafety risk classification and its significance.  

8
End Semester Examination, Dec. 2015  
B. Tech. – Second Semester  
BIOMOLECULES (BT-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 Answer briefly:
   a) What is the significance of hydrophobic interactions in biological systems?
   b) How does a peptide bond form?
   c) Mention the role of dialysis in protein purification.
   d) What is co-enzyme? Give one example.
   e) How does pH affect enzyme activity?
   f) Give Haworth formula for glucose.
   g) Why is sucrose called ‘invert sugar’?
   h) What are essential fatty acids?
   i) What is the importance of base complimentarity?
   j) Enlist the functions of mRNA.

   2x10

**PART-A**

Q.2 a) Elaborate the Bronsted-Lowry concept of acids and bases.  
   10  
   b) Give description of a biological buffer system and mention its physiological importance.  
   10

Q.3 a) Discuss the electrochemical properties of amino acids.  
   10  
   b) Explain different types of chemical bonds involved in protein structure.  
   10

Q.4 a) Give broad classification of enzymes and enumerate their biological functions.  
   10  
   b) Explain the allosteric regulation of enzyme with an example.  
   10

**PART-B**

Q.5 a) Describe the structure, properties and biological role of any one homopolysaccharide.  
   10  
   b) Mention the mechanism of mutarotation in monosaccharides.  
   10
Q.6 Write notes on *any two*:
   a) Prostaglandins.
   b) Hydrolysis of fats.
   c) Cholesterol.
   \[10\times 2\]

Q.7 a) Discuss the salient features of Watson-Crick model of DNA.
   \[10\]
   b) Draw a comparison among A, B and z-DNA.
   \[10\]
Q.1 a) Define gene interaction.
b) What is penetrance and expressivity of a gene.
c) Differentiate between test cross and back cross.
d) Describe genotype and phenotype.
e) Define nucleosomes.
f) How we can calculate recombinant frequency?
g) Explain pleiotropy.
h) Write down note on SAT chromosome.
i) Define reciprocal cross.
j) What is genetic drift? 2x10

PART-A
Q.2 Write short notes on:
   a) Mendal's law of independent assortment with example. 10
   b) Incomplete dominance and co-dominance. 10

Q.3 a) Describe structural and numerical aberrations in chromosomes? 10
   b) Explain chromosomal theory of inheritance. 10

Q.4 Explain the following:
   a) Polytene chromosomes with diagram. 12
      b) Repetitive and non-repetitive DNA. 8

PART-B
Q.5 a) Explain coupling and repulsion theory of linkage. 8
   b) Write down detail note on gene mapping by taking suitable example. 12

Q.6 a) Describe maternal effect and maternal inheritance by taking suitable example. 15
   b) Write down note on cytoplasmic inheritance by endosymbiont. 5

Q.7 a) Write down the method for determining gene frequency. 10
   b) Explain quantitative inheritance. 10
End Semester Examination, Dec. 2015  
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 Answer briefly:
   a) Write down basic properties of cell.
   b) Describe functions of ribosomes.
   c) Explain the concept of fluidity of membrane.
   d) Define cellular compartmentation.
   e) Write down two functions of secondary messengers.
   f) Define apoptosis.
   g) Write down names of different cell adhesion molecules.
   h) What are viral oncogenes?
   i) What are the structural proteins of muscles?
   j) Define receptors. 10×2

**PART-A**

Q.2 a) Explain with a diagram the cell membrane and its permeability 14
   b) Describe cell fractionation. 6

Q.3 a) Discuss structure and functions of intermediate filament and microfilaments. 12
   b) Write down a note on biogenesis of Golgi complex. 8

Q.4 a) Explain the discovery, structure and functions of mitochondria. 8
   b) Describe the cell cycle and its regulation. 12

**PART-B**

Q.5 a) Explain general principle of cell signaling with a neat diagram. 14
   b) What do mean by convergence and divergence of signals? 6

Q.6 a) Describe the phenomena of cell interaction. 10
   b) Discuss different types of cancer in detail. 10

Q.7 a) Write down regulation of muscle contraction. 8
   b) Explain resting and action membrane potential in detail. 12
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
MICROBIOLOGY (BT-302 / BT-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 Briefly answer:
a) What is the importance of Bergeys manual in bacterial classification?
b) What are the contributions of Beijerinck in the field of microbiology?
c) How archaeabacterial cellwall differs from the eubacterial wall?
d) How years are different from molds?
e) What is turbidostat?
f) Differentiate between an antisepctic and a disinfectant.
g) What is the difference between $F^- F^-$ and $Hfr \times F^-$?
h) How much energy is captured in glycolysis?
i) How effectiveness of sterilization using moist heat is monitored?
j) What are auxotrophs?

2x10

PART-A

Q.2 a) Louis Pasteur is regarded as “Father of modern microbiology” Justify. 7
b) Give a brief description of numerical taxonomy. 7
c) What are the contributions of Robert Koch in the field of microbiology? 6

Q.3 a) Compare the structure of the cell walls of gram-negative and gram-positive bacteria. Where and how lysozyme and penicillin act to disturb the cell wall? 14
b) What are capsules and how are they important to a bacterium? 6

Q.4 a) Draw a typical bacterial growth curve. Label the stages of growth and briefly describe what processes are occurring in each stage. 8
b) How continuous culture is different from a synchronous culture? How they can be obtained? 12

PART-B

Q.5 Briefly describe the three major processes of bacterial genetic exchange. 20
Q.6  Briefly explain the following:
  a) Pentose phosphate pathway.  
     8
  b) Photosynthesis.  
     12

Q.7  a) What is the principle behind sterilization using moist heat and how is it carried out?  
     10
  b) List down the characteristics of an ideal chemotherapeutic agent.  
     10
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
BIOCHEMISTRY (BT-303B)

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 properties of water that make it so special for life? 3
b) What is a buffer capacity? 3
c) How essential amino acids differ from non essential amino acids? 3
d) Differentiate between reducing and non reducing sugars with an example. 3
e) Write a short note on classification of lipids. 3
f) How nucleoside is differ from nucleotide? 3
g) What are ketone bodies? 2

PART-A

Q.2
a) Explain Hasselback and Henderson equations and its implications. 10
b) Write a note on secondary structure of protein. 10

Q.3
Differentiate between the following:
a) Starch and Glycogen.
b) Sphingolipids and Steroids.
c) Cellulose and Chitin.
d) Aclyglycerol and Terpenes. 5x4

Q.4
Write short notes on the following:
a) Properties of purine and pyrimidine. 5x4
b) Isoenzymes.
c) Competitive inhibition.
d) Biologically important nucleotides.

PART-B
Q.5  a) What are first and second law of thermodynamics?
      10  
b) How ATP is participate in metabolic network?
      10 

Q.6  Explain in detail Nitrogen excretion and urea cycle.
     20 

Q.7  a) What is TCA cycle? How TCA cycle is regulated?
     10  
b) Comments on inhibitors and uncouplers of oxidative phosphorylation.
     10  


End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
BIOCHEMISTRY (BT-303C)

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 do you mean by catabolism? Explain with the help of an example.
   b) What is the role of glutamate in amino acid catabolism?
   c) Write down the structure of urea and the source of nitrogen and carbon in urea formation.
   d) What do you mean by Kreb’s bicycle?
   e) Where does glycolysis, glyoxylate cycle, TCA cycle and ETC occur in cell?
   f) What do you understand by glucose priming? Why does it occur in glycolysis?
   g) Why do muscles produce lactate in limited oxygen supply?
   h) Name the only enzyme of TCA cycle that is membrane bound. Write the reaction performed by this enzyme.
   i) Why the oxidative phase of pentose phosphate pathway is important in liver and lactating mammary glands?
   j) Name the enzymes/complexes involved in electron transport chain.

   2x10

PART-A

Q.2 a) Define metabolic reactions and what is the role of ATP cycle in such reactions.  
   5  
   b) With the help of an example differentiate between oxidative and substrate level phosphorylation.  
   5  
   c) What do you mean by in-born error in metabolism? Write down the causes, symptoms and therapy for phenylketonuria.  
   10

Q.3 Elaborate any four in the following with an example.
   a) Write the reaction and enzyme that generates NADH in glycolysis pathway.
   b) Name the enzyme that splits six carbon molecule into 2 three carbon molecule in glycolysis. Write the reaction also.
   c) Write down the components of pyruvate dehydrogenase complex. What are the advantages of multi-enzyme complex? How the cell regulates the activity of pyruvate dehydrogenase complex?
   d) Which reactions of TCA cycle are by-passed in glyoxylate cycle?
   e) Write down the step reactions that produce NADPH in pentose phosphate pathway.  
   5x4
Q.4  a) Delineate the urea cycle and name the scientist who discovered it?  
10

b) Explain the metabolism of aromatic amino acids with an example.  
10

**PART-B**

Q.5  Write short notes on:

a) Ketone bodies.

b) Utilization of fat for energy production.

c) How is glycerol of triglycerides converted into glycolytic intermediates?

d) Uncouplers and inhibitors of electron transport chain.  
5x4

Q.6  a) With the help of an example write down the synthesis of pyrimidine nucleotide.  
10

b) Write in details the various steps involved in electron transport chain.  
10

Q.7  a) Write down in detail about the steps involved in oxidation of odd carbon fatty acids.  
15

b) Name the scientist who gave chemiosmotic theory. Write its postulates.  
5
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
GENETICS (BT-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 Briefly answer:
   a) What is polygenic inheritance?
   b) Define recombination frequency.
   c) What are homozygous and heterozygous conditions?
   d) Differentiate test cross with back cross.
   e) Briefly describe the structure of polytene chromosome.
   f) What is positive and negative supercoiling?
   g) What is the difference between a missense mutation and a nonsense mutation?
   h) What are chromosomal disorders? Give an example.
   i) What is genetic map unit (m.u.) of a centimorgan?
   j) Write the genotypic and phenotypic ratios of F2 generation in a dihybrid cross experiment.

PART-A

Q.2 a) In cattle, RR=red, Rr=roan and rr=white. What are the predicted color phenotypes and their frequencies for the offspring from crosses between:
    i) a red bull and a white cow.
    ii) a red bull and a roan cow.
    iii) a roan bull and a roan cow.
   b) Explain incomplete dominance with an example.

Q.3 a) Differentiate between the X-Y and X-0 systems of sex determination.
   b) Describe different types of aberration caused due to change in chromosome number.

Q.4 a) When stretched, a single set of human chromosomes will be over 1 meter long, yet the cell’s nucleus is only 2 to 4 µm in diameter. Explain how the DNA is compacted to fit in?
   b) Eukaryotic genomes vary substantially in size, explain how this variation arises.

PART-B

Q.5 a) Discuss the role of chloroplast and mitochondria in cytoplasmic inheritance.
   b) Comment upon the chemical mutagens and their effects in detail.

Q.6 Write short notes on:
   a) Hardy Weinberg law.
   b) Multiple factor hypothesis.
   c) Gene pool and gene frequency.
Q.7  a) Discuss some of the main human diseases which have a genetic basis. Discuss the biochemical basis wherever known for genetic disease.  

b) Derive the possible blood groups of children where the parents have the blood groups AB and O.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
BIOANALYTICAL TECHNIQUES (BT-305B)

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 is a calibration curve?
   b) What limits the resolution in light microscopy?
   c) Mention the function of a thermionic electron gun in electron microscope.
   d) Define isopycnic point.
   e) Give examples of any two polar solvents.
   f) What is the principle of Gel filtration?
   g) What is native-PAGE?
   h) Mention the advantages of 2-D Gel electrophoresis.
   i) What does an IR-finger print reveal?
   j) Briefly explain the use of autoradiography. 2x10

PART-A

Q.2 a) Describe a statistical method of assessment of precision of an analytical instrument. 10
   b) What kind of errors affect precision and why? 10

Q.3 a) Differentiate between dark field and bright field microscopy. 10
   b) Explain the functionary of a fluorescence microscope. 10

Q.4 Write notes on:
   a) Ion exchange chromatography. 10
   b) Selection of chromatographic systems. 10

PART-B

Q.5 What is discontinuous electrophoresis? Describe the process of SDS-PAGE. 20

Q.6 Discuss the use of UV-VISIBLE spectroscopy in qualitative and quantitative estimation of biomolecules. 20

Q.7 a) Discuss the exponential nature of radioactive decay. 10
    b) Elaborate the working of scintillation counters. 10
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
BIOCHEMICAL CALCULATIONS (BT-306B)

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) Convert 10 km/hr/s to m/s².
   b) Balance the following equation: \( \text{NH}_4\text{NO}_3(s) \rightarrow \text{N}_2(g) + \text{O}_2(g) + \text{H}_2\text{O}(g) \)
   c) Define and give units:
      i) Enthalpy
      ii) Heat of formation
   d) Give the properties and nuclear reactions occurring in:
      i) \( \alpha \) decay
      ii) \( \beta \) decay
   e) What is the MW of DNA that codes for a protein of MW 60,000?
   f) Give units of:
      i) Velocity \( V \) of enzymatic reactions
      ii) Michaelis menten constant
   g) Explain the principle of SDS-PAGE electrophoresis.

PART-A

Q.2 a) Explain the following measures of concentration:
   i) PPM
   ii) Mole fraction
   iii) Molarity
   iv) % w/w
   b) Calculate the concentration expressed in %w/v of a 0.1 M solution of HCl.
   c) Derive Henderson-Hasselbalch equation. Explain the significance of the same.

Q.3 a) Consider the following equation:
   \( \text{CH}_4(g) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(l) \)
   What volume of \( \text{CO}_2 \) is produced when 180g of \( \text{CH}_4 \) burns?
   b) Define:
      i) Limiting reactant
      ii) Degree of completion
      iii) Selectivity of the reaction
      iv) Yield
c) How many grams of NO are produced if 4 moles of ammonia are burned in 20 moles of oxygen?

\[ 2NH_3 + O_2 \rightarrow 2NO + 3H_2 \]

\[ \text{Q.4} \]

a) Compare heat capacities of solid liquids and gases giving adequate explanation.

b) Find the $\Delta H$ for the reaction below, given the following reactions $a$, $b$ and $c$ and subsequent $\Delta H$ values: $2CO_2 (g) + H_2O (g) \rightarrow C_2H_2 (g) + 5/2O_2 (g)$

\[
\begin{align*}
\text{i) } & C_2H_2 (g) + 2H_2 (g) \rightarrow C_2H_6 (g) & \Delta H = -94.5 \text{kJ} \\
\text{ii) } & H_2O (g) \rightarrow H_2 (g) + 1/2O_2 (g) & \Delta H = 71.2 \text{kJ} \\
\text{iii) } & C_2H_6 (g) + 7/2O_2 (g) \rightarrow 2CO_2 (g) + 3H_2O (g) & \Delta H = -283 \text{kJ}
\end{align*}
\]

c) Suppose a piece of iron with a mass of 21.5 g at a temp of 100.0°C is dropped into an insulated container of water. The mass of the water is 132.0 g and its temperature before adding the iron is 20.0°C. What will be the final temperature of the system? Specific heat of iron is 0.449 kJ/kg °C and water is 4.184 kJ/kg °C.

\[ \text{PART-B} \]

\[ \text{Q.5} \]

a) The activity of a certain radionuclide decreases to 15% of its original value in 10 days. Find its half-life ($t_{1/2}$).

b) Draw and explain the titration curve of amino acid glycine.

c) Predict the order of elution when a mixture containing the following compounds is passed through a gel chromatography column that excludes all proteins of MW 200,000 and higher: cytochrome $c$ ($MW = 13,000$), tryptophan synthetase ($MW = 117,000$), hexokinase ($MW = 96,000$). ATP sulfurylase ($MW = 440,000$), glucose oxidase ($MW = 154,000$) and Xanthine oxidase ($MW = 300,000$).

\[ \text{Q.6} \]

a) Explain the design and working of a spectrophotometer.

b) A solution containing 1g/l of a substance in a 1 cm cuvette transmits 80% of the incident light of certain wavelength. Calculate the transmission of a solution containing 3g/l of the substance. If the molecular weight of the compound is 250, calculate the molar extinction coefficient $a_m$.

c) Explain in brief the structural analysis of carbohydrates.

\[ \text{Q.7} \]

For an enzyme (5, $\mu$M), the following initial velocities have been reported depending on the substrate concentration:

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<thead>
<tr>
<th>[Substrate], mM</th>
<th>Velocity, $V_0$, mM S⁻¹</th>
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</table>

78/3
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<td>56.88</td>
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</table>

a) Draw a Michaelis-Menten plot for this enzyme.
b) Draw a Lineweaver-Burke plot for this enzyme.
c) Determine Km and Vmax for this enzyme.
d) Calculate the catalytic constant and the catalytic efficiency for this enzyme.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
CONCEPTS IN IMMUNOLOGY (BT-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) Differentiate between innate and acquired immunity.
b) Draw the structure of granulocytes.
c) What are characteristics of antigen?
d) Discuss the function of cytokines.
e) Explain the principle of ELISA.
f) What is DTH?
g) Write a brief note on DNA vaccine.
h) Which chromosomes in humans and mouse have genes for MHC?
i) Define autoimmunity.
j) How hybridomas are prepared?

PART-A

Q.2 a) Discuss the structure and function of lymphoid organs.

 Q.3 Define antibody. Explain the structure and function of all types of immunoglobulins.

Q.4 Write notes on the following:
a) Heavy chain genes rearrangement.
b) MHC.

PART-B

Q.5 Write notes on following:
a) Immuno therapy of infectious diseases.
b) Monoclonal antibodies.

Q.6 Discuss principle, procedure and application of following techniques:
a) Immunofluorescence.
b) RIA.

7

c) Immunoelectron microscopy.

6

Q.7  a) Differentiate between tumor specific antigen and tumor associated antigen. What cellular mechanism enables the immune system to recognize cancer cells?

10

b) Define hypersensitivity. Discuss the mechanism of immediate and delayed type hypersensitivity in detail.

10
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
MOLECULAR BIOLOGY (BT-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 Briefly answer the following:
   a) What are the two bacterial enzymes responsible for control of super coiling in lining bacteria?
   b) What do you understand by unique and moderately repetitive sequences in eukaryotic genome?
   c) What is replisome? Why is it important in process of replication?
   d) What is the importance of RNA primer in replication process?
   e) What is the role of RNA polymerase? Give its components alongwith their significance.
   f) What is spliceosome? Give its action and significance.
   g) What is the role and significance of Ribozymes?
   h) What do you understand by the terms negative and positive control in Operon model?
   i) Which component of protein synthesis is the scaffold to receive ERNA and how does it do so?
   j) What is the organization of the retro elements?

 PART-A

Q.2
   a) How do nucleosomes become closely associated to form 30 mm fibre and further into radial loop domains? 10
   b) What are the unique features of DNA structure? Who were the scientist to discover it and how? 10

Q.3
   a) What are Okazaki fragments? How are they formed? Why are they necessary in replication process? 10
   b) How are the ends of eukaryotic chromosomes replicated? 10

Q.4
   a) How is eukaryotic transcription initiated and proceeds or elongates? Give unique features of the process. 10
   b) How are eukaryotic pre-mRNAs are processed within nucleus to obtain mature mRNA? 10

 PART-B

Q.5 What is role of lac operon in lactose metabolism? How is it regulated by an activator protein? 20

Q.6 What is the structure of tRNA? Give its role in protein synthesis. How does it coordinate with other components of protein synthesis machinery? 20
Q.7 What are transposable elements? Who identified them and how? What influence do they pose on mutation and evolution?
End Semester Examination, Dec. 2015
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:
   a) Describe the different main categories of professional antigen presenting cells.
   b) The T cell is said to be class I restricted. What does this mean?
   c) Differentiate between allotypic determinants and idiotypic determinants.
   d) Where are the CDR regions located on an antibody molecule and what are their functions?
   e) What are the advantages and disadvantages of live attenuated vaccines?
   f) Why are the immediate reactions immediate and the delayed type delayed?
   g) What do you mean by opsonization?
   h) What is prozone effect?
   i) How autograft differs from allograft?
   j) Explain the development of the severe hemolytic disease of the newborn (erythroblastosis fetalis).

PART-A

Q.2 a) How do cells of the innate immune system contribute to activation of adaptive immune responses? 10
    b) Discuss the structure and function of a lymph node. 10

Q.3 a) Represent diagrammatically the differences in the structure of MHC class I and class II molecules. 8
    b) Describe the organization of immunoglobulin germ-line gene segments in light chain. How this light chain DNA undergoes rearrangements? 12

Q.4 a) Give an account of different antigenic determinants on immunoglobulins. 10
    b) What are the functions of complement? How complement activation occurs via alternate pathway? 10

PART-B

Q.5 a) Give an account of the immune response to extracellular and intracellular bacteria. Also discuss the mechanisms through which bacteria can effectively evade the host defence. 15
    b) List down the applications of monoclonal antibodies. 5

Q.6 a) What is the principle of immunofluorescence? List down the various fluorochromes that are used in immunofluorescence assays. 14
    b) How competitive ELISA is used to detect the presence of an antigen in clinical sample? 6
Q.7  

a) List down the properties of an ideal vaccine. How DNA vaccines raise both cellular and cell mediated immunity?  
b) Explain the hypersensitive reaction induced by poison oak in sensitive individuals.
Q.1 Answer briefly:
   a) Differentiate between primary metabolites and secondary metabolites.
   b) Differentiate between Auxotrophs and phototrophs.
   c) Differentiate between Feedback inhibition and feedback repression.
   d) Define parasexul cycle.
   e) What is Bt-toxin?

Q.2 a) Draw a well labeled diagram of a fermenter and explain the function of impeller, baffles and sponger in a fermenter.
   b) Give in detail the range of fermentation process.

Q.3 Explain the improvement of industrial microorganisms using recombinant DNA approaches.

Q.4 a) Discuss the production of vinegar on large scale through various fermentation methods.
   b) Give an account on industrial production of butanol.

Q.5 a) Define antibiotics. Explain their mode of actions. Briefly discuss the production of penicillin antibiotic.
   b) Explain the production of vitamin B12.

Q.6 a) What are bio-pesticides? Why are they prefer over chemical pesticides?
   b) What are biofertilizers? Discuss the application of biofertilizers in agricultural fields.

Q.7 Explain fermentation economics. Give in detail the cost and investment decision in fermentation economics.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
BASICS OF CHEMICAL ENGINEERING (BT-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 Answer briefly:
   a) What is residence time distribution? 2
   b) State the difference between instantaneous rate and average rate of reaction. 3
   c) State Stefan-Boltzmann equation for heat transfer. 2
   d) Give a brief account of factors that affect convective mass transfer coefficient. 3
   e) Enlist any two commonly employed adsorbents. What types of interactions exist between adsorbent and adsorbate? 3
   f) How can segregation in blended solids be minimized? 3
   g) Define: i) Systematic error  ii) Manual error  4

PART-A

Q.2 a) The following set of data was obtained by the method of initial rates for the reaction: \( 2\text{HgCl}_2(\text{aq}) + \text{Cl}_2(\text{aq}) \rightarrow 2\text{Cl}^- + 2\text{CO}_2(\text{g}) + \text{Hg}_2\text{Cl}_2(\text{s}) \).
What is the rate law for the reaction? What is the value of the rate constant? What is the overall order?

<table>
<thead>
<tr>
<th>EXPT</th>
<th>[HgCl(_2)] M</th>
<th>[Cl(_2)] M</th>
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b) Explain the working of an ideal plug flow reactor. Derive its design equation. 10

Q.3 a) What is the relationship between temperature and viscosity of liquids and gases? 6
b) Write short notes on: i) Working of manometers  ii) Bernoulli’s equation 14

Q.4 a) Discuss in detail the mechanisms of heat transfer. 10
b) Distinguish between concurrent and countercurrent flow in heat exchangers. 5
   c) A plane wall is constructed of solid iron with thermal conductivity 70 W/m\(^{\circ}\)C, thickness 50 mm and surface area 1 m by 1 m. The temperature is 150 \(^{\circ}\)C on one side and 80 \(^{\circ}\)C on the other side. Calculate heat transfer by conduction. 5

PART-B

Q.5 a) Explain film theory using an example of mass transfer of solute A in two immiscible liquids. 8
b) Give a detailed account of Gas-liquid mass transfer. 12

Q.6 Explain the following:
   a) Applications of drying in process industries.
   b) Selection of solvent for extraction.
   c) Causes of segregation or de-mixing in solid mixes/blends.
d) Factors affecting crystal size during crystallization.

Q.7  

a) Describe in detail the components and working of a feedback control system.

b) Explain the principle and working of any one instrument used for measurement of pressure.
End Semester Examination, Dec. 2015
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 short notes on:
   a) Equilibrium constant.
   b) Heat of reaction.
   c) Enthalpy.
   d) Diffusion.
   e) Law of mass action.  4x5

PART-A

Q.2 a) Explain first, second and third law of thermodynamics.  10
    b) What is Gibb’s free energy? Explain free energy change for a spontaneous reaction.  10

Q.3 a) What is Henry Law? Explain equilibrium constant (Kc) for homogeneous and heterogeneous solutions.  15
    b) Write a note on phase transition.  5

Q.4 a) Explain thermodynamic concept of biological systems.  10
    b) Explain the concept of flux and force in detail.  10

PART-B

Q.5 Define and explain the term entropy? Explain the concept of coupling in biological processes.  20

Q.6 a) Give the thermodynamics of membrane transport. Differentiate among active, passive and facilitated transport mechanisms.  10
    b) What happens far from equilibrium? Explain with help of a suitable example.  10

Q.7 a) What is epigenetic clock? How does DNA methylation rate can predict the age of an individual?  10
    b) Explain glycolytic oscillations in yeast cells in brief.  10
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
RECOMBINANT DNA TECHNOLOGY (BT-501)

Time: 3 hrs
100

Max Marks:

Note: Attempt FIVE questions in all; 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 pallindromic sequences? Give an example.
   b) What role do restriction enzymes play in bacteria? How do bacteria protect their own DNA from the action of restriction enzymes?
   c) What is the purpose of southern blotting?
   d) Give three important characteristics of cloning vectors.
   e) How are plasmids transferred into bacterial cells?
   f) A microbiologist discovers a new type II restriction endonuclease. When DNA is digested by this enzyme, fragments that average 1,048,500 bp in length are produced? What is the most likely number of base pairs in the recognition sequence of this enzyme?
   g) Describe what pituitary dwarfism is, what cause it, and how it can be treated.
   h) Why isn’t the plasmid that contains the strongest constitutive promoter always the best expression vector?

   2½x8

PART A

Q.2 a) Elaborate the different types of DNA polymerases used in recombinant DNA technology.
     10
   b) What are the characteristics of restriction enzymes? How are they used to create a recombinant DNA molecule?
     10

Q.3 a) Briefly explain how an antibiotic-resistance gene and the lacZ gene can be used as markers to determine which cells contain a particular plasmid.
     10
   b) What are yeast artificial chromosomes? When are these cloning vectors used and how screening of recombinant YAC is done?
     10

Q.4 a) What are subtraction cDNA libraries and how are they created?
     10
   b) How Sanger’s Dideoxy method of gene sequencing is different from Maxam Gilbert method? Which one is better and why?
     10

PART B
Q.5 Why polar molecules such as DNA and protein are unable to freely pass through the membrane? Discuss the various physical methods employed to overcome this and aid in gene transfer.

86

Q.6 a) Discuss the tetracycline based regulation system for the production of recombinant proteins in mammals.

b) Describe the different promoters used for the construction of expression vectors in prokaryotes.

Q.7 a) How is genetic engineering used to create bacteria capable of producing human insulin?

b) What is gene therapy? Discuss the advantages and disadvantages of various viral vectors used for gene therapy.
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
BIOREACTOR AND BIOPROCESS ENGINEERING (BT-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) Write a short note on the microbial and biochemical interaction with chemical engineering.  
b) What do you understand by multi stage system?  
c) Enlist the major industrial fermentation products for human use and benefit.  
d) What are the reasons for non ideal flow?  
e) Write a note on the exit air system of bioreactors.  
f) What are the antifoam agents?  
g) Why do we add chelators in the medium?  

3x6

Q.2  
a) Explain upstream and downstream processing.  
b) Batch culture and fed bed culture.  

Q.3  
a) Write notes on:  
   i) Air lift bioreactor  
   ii) Fluidized bed bioreactor  
b) What are various kinds of flow pattern in agitated tank?  

5x2

Q.4  
a) Explain the factors to be considered for developing medium for a microbial cell.  
b) Mention some carbon sources for media formulation.  
c) What are the effects of contamination on large scale fermentation processes?  

Q.5  
a) What is the importance of sterilization in bioprocessing?  
b) What is meant by Del factor? Describe the calculation of the Del factor during heating and cooling.  

Q.6  
Explain in detail about various mechanisms of filter sterilization.  

Q.7  
a) Write short notes on:  
   i) Factors affecting Kla.  
   ii) Liquid-solid mass transfer.  
b) Discuss the principle of scale up of bioprocess.  

5x2
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
ENZYME BIOTECHNOLOGY (BT-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 briefly:
   a) Enzyme increase ___________ by decreasing the ______________.
   b) What do you mean by salting out and how is it useful in concentrating protein from cell extracts?
   c) Expand SDS-PAGE and write down its principle.
   d) Why was the need of enzymes occurred in detergent industry?
   e) Name the enzymes used to improve the liberation of juice from the pulp.
   f) How can enzymes be helpful in production of animal feed?
   g) How are enzymes immobilized by entrapment method? Name the polymers used for this purpose.
   h) Write down the basic criteria for successful enzyme immobilization.
   i) What is the principle of amperometric biosensor?
   j) How can you deactivate an enzyme?

2x10

PART-A

Q.2 a) What are protease, write its various types? Elaborate the mechanism of serine protease functioning.

   10

   b) Write down the role of enzyme in food industry in detail.

   10

Q.3 a) Explain in detail about the various chromatographic techniques which can be used in protein purification.

   15

   b) Explain the various methods for cell disruption during protein purification.

   5

Q.4 a) Write in detail about the surface immobilization of enzymes. State the advantages and disadvantages of various methods.

   10

   b) Write a note on application of immobilized enzymes.

   10

PART-B

Q.5 a) What are the main components of a biosensor? Explain the principle and working of calorimetric and potentiometric biosensor with a diagram.

   10
b) Enzymes are known to be helpful in various industrial processes. Explain the role of enzymes in organic synthesis.

Q.6 a) With the increased demand of enzymes in industries and daily needs, discuss the status of enzyme business in India.

b) How are enzymes useful over chemical catalysts? List advantages of enzymes giving examples.

Q.7 a) Define the term enzyme engineering. How is it useful in creating novel enzymes?

b) Write down the principle and design of fluidized bed reactor and membrane reactor. Give their merits and demerits.
End Semester Examination, Dec. 2015
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 the advantages of bioinformatics?
   
   $2\frac{1}{2}\times8$

**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 ER diagram? Discuss different symbols used in ER diagram.  
   10

**PART-B**

Q.5 Align the given sequence using Smith Waterman algorithm for the given sequences ACCTGTT and AGCGGT upto trace back using +2, -1 and 0 for match, mismatch and gap penalty respectively.  
   20

Q.6 a) When a global MSA is performed what are the observations one can make from these sequences?  
   8
   b) Discuss different methods used for multiple sequence alignment.  
   12
Q.7 Write short notes on:
   
a) Protein structure predictions method.
   
b) Challenges faced in integration of biological data.

10x2
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
DOWNSSTREAM 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) Characteristic features of bioprocesses.
   b) Agricultural bioproducts.
   c) Filter aids.
   d) Rotatory vacuum filters.
   e) Two stage batch extraction.
   f) Decantation.
   g) Dialysis.
   h) HPLC.
   i) Microfiltration.
   j) Product finishing.

PART-A

Q.2 a) Write short notes on the classification and applications of bioproducts. 8
     b) Describe the chromatography that uses for the bioseparation on the basis of charge. 12

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 the protein precipitation techniques by the addition of organic solvent. 10
     b) Explain the principles of supercritical fluid extraction. What are the advantages of supercritical fluid extraction? 10

PART-B

Q.5 Briefly explain the following:
   a) Plate and frame filter.
   b) Batch centrifugation.
   c) Broth conditioning.
   d) Cross flow filtration. 5x4

Q.6 a) Write the principle and working of SDS-PAGE chromatography. 10
     b) Explain the principle of the affinity chromatography and use of spacer arm. 10

Q.7 a) Write short notes on:
     i) Crystallization.
     ii) Drying. 5x2
     b) How the protein purification takes place by the salt precipitation method? 10
Q.1 Answer briefly:
   a) Explain the importance of stringent quality control for animal cell culture medium. 2
   b) How is animal cell culture medium sterilized? 2
   c) Differentiate between normal and transformed cell types. 2
   d) Give examples of two cell disaggregating enzymes used in primary culture. Mention their key properties. 3
   e) What are the advantages of retroviral vector for preparation of transgenic animals? 2
   f) Define in-vivo and ex-vivo gene delivery systems. 2
   g) Explain the process of liposome mediated gene delivery using a suitable diagram. 2
   h) What is the mechanism of radiation carcinogenesis? 2
   i) Highlight the commercial value of stem cells. 3

Q.2 Discuss in detail the history and scope of animal biotechnology. 20

Q.3 a) Give a detailed account of preservation of animal cells. Include the following key points:
    i) Procedure.  
    ii) Cryopreservation medium.  
    iii) Mechanism.  
    iv) Cooling and thawing of cells. 10
   b) Discuss the different strategies applied for immortalization of cell lines. 10

Q.4 Discuss the following techniques of transgenic animal production:
   a) Retroviral vector method.
   b) Embryonic stem cell method.
Compare these techniques with respect to their outcome, efficiency and limitations.

PART-B

Q.5  Write detailed notes on:
  a) General techniques for detection of genetic diseases.  
      10
  b) Inducible expression vectors.  
      10

Q.6  a) What are the common approaches for treatment of cancer?  
      10
  b) Explain in detail the principle of antisense technology and its applications.  
      10

Q.7  What are stem cells? Describe sources, types, isolation, culture and applications of  
     stem cells in detail.  
     20
End Semester Examination, Dec. 2015
B. Tech. – Sixth Semester
PLANT BIOTECHNOLOGY (BT-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 in briefly:
   a) What are the minimum facilities needed for the development of a plant tissue culture set up?
   b) What are the key transformations in nitrogen cycle?
   c) Briefly explain the embryo rescue technique.
   d) What do you mean by surface sterilization of explants?
   e) What do you understand by biofarming?

PART-A

Q.2 a) Explain in detail the main steps involved for regeneration of plants by tissue culture. 10
   b) What is anther culture? Explain the factors influencing anther culture and its applications in detail. 10

Q.3 a) Give an account of somatic hybridization and protoplast fusion. 9
   b) What is the role of polyethylene glycol in somatic hybridization? 2
   c) What is soma clonal variations? Write its causes and importance in detail. 9

Q.4 a) Describe mechanism of biological nitrogen fixation in detail. 10
   b) Discuss edaphic, climatic and biotic factors limiting biological nitrogen fixation. 10

PART-B

Q.5 a) Describe the method of genetic improvement by molecular tagging of genes in chick pea. 10
   b) What do you mean by SSR’s? Explain their role in molecular tagging of agronomic traits. 10

Q.6 Write short notes on:
   a) Visible or morphological markers.
   b) Chimeric gene vectors.
   c) Gene silencing.
   d) Transposable elements. 5x4

Q.7 a) Explain with examples the mechanism of improvement of herbicide resistance in plants. 10
   b) How important are the flavanoids for the plant itself and for biotechnological applications? 10

100/3
End Semester Examination, Dec. 2015  
B. Tech. – Sixth Semester  
ENVIRONMENTAL 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 Answer in briefly:  
   a) Global environmental issues.  
   b) Acid rain.  
   c) Treatment technologies for removal of nitrogen.  
   d) Municipal solid waste.  
   e) Reclamation of wasteland.  

**PART-A**

Q.2 Discuss different types of air pollution, its effect and measurement. What do you mean by green house effect?  

Q.3 a) What are bioreactors? Discuss different types of bioreactors with a well labeled diagram.  
   b) How CSTR is different from other bioreactors?  

Q.4 a) Discuss different hazardous wastes and their treatment technologies available.  
   b) What are the different stages of composting?  

**PART-B**

Q.5 a) How microbes are helpful in degradation of Xenobiotic compound?  
   b) Discuss factors affecting process of biodegradation.  

Q.6 What are the in-site and ex-site technologies of bioremediation? Discuss factors influencing bioremediation in detail.  

Q.7 Write short notes on:  
   a) Vermi composting.  
   b) Water harvesting.  

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End Semester Examination, Dec. 2015
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 the following questions in brief:
   a) Micro satellites. 3
   b) Immunology ingene therapy. 4
   c) Malaria. 3
   d) Karyotype analysis. 4
   e) Maternal-fetal incompatibility. 4
   f) DNA markers. 2

**PART-A**

Q.2 How forward genetic approach is different from reverse genetic approach? Discuss origin of genomics in detail. 20

Q.3 What do you mean by disease gene versus susceptibility? Discuss diseases associated with X-chromosome. 20

Q.4 How genetic disease is detected? Explain RFLP analysis. 20

**PART-B**

Q.5 Discuss general rules followed in autosomal recessive inheritance. How pedigree analysis is helpful in identification of a genetic disease? 20

Q.6 How current technology for DNA finger printing is helpful in detection of a genetic disorder? Explain one technology with a suitable example. 20

Q.7 Enumerate the application of gene therapy in various disorders. How bone marrow transplantation in leukemia is done? 20
End Semester Examination, Dec. 2015  
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 Answer in briefly:
   a) What do you mean by positive sense mRNA viruses?
   b) What is receptor mediated endocytosis?
   c) What are the principle components of a parvovirus?
   d) The poliovirus mRNA does not have 5’ methylated cap that is present on the host cell mRNA. How do host cell ribosomes begin translation of this message?
   e) What are the advantages and disadvantages of DNA vaccines?
   f) How direct electron microscopy differs from immunoelectron microscopy?
   g) How flow cytometry is useful in virology?
   h) How M-13 phage is used for determining the sequence of a gene?
   i) How yeast centromeric plasmid differs from yeast replicative plasmid?
   j) What are the different levels of ensuring biosafety while working with laboratory animals?

   2x10

PART-A

Q.2 a) Discuss the contributions of the following in the field of virology:
   i) Twort.
   ii) Felix d’Herelle.
   iii) Hershey and chase.
   b) How viruses can be classified?

   10

Q.3 Discuss the steps involved in the replication of adenovirus in a susceptible host.

   20

Q.4 a) Describe the mechanism of action of resistance against the following drugs:
   i) Acyclovir.
   ii) Amantadine.
   b) List down the properties of an ideal vaccine. What are the advantages and disadvantages of killed and live attenuated vaccines?

   5x2

   10

PART-B

Q.5 a) What are the drawbacks of the cultural techniques used for the diagnosis of a viral infection? Discuss in detail any two serological techniques used in virology.

   10

   10

Q.6 a) How tumour inducing plasmid (pTi) is tailored to act as a cloning vector?
   b) How screening of recombinant YAC is done?

   6

   14

Q.7 a) How biological containment is ensured while working with recombinant viruses?

   5

103/3
b) Discuss the points concerning risk management in laboratory animal facilities.
End Semester Examination, Dec. 2015
B. Tech. – Sixth Semester
DIAGNOSTIC TECHNIQUES (BT-623B)

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 briefly:
   a) What is the use and chemical principle of the catalase and oxidase test used in the preliminary bacterial identification?
   b) Explain selective, differential and enrichment media used in diagnostic bacteriology giving an example of each type.
   c) What do you mean by prozone effect?
   d) For diagnostic assays what is meant by sensitivity, specificity and simplicity.
   e) What are humanized monoclonal antibodies?
   f) How can molecular beacon probes used to detect several genes in the same sample?
   g) What are the advantages of nonradioactive detection procedures?
   h) How single-stranded conformation polymorphism (SSCP) is used to identify different genomic variants?

2½x8

PART-A

Q.2 a) Discuss the key environment factors that are required to support the growth of clinically relevant bacteria. 8
   b) List down the different phenotypic characteristics taken into account for the identification of bacteria. How identification using phenotypic criteria differs from that using genotypic one? 12

Q.3 a) How purification of antibodies is done for use in research and diagnostics? 14
   b) What is the use of flow cytometry in the diagnosis of infected cells? 6

Q.4 Discuss the principle underlying the RIA. Also review on the essential features of the verification and validation of raw materials for the same. 20

PART-B

Q.5 a) List down the steps used for the production of a monoclonal antibody. What will happen if aminopterin is removed from the HAT medium? 10
   b) Discuss the application of monoclonal antibodies in the treatment of tumors. 10

Q.6 a) Describe how the change in the beta globin gene that gives rise to sickle cell anemia can be detected. 10
   b) Compare and contrast RAPD and RFLP as molecular diagnostic tools. 10

Q.7 Summarize the steps involved in the chemical mismatch cleavage mutation detection assay. In what ways denaturing gradient gel electrophoresis is better for the detection of mutations. 20
Q.1 Briefly answer:
   a) Enlist four high throughput technology.
   b) How different dye bias helps in global normalization process?
   c) How promoter analysis is done?
   d) How one can determine where the primer is binding in genome?
   e) What is the role of distance measure in cluster analysis?
   f) Name two anchoring and tagging enzyme used in SAGE analysis.
   g) How SNPs are helpful in DNA microarray experiment?
   h) How image analysis is performed in DNA microarray?
   i) What are the factor that affects heteroduplex formation in the process of hybridization?
   j) Enlist four methods of genotyping.

PART-A

Q.2 Discuss the algorithms for clustering in:
   a) Hierarchical clustering.
   b) K-mean clustering.
   c) Self organizing map.

Q.3 What do you mean by gene normalization? Explain with a suitable diagram.

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

PART-B

Q.5 a) Explain with an example, design of a suitable DNA microarray experiment.
    b) What do you understand by hypothesis driven experiment?

Q.6 a) What do you mean by validation scheme?
    b) Discuss the need of factorial design in DNA microarray experiment evaluation.

Q.7 In gene regulatory network analysis, how reverse engineering of the regulatory network is helpful?
Q.1 a) Define biosafety.
b) What do you mean by intellectual property rights?
c) Discuss social concerns of bioethics.
d) How is biosafety concern for human health?
e) What is biological containment?
f) Define bio-safety regulations.
g) What is ethical value?
h) Define copyright.
i) Write down a note on bioterrorism.
j) Describe importance of labeling.

Q.2 a) Explain the socioeconomic impacts of biotechnology.
b) What is the public liability towards biodiversity and sustainable environment?

Q.3 a) Comment on “fear of unknown” in reference to biotechnology/bioethics.
b) Write about technology transfer international relations and globalization in BT.

Q.4 a) Give biosafety assessment for transgenic food crops.
b) Explain relationship between exposure and safeguard.

Q.5 a) Explain assessment of biological hazards and levels of biosafety.
b) Write down a short note on catagena protocol on biosafety.

Q.6 Write short notes on:
a) Biological weapons.
b) Competitive research.

Q.7 a) Describe bio-safety assessment procedures in India.
b) Define patents. How can we test the novelty of patents?
End Semester Examination, Dec. 2015
B. Tech. – 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 the following in brief:
   a) How do microorganisms contribute to body odor?
   b) What is the difference between exogenous and endogenous infection?
   c) Comments on Gene therapy.
   d) Write some biochemical and enzymatic characteristics that could be used for the identification of bacterial strain.
   e) What do you understand by the term interferons and base analogues?
   f) Comments on biological barriers to infection.
   g) How is tuberculosis diagnosed?
   h) What is the peculiar characteristic of dengue causing mosquito?
   i) How airborne diseases could be prevented?
   j) What are true pathogens?

   2x10

PART-A

Q.2 What are different methods by which drug susceptibility test could be done?
   20

Q.3 Write brief notes on:
   a) Principles of fungal cultivation.
   b) Isolation of pathogens from pus sample.
   c) Use of molecular techniques for the identification of pathogen.
   d) Identification of mycoplasma.

   5x4

Q.4 Differentiate between the following:
   a) Bacterial replication and viral replication strategy.
   b) Peptide and DNA vaccines.

   10 10

PART-B

Q.5 a) What are the different causative viruses of the hepatitis and how do they differ from one another?
   b) How can human acquire anthrax and tuberculosis? Describe the major symptoms of each.

   10 10

Q.6 Write short notes on:
   a) Prions.
   b) Sulfa drugs.
   c) Hepatitis viruses.
   d) Typhoid.

   5x4

Q.7 a) What are interferons? Describe the mechanism of action of interferon.

   10
b) Briefly discuss the factors that influence the effectiveness of antimicrobial drugs.
End Semester Examination, Dec. 2015
B. Tech. – 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 Answer briefly:
   a) Energy role in economic growth.
   b) Wind energy principles.
   c) Advantages of fuel cell.
   d) Municipal solid waste.
   e) Energy fact file and policy in India.  4x5

PART-A

Q.2 How population growth and Industrialization effects energy demand? Discuss environmental impact of energy production.  20

Q.3 What are the sources of geothermal energy? Discuss India’s prospects in geothermal energy.  20

Q.4 Write short notes on:
   a) Batteries.
   b) Hydrogen energy.  10x2

PART-B

Q.5 How energy from biomass is produced? Discuss biogas generation and factors affecting biogas generation.  20

Q.6 What are the principles of energy conservation? Discuss approaches and technologies for energy conservation.  20

Q.7 Write short notes on (any four):
   a) Bio fuels.
   b) Biodiesel production.
   c) Global fuel consumption.
   d) Types of electrodes.
   e) Alternative liquid fuel.  5x4
End Semester Examination, Dec. 2015
M. Tech. (Biotechnology) - First Semester
GENETIC ENGINEERING (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) Why is an RNA primer necessary for DNA replication?
   b) What will happen if a mutation is done in DNA polymerase that eliminate the 3’-to-5’ exonuclease activity?
   c) Differentiate between template strand or the antisense strand and coding strand or the sense strand.
   d) What is spi phenotype?
   e) How biological containment is ensured while working with phages?
   f) What are zinc finger motifs?
   g) How culture conditions determine the fate of a lambda phage?
   h) How a poly G tail can be added to the 3’ end of a DNA molecule?
   i) What is the difference between dNTP and ddNTP?
   j) What is the significance of cDNA cloning? ½x10

PART-I

Q.2   a) What is semi conservative replication? How it was proved? List down the different steps involved in the replication of DNA. 10
   b) Discuss the promoters and transcription factors recognized by RNA polymerase involved in the transcription of tRNA coding genes. 5

Q.3 Briefly explain the following:
   a) Role of cAMP in regulation of lac operon. 7½
   b) Role of attenuation in tryptophan biosynthesis. 7½

PART-II

Q.4 What are cloning vectors? Enlist the essential requirements for a DNA molecule to be considered as a vector for cloning. Give details of plasmids and phage vectors used in genetic engineering. 15

Q.5 a) Discuss the different promoter systems used for expression of a foreign gene in eukaryotes. 10
   b) Discuss the physical methods used to transfer the gene of interest in a particular host. 5

PART-III

Q.6 a) Discuss the principle, Procedure and significance of southern blotting. How is it different from western blotting? 8
   b) Give the principle behind the isolation of genomic DNA. How can it be quantified? 7
Q.7  

a) Give a detailed account of different molecular markers used in recombinant DNA technology stating their applications and disadvantages.

b) List down the different steps used for the production monoclonal antibodies. How Mab differs from polyclonal antibodies?
End Semester Examination, Dec. 2015
M. Tech. (Biotechnology) - First Semester
APPLIED BIOINFORMATICS (BT-M-102A)

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:
   a) Application of array in bioinformatics.
   b) Difference between PAM and BLOSSUM.
   c) Basic operator in peri programming.
   d) Cladistics and ontology.
   e) Pair wise sequence alignment.  3x5

PART-I

Q.2   a) Distinguish stacks and queues in detail.  10
   b) How blast is different from fasta?  5

Q.3   a) Explain the algorithm of hash function and recursive function.  9
   b) Using Perl programming transcribe DNA into RNA.  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 Write short notes on:
   a) Needleman Wunch Algorithm.  7½
   b) Perl module.  7½

PART-III

Q.6 What do you mean by UPGMA? How does it help to find distance and evolutionary relationship? Justify using five genomic sequence and draw cladogram.  15

Q.7 Write short notes on:
   a) Trees and graphs.  7½
   b) Multiple sequence alignment.  7½
Q.1 Answer briefly:
   a) State Molecular Orbital Theory. How bond order is calculated for a diatomic molecule? 3
   b) State the principle of Raman spectroscopy and scanning probe microscopes. 4
   c) “Nanoparticles have been employed as non-viral transfection agents”. Explain. 2
   d) Differentiate between metals and semiconductors. 3
   e) Write down the various applications of magnetosomes. 3

PART-A

Q.2 a) Explain the mechanism of wave particle duality with the help of a Schrodinger equation. 10
   b) What do you mean by uncertainty principle in quantum mechanics? Write down the 1-D Schrodinger equation for particle in a box. 5

Q.3 a) What is the basic principle underlying electron microscopes? Differentiate between Scanning Electron Microscope (SME) and Transmission Electron Microscope (TME) with the help of well labeled diagram. 12
   b) Write down the principle behind Ellipsometry. 3

Q.4 a) What do you mean by the term “crystal defects”? Explain in detail the various types of imperfections occurring in solids. 12
   b) What is the role of size in nanomaterials? 3

PART-B

Q.5 What are carbon nanotubes? Write in detail about the various methods of its preparation and its applications. 15

Q.6 Write notes on:
   a) Bacteriorhodopsin. 8
   b) Therapeutic applications of nano-devices. 7

Q.7 Write notes on:
   a) Nano-composite biomaterials used in bone substitution. 7
   b) Protein based nano-structures. 8
End Semester Examination, Dec. 2015
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) Define biosensor with a neat and labeled ray diagram.
   b) Explain the role of waveguides in a biosensor.
   c) What are neuronal biosensors?
   d) Why are nucleic acids currently becoming of greater importance as bio selective agents?
   e) What are SAMs? Explain the use of alkanethiols in SAMs. 3x5

**PART- I**

Q.2 a) What are the performance factors that one should keep in mind before developing a new biosensor? 8
   b) What is a thermal transducer? Explain the principle, applications and limitations of thermal transducers in Biosensors. 7

Q.3 Discuss short on **(any three):**
   a) SPR based biosensors.
   b) ENFET.
   c) Piezoelectric transducers.
   d) Amperometric transducers. 5x3

**PART- II**

Q.4 What is the role of immobilization in order to make a viable biosensor? Discuss the examples of applications of different immobilization methods. 15

Q.5 a) Discuss the advantages and disadvantages of using plant materials as selective agents. 5
   b) How do receptors differ from antibodies in their mode of action as bio-recognition elements? 5
   c) Write two examples of enzyme bio-sensors and explain the types of electrodes used. 5

**PART- III**

Q.6 a) What do you mean by systems on a chip? Explain the applications and limitations of biochips. 7
   b) What are the different applications of a biosensor in drug development and detection? 8

Q.7 a) What are non-invasive methods for clinical analysis by using biosensor? 7
b) How the fabrication technology of photolithography has contributed to the development of biosensors?
End Semester Examination, Dec. 2015
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) Enlist the key features of the three ideal bioreactors.
    b) Give a method to determine temperature driving force (ΔT) in stirred fermenter.
    c) Mention the role of diffusion in bioprocessing.
    d) Enumerate the factors affecting the resolution of peaks in HPLC.
    e) What are the advantages of freeze drying? 3x5

Q.2 Discuss the kinetics of microbial growth and product formation in a batch culture. 15

Q.3 Describe the basic design of a fermenter. Discuss the critical considerations in its design and construction. 15

PART-I

Q.4 a) Explain the process of medium sterilization. 10
    b) How is the thermal destruction of nutrients prevented? 5

Q.5 a) How does oxygen transfer from gas bubble to cell in an aerobic fermenter? 10
    b) Mention the factors affecting cellular oxygen demand. 5

PART-II

Q.6 Give a detailed account of mechanical methods of cell disruption. 15

Q.7 Write short notes on:
    a) Affinity chromatography.
    b) Crystallization.
    c) Solvent extraction. 5x3

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End Semester Examination, Dec. 2015
M. Tech. (Biotechnology) - Third Semester
ANIMAL BIOTECHNOLOGY (BT-M-302)

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 Answer briefly:
   a) How is glucose metabolism affected in tumor cells?
   b) Explain the advantages of adult stem cells for cell replacement and tissue engineering applications.
   c) What is the mechanism of calcium phosphate mediated transfection?
   d) Describe the genetic changes that occur due to cell transformation.
   e) Why mice are most preferred animal models? 3x5

PART-I

Q.2 a) Describe the determination of animal cell viability using clonogenic growth in soft agar method. 6
   b) Explain the construction and working of any one high density animal cell culture system. 9

Q.3 a) Describe the different types of skin substitutes.
   b) Highlight the major challenges for practical application of xenotransplantation.
   c) How do stem cells differ from differentiated cells? Enlist the applications of stem cells. 5x3

PART-II

Q.4 a) What are the hallmarks of cancer?
   b) Discuss the key steps in manufacture of cell culture based vaccines.
   c) Explain the mechanism of RNAi. 5x3

Q.5 a) Describe in detail different types of assisted reproduction technologies (ART) used for treatment of infertility. 10
   b) Discuss the technique used in first successful gene therapy treatment (ADA deficiency). 5

PART-III

Q.6 a) Describe the layout of a typical animal house. 7½
   b) What are the safety hazards associated with working in animal house? 7½

Q.7 Write short notes on:
   a) Types of animal models.
   b) Test for acute toxicity.
   c) Animal models of diabetes. 5x3
End Semester Examination, Dec. 2015
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 mean by 'best before' and 'code number'?
   b) What is 'Principal display panel' and 'Prepackaged food'?
   c) Discuss permeation.
   d) Define the concept of migration test.
   e) Describe trends in food packaging. 3x5

PART-I

Q.2 a) Describe different developments in packaging techniques. 8
     b) Explain food safety and standards as per food safety and standard Act, 2006. 7

Q.3 a) Explain the concept of green packaging. 8
     b) Write down general packaging requirements. 7

PART-II

Q.4 a) Explain different methods for prevention of deterioration of food. 10
     b) What is invisible set-off? 5

Q.5 a) Write down a note on interaction between foodstuff and packaging material. 5
     b) Discuss classification of food stuff according to BIS code. 10

PART-III

Q.6 Explain briefly:
   a) Laminating and coating process. 8
   b) Aseptic packaging system. 7

Q.7 a) Write down a note on packaging machineries. 8
     b) What is the relevance of packaging testing? 7
End Semester Examination, Dec. 2015
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) Ca++ as second messanger.
   b) Autocrine signaling.
   c) Functions of poly A tail.
   d) Rho dependent termination.
   e) Structure of RNA polymerase holoenzyme.
   f) Differentiate between nucleotide triphosphate and di-deoxynucleotide triphosphate.

UNIT-I

Q.2 a) Discuss the various checkpoints in cell cycle control.
   b) Explain briefly how are proteins targeted to various organelles.

Q.3 a) Write an elaborative note on enzyme linked receptors. Explain the crosstalk between different signaling pathways.

UNIT-II

Q.4 What is meant by self splicing? Which types of introns are self-splicing? Describe the chemical reactions that are carried out during splicing.

Q.5 Summarize the steps that occur during the chromosomal DNA replication in E.coli. How the process is different from that occurring in mammals?

UNIT-III

Q.6 Give a brief account of the different steps involved in the translation of mRNA into a polypeptide in prokaryotes. How do these steps differ in eukaryotes?

Q.7 a) Discuss different strategies used to sequence a 500 bp DNA fragment.
   b) How selection of a recombinant YAC is done?
Q.1 Briefly answer the following:
   a) How selective media differs from differential media? Give an example of each.
   b) In gram negative bacteria how do small molecules move into the periplasm from the outside of the cell?
   c) A bacteria doubles itself in 5 min. What would be the number of bacteria at the end of the 20 minutes if the number of bacteria at the time of inoculation is 4?
   d) What is the energy source for the movement of flagella?
   e) Describe the minimum inhibitory concentration of a bactericidal agent.
   f) How air can be sterilized?

   **UNIT-I**

   Q.2
   a) "Microorganisms are much more than just agents of disease". Justify the statement. 8
   b) Who is regarded as father of modern microbiology and why? 4

   Q.3 What conditions of cultivation would allow you to grow selectively?
   a) Neisseria gonorrhoeae from a clinical sample.
   b) An extreme halophile from a sample of sea salt.
   c) A free living nitrogen fixing bacteria from soil.
   d) An endospore forming bacteria from soil.
   e) Cellulase producing bacteria from soil.
   f) Caulobacter species from a water sample.

   **UNIT-II**

   Q.4
   a) Discuss the life cycle of Chlamydia. Also mention its clinical significance. 7
   b) How cell wall and cell membrane of archaea are different from that of bacteria? 5

   Q.5 Since a single peptidoglycan molecule is very thin, explain in chemical terms how the very thick peptidoglycan containing cell wall of gram positive bacteria is formed? 12

   **UNIT-III**

   Q.6 Conjugation is the mechanism used by self-transmissible plasmids to move to a new bacterial host cell. Sometimes bacterial genes can be transferred during conjugation.
   a) Explain how bacterial genes are transferred to the recipient cell by an Hfr donor strain.
   b) Explain how bacterial genes are transferred to the recipient cell by an F' donor cell.
   c) How it is used to find out the order of genes on a chromosome? 4x3

   Q.7
   a) Explain the process of fractional sterilization. 5
b) Briefly explain how the effectiveness of antimicrobial agents varies with population size, population composition, concentration or intensity of the agent, treatment duration, temperature and local environmental conditions.
End Semester Examination, Dec. 2015
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) The \([\text{OH}^-]\) of a solution is \(1.0 \times 10^{-3} \text{ M}\). What is the \([\text{H}_3\text{O}^+]\)?
b) What is zwitterions?
c) How a alpha-helix is formed?
d) What are the properties of a homogenous solution?
e) Draw the structure of NAD.
f) Mention the symptoms and causes of alkaptonuria (AKU).

UNIT-I

Q.2 a) Discuss the Henderson-Hasselbalch equation and its applications. 6
b) Explain the structure and functions of beta sheets and tropocollagen. 6

Q.3 a) Discuss in brief about isomerism in monosaccharides. Draw the structure of aldoses and ketoses. 6
b) Mention structure and functions of compound lipids. 6

UNIT-II

Q.4 Describe the process of purification of proteins by:
a) Gel-Filtration chromatography. 6x2
b) Affinity chromatography.

Q.5 Write notes on:
a) Ramachandran Map. 6x2
b) Applications of spectroscopic methods in protein analysis.

UNIT-III

Q.6 Define inborn errors of metabolism. Discuss the disorders related with amino acid and carbohydrate metabolism. 12

Q.7 a) Explain the mechanism of oxidative phosphorylation and its coupling with electron transport system. 6
b) Write about the role of body fluids in acid base balance and clinical biochemistry. 6
Q.1 Briefly answer:
   a) Mention the role of excitation filter and emission filter in a fluorescence microscope.
   b) What are the factors on which rate of sedimentation depends?
   c) How are fused peaks resolved in chromatography?
   d) What is the advantage of two dimensional gel electrophoresis?
   e) Briefly explain the Beer-Lambert’s law.
   f) What is meant by ‘Half life’ of a radioactive substance?  

Q.2 a) How is ‘phase contrast’ used in contrast enhancement of microscopic images?  
b) Differentiate between scanning and transmission electron microscope giving proper diagrams.

Q.3 Describe the general principle of centrifugation. What are the different types of rotors used in centrifugation? Explain.

Q.4 What is partition chromatography? Give a detailed account of biomolecule separation by gas chromatography.

Q.5 Elaborate the procedure of electrophoretic separation of DNA. How does this technique help in determining size of unknown DNA?

Q.6 Write short notes on:
   a) Spectrofluorimetry.
   b) Nuclear spin resonance.

Q.7 a) Mention the properties of $\alpha$, $\beta$ and $\gamma$ rays.
   b) Describe the Geiger Muller counting method for measurement of radioactivity.
End Semester Examination, Dec. 2015
M.Sc. (Biotechnology) – First Semester
BIOSTATISTICS (BT-S-105 / BT-S-105A)

Time: 3 hrs  Max Marks: 60
No. of pages: 2

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 Answer briefly:
   a) Differentiate inclusive and exclusive distribution.
   b) Define range.
   c) What do you mean by Kurtosis? State different kind of Kurtosis.
   d) In rolling a fair dice once what is the probability of appearing 2 or 3?
   e) What do you mean level of significance?
   f) Define two way ANOVA.

UNIT-I

Q.2 a) Following grouped data is obtained in an observation of ‘rate of reproduction’ of 50 fishes of a species. Make a frequency polygon and frequency curve with the help of data provided:

<table>
<thead>
<tr>
<th>Class interval (Ci)</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</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>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Q.3 a) Hemoglobin percentage of ten patients suffering from AIDS was recorded as 5.2 mg, 5.3 mg, 5.6 mg, 5.7 mg, 5.4 mg, 5.2mg, 5.3 mg, 5.4 mg, 5.3 mg, 5.20 mg. Find out the mean Hb% of patients suffering from AIDS.

b) Ovary weight of 50 fishes and their frequency is given in class interval. Find standard deviation:

<table>
<thead>
<tr>
<th>Wt. of ovary</th>
<th>2-2.9</th>
<th>3-3.9</th>
<th>4-4.9</th>
<th>5-5.9</th>
<th>6-6.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>6</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

UNIT-II

Q.4 a) What is sampling?

b) To test the significance of the variation of the prices of eggs per dozen in three cities-Mumbai, Kolkata, Chennai. Four shops were chosen at random in each city and prices observed in rupees were given as follows:

<table>
<thead>
<tr>
<th></th>
<th>Mumbai</th>
<th>Kolkata</th>
<th>Chennai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prices</td>
<td>10 8 12</td>
<td>14 10 10</td>
<td>4 10 8</td>
</tr>
</tbody>
</table>

Do the data indicate that the prices in the three cities are having significantly different? Table value of $F_{0.05} = 4.26$.
Q.5  
   a) Define null hypothesis. Explain all the steps needed in order to test a hypothesis 
   with the help of a suitable example.  
   b) In experiments on pea breeding, Mendel got the following frequencies of seeds:  
      315 round and yellow, 108 round and green, 32 wrinkled and green; total 556.  
      Theory predicts that the frequencies should be in the proportion 9:3:3:1. Examine  
      the correspondence between theory and experiment.  
      \[ \chi^2 \text{ for } 3 \text{ d.f at 5\% level } = 7.815. \]  
   6

UNIT-III

Q.6  
   a) What is regression?  
   b) Number of ponds (X) in a town and number of fishes (Y) were as follows. Find the  
      rank correlation \( \rho \).  
      \[
      \begin{array}{cccccccccc}
      X & 17 & 17 & 18 & 19 & 19 & 20 & 21 & 22 & 23 \\
      \end{array}
      \]
   10

Q.7  
   The marks secured by recruits in the selection test (x) and proficiency test (y) are as  
   follows:  
   \[
   \begin{array}{cccccccccccc}
   \text{S.No.} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
   X & 10 & 15 & 12 & 17 & 13 & 16 & 24 & 14 & 22 \\
   Y & 30 & 42 & 45 & 46 & 33 & 34 & 40 & 35 & 39
   \end{array}
   \]
   Calculate the rank correlation coefficient.  
   12
End Semester Examination, Dec. 2015
M. Sc. (Biotechnology) - Third Semester
ANIMAL BIOTECHNOLOGY (BT-S-301A)

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 Answer briefly:
(a) Draw a well labeled diagram depicting the structure of mitochondrion.
(b) Differentiate between the characteristics of primary and established cell lines.
(c) Enlist the key events in apoptosis.
(d) Give applications of Cytotoxicity testing.
(e) What are the factors responsible for cell adhesion?
(f) Explain the significance of somatic cell genetics.

UNIT-I

Q.2 a) Explain the various modes of transport across plasma membrane.
(b) Discuss the importance of following constituents in animal cell culture medium.
   i) Carbon dioxide.
   ii) Phenol red.
   iii) Glutamine.

Q.3 Describe in detail the formulation of animal cell medium. Why is serum added to the medium?

UNIT-II

Q.4 a) Compare the following types of culture techniques.
   i) Organ culture.
   ii) Histotypic culture.
   iii) Disaggregated cell culture.
(b) Discuss the indirect methods used for determination of cell viability.

Q.5 Write short notes on:
(a) Cell cloning.
(b) Cell synchronization.

UNIT-III

Q.6 Describe various applications of cultured animal cells.

Q.7 a) What are the advantages of cell culture based vaccines over egg-based vaccines?
   b) Highlight the major bottlenecks in stem cell therapy.
   c) Explain the construction and working of any one type of animal cell culture bioreactor.
End Semester Examination, Dec. 2015  
M.Sc. (Biotechnology) – Third Semester  
PLANT BIOTECHNOLOGY (BT-S-302 / BT-S-302A)

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 de-differentiation and re-differentiation?
   b) Differentiate between symmetrical and asymmetrical hybrid.
   c) What do you mean by surface sterilization of explants?
   d) Define the concept of disarmed in gene transfer.
   e) What is a satellite RNA protection?
   f) Describe microsatellites.

UNIT-I

Q.2 a) Explain the technique of embryo culture with a suitable diagram. 8  
    b) Describe enzymatic method for protoplast isolation. 4

Q.3 a) Discuss microspore culture for obtaining androgenic haploids. 7  
    b) Write a note on significance of germplasm conservation. 5

UNIT-II

Q.4 a) Explain Agrobacterium mediated gene transfer method in detail. 10  
    b) What are binary vectors? 2

Q.5 a) Describe particle bombardment and microinjection methods for direct DNA transfer. 8  
    b) Write a note on caulimovirus and geminivirus vectors. 4

UNIT-III

Q.6 a) Explain different methods for insect resistance and virus resistance. 10  
    b) What is shelf life? 2

Q.7 Discuss the technique of RFLP along with its applications. 12
End Semester Examination, Dec. 2015
M.Sc. (Biotechnology) – Third Semester
ENVIRONMENT BIOTECHNOLOGY (BT-S-303A)

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) Write a brief note on oilzapper technology.
   b) What are the major points of comparison between aerobic and anaerobic waste water treatment?
   c) Explain the concept of bioavailable fraction of heavy metals in soil with the help of an example.
   d) What do you mean by bioprospecting? 3x4

UNIT-I

Q.2 a) Define environment biotechnology and discuss the current areas of research for environment protection. 5
   b) Explain the physical, chemical and biological characteristics of waste water. 7

Q.3 What do you understand by waste water treatment? Explain the classification of waste water treatment systems with the help of the flow charts and suitable diagrams. 12

UNIT-II

Q.4 Explain the possible mechanisms of metal resistance in microorganisms and discuss the adverse effects of microbial metal transformations. 12

Q.5 a) What is bioremediation? Discuss the role of microbes in environmental cleanup. 5
   b) Differentiate between natural and induced hyperaccumulation. What are the different mechanisms of phytoremediation? 7

UNIT-III

Q.6 a) Differentiate between the concept of green growth and sustainable development. 6
   b) Write a short note on biopiracy. 6

Q.7 a) How do we measure the biodiversity in India? What are the three approaches used to determine the value of earth’s biological resources? 7
   b) “India is one of the megadiversity nations”, comment. 5
End Semester Examination, Dec. 2015  
M.Sc. (Biotechnology) – Third Semester  
FOOD AND ENZYME BIOTECHNOLOGY (BT-S-304A)

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 Answer briefly:
   a) Discuss the principle of aerobic plate count.
   b) What is the role of Saccharomyces cerevisiae in food production?
   c) Draw Michaelis-Menten graph and write its equation.
   d) What are iso-enzymes, explain with an example?
   e) Write the steps for enzyme engineering.
   f) What are the roles of glucose oxidase and catalase in food industry?

   2x6

UNIT-I

Q.2 Write short notes on:
   a) Production of Cheese.
   b) Single cell protein.
   c) Use of food waste for production of valuables.

   4x3

Q.3 a) Give a synopsis of bacteria and yeast associated with food spoilage.
   b) Define drying and describe the methods of food preservation by drying and high temperature.

   6

UNIT-II

Q.4 a) Discuss the mechanism of action of enzymes.
   b) What are the different strategies to purify an enzyme?

   6

Q.5 a) Derive Line weaver Burk plot and explain competitive and non competitive inhibition.
   b) Discuss the mechanism of reactions of enzymes in biphasic-organic media.

   6

UNIT-III

Q.6 Describe the mechanism of enzyme action in:
   a) Production of glucose and maltose syrup.
   b) Diary industry.

   6x2

Q.7 Write notes on:
   a) Industrial uses of amylases and proteases.
   b) Use of glucose oxidase and catalase in food industry.

   6
End Semester Examination, Dec. 2015  
M.Sc. (Biotechnology) – Third Semester  
STEM CELLS AND REGENERATIVE MEDICINES (BT-S-305B1)

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  Answer briefly:  
   a) What is leukemia inhibitory factor?  
   b) What are induced pluripotent stem cells (IPS)?  
   c) Differentiate among Totipotent, pluripotent and unipotent cells.  
   d) Why adult stem cells are preferred over embryonic stem cells?  

   **UNIT-I**

Q.2  a) Define stem cell niche. Explain the self renewal of inner lining of small intestine.  
     b) What do you understand by fate mapping of stem cells?  

Q.3  a) Differentiate between embryonic germ cells and embryonic stem cells.  
     b) Explain the molecular mechanism underlying pleuri-potency of embryonic stem cells.

   **UNIT-II**

Q.4  a) What are hemangioblast cells?  
     b) Explain myeloid and lymphoid lineages of hematopoietic stem cells.

Q.5  a) What is hematopoiesis?  
     b) Give a brief account of repopulating pattern of primitive hematopoietic stem cells.

   **UNIT-III**

Q.6  What are the strategies to repair the nervous system by stem cells? Give an example of curing any neurological disorder by stem cells.

Q.7  Give the cause, types and symptoms of diabetes disease. Explain how diabetes can be cured by stem cells.
Q.1 a) What is the use of drain tiles?
b) What do you understand by refractoriness of a material?
c) How would you explain natural bed of stone?
d) What is thermal metamorphism?
e) What is the limitation of good building stone in specific gravity?
f) What is slaking?
g) What is the function of alumina in cement manufacturing?
h) How do we categorize coarse sand?
i) What is the meaning of rough timber?
j) Define annealing.

PART-A

Q.2 a) Write a note on quarrying of stones.
b) Make a clear diagram of Bull’s trench kiln and explain the working of it.

Q.3 a) What are the various types of lime used in construction work?
b) Explain briefly the following about cement:
   i) Consistency test.
   ii) Soundness test.

Q.4 a) Write the effects of fly-ash on cement concrete briefly.
b) How many types of shakes are there, explain with neat and clear figures?

PART-B

Q.5 a) Write in detail about the classification of mortar on the basis of kind of binding material.
b) What are the common constituents of paints?

Q.6 a) Explain the following briefly:
   i) Weigh batching.
   ii) Curing.
   iii) W/C ratio.
   iv) Compaction factor test.
b) How pig-iron is manufactured?

Q.7 a) Differentiate between coal tar and mineral tar.
b) Classify bitumen on the basis of sources.
c) How glass is manufactured? Explain the process of it in detail.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
STRUCTURAL ANALYSIS-I (C-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 Varignon’s theorem.  
b) Differentiate between determinate and indeterminate structures.  
c) Draw the shear force diagram for simply supported beam with a point load ‘W’ at the centre of the span.  
d) Check determinacy of a three hinged arch and a two hinged arch.  
e) Write the equation to differentiate between perfect, deficient or redundant frame.  
f) Write the assumptions used in the analysis of a truss.  
g) Define slenderness ratio.  
h) Write down the assumptions used in Euler’s theory for long columns.  
i) What is a conjugate beam?  
j) Write down the first moment area theorem.  
2x10

PART-A

Q.2  
a) Explain any two supports and the reactions developed.  
5  
b) Find the reactions at A and B of the figure given below:

15

Q.3  
Draw SFD and BMD for the figure given below:

20

Q.4  
A three hinged parabolic arch hinged at supports and at the crown has a span of 24m and a central rise of 4m. It carries a concentrated load of 50kN at 8m from left
support. Determine the vertical reactions and horizontal thrust at the supports.

PART-B

Q.5 Determine the mature and magnitude of forces in the members DF, EF and EG in the figure given below:

![Diagram of a triangular structure with forces applied at the vertices](image)

Q.6
a) Derive the crippling load for column with both ends hinged.

b) A mild steel tube of 50mm internal diameter and 60mm external diameter, length 4m is used as a column with both ends fixed. Calculate the Euler’s load. Given $E = 2 \times 10^5 \, \text{N/mm}^2$.

Q.7 Find out the deflection at the mind span of simply supported beam of length 16m with a $\mu.D.L.$ of 10N/m using double integration method.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
STRUCTURAL ANALYSIS-I (C-301B)

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 do you understand by Bending Moment and Shear force?
   b) Write Sign Convention for shear force and bending moment which is usually adopted.
   c) What is an Influence line diagram?
   d) What are single concentrated load positions for maximum end shear(+ve and –ve)?
   e) In a Parabolic Symmetrical Three Hinged arch, the Bending moment at any section due to dead load is zero. Why?
   f) What is the rise at Quarter Points of a Parabolic Arch?
   g) Draw any two stable and unstable trusses.
   h) Why is a triangle and not a square a basic unit of a truss?
   i) What are the various end conditions and equivalent length corresponding to different end conditions?
   j) Explain moment area first and second theorem.

PART-A

Q.2 Draw Shear Force and Bending Moment diagrams for the following beam.

\[ \text{Shear Force Diagram} \]
\[ \text{Bending Moment Diagram} \]

Q.3 Uniformly distributed load of intensity 30kN/m crosses a simply supported beam of span 60m from left to right. The length of the udl is 15m. Find the value of maximum bending moment for a section 20m from left end. Find also the absolute maximum bending moment.

Q.4 A three hinged circular Arch hinged at the crown and springing points has a span of 40m and a central rise of 8m. It carries a udl of 20kN/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 10m from left support.
   c) Find radial shear at a section 10m from left support.

PART-B
Q.5 Compute the forces in the members BD, CD and CE of the truss shown using method of sections.

![Diagram of truss](image)

Q.6 a) Obtain an expression for Euler’s load in case of both ends fixed for a column. 

b) A solid circular section of diameter 250mm and 3 m long is used as a column with both ends fixed. Calculate the crippling load using $E = 2 \times 10^5$ N/mm$^2$.

Q.7 a) Write down the Conjugate Beam Method’s first and second theorem?

b) Find out the deflection at the mid span of simple supported beam with UDL on entire length using double integration method.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
BUILDING CONSTRUCTION AND MATERIALS (C-302C)

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 different types of building.
     b) Define:  i) Perpend   ii) Nogging
     c) Give brief classification of masonry walls.
     d) Briefly explain need of deep foundation.
     e) What are various sources of dampness?
     f) Draw a neat sketch of queen post truss.
     g) What is the need for sustainability in construction and material?
     h) What is the size and weight of a standard brick?
     i) List any four materials which can be used for damp proofing.
     j) What is strap footing?  

   PART-A  

Q.2  a) Give detail classification of rubble masonry with neat sketches.  
     b) i) Explain various defects in brick masonry.
          ii) Write a short on composite stone masonry.

Q.3  a) What are functions of cavity wall? Also list various precautions which are to be kept in mind while constructing cavity wall.
     b) Write short notes on:
          i) Hollow brick partition.
          ii) Concrete partition wall.
          iii) G.I sheet partition.
     c) List various advantages of partition walls.

Q.4  a) What are various purposes of foundations?
     b) Give a brief classification of foundation. Also explain pile foundation in detail.
     c) Write a short note on raft foundation.
     d) What are geophysical methods? Explain any one in detail.

   PART-B  

Q.5  a) i) What are various defects caused by dampness?
     ii) Explain:  a) Membrane damp proofing.  b) Integral damp proofing. 
     b) Explain DPC treatment given in basement in detail.

Q.6  a) What are different types of roofs? Explain any two in detail.
     b) Write short notes on:
          i) Terrazzo flooring.
          ii) Mosaic flooring.
     c) Define following:
          i) Ridge  ii) Eaves  iii) Span  iv) Purlin  v) Rafter
Q.7  a) Write short notes on:
   i) Hot weather concrete    ii) Fibre reinforced concrete    iii) Flyash  5x3
b) What are smart materials? Explain any two in detail.  5
Q.1 Write notes on:
   a) Newtonian and Non-Newtonian fluids.
   b) Capillarity and viscosity.
   c) Absolute and Gauge pressure.
   d) Manometer.
   e) Centre of buoyancy.
   f) Pathline and streak line.
   g) Assumption of Bernoulli’s equation.
   h) Froud number.
   i) Uniform and nonuniform flow.
   j) Model and prototype.

**PART-A**

Q.2 a) What do you mean by surface tension? Derive an expression for surface tension force.  

b) Find the dia of a bubble if surface tension in the bubble is 0.015 N/m, and inside pressure is 7 N/m above atmospheric pressure.

Q.3 a) What do you mean by hydraulic gradient line and energy gradient line? Discuss with a suitable sketch for given diagram in detail.

b) What do you mean by stability of floating body? Derive an expression for metacentric height.

Q.4 a) Discuss in details about Euler’s equation along stream line and its integration.

b) Derive an expression for discharge flowing through sharp crested rectangular weir.

**PART-B**

Q.5 a) What do you mean by notches and weirs? Discuss in details the various types of weirs.

b) What do you mean by boundary layer thickness? Discuss in details the laminar, transition, turbulent and laminar-sublayer boundary thickness with a suitable sketch.

Q.6 a) Discuss the boundary layer separation and its control with a suitable sketch.

b) What is Buckingham theorem? Discuss in details.
Q.7  a) Write a note on important dimensionless numbers and their significance.  
10
b) What do you mean by dimensional analysis? Discuss in details about similitude and type of similarity.  
10
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
SURVEYING-I (C-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 Answer all questions:
a) State the principles of surveying.
b) What is temperature correction in tape measurement?
c) What is fore-bearing and back-bearing?
d) What could be the maximum value of an angle in whole circle bearing?
e) Define leveling.
f) What is meant by a contour?
g) What are temporary adjustments of theodoliti?
h) Define latitude and depart use of a line.
i) What is the use of anallactic lens in tachometer?
j) What is plane table surveying?

Q.2 a) What do you mean by surveying? What are primary divisions of surveying? Differentiate clearly between plane and geodetic surveying.

b) A steel tape was exactly 30 m long at 18°C, when supported throughout its length under a pull of 8 kg. A line was measured with a tape under a pull of 12 kg and found to be 1602 m. The mean temperature during measurement was 26°C. Assuming the tape was supported at every 30 m, calculate the true length of the line. Given cross-sectional area of tape = 0.04 cm² weight of 1 cube cm is 0.077 kg, coefficient of thermal expansion, α = 0.000012°C, E = 2.1x10⁶ kg/cm².

Q.3 a) Describe the whole circle bearing (WCB) and quadrantal bearing (QB) in details. Give examples in each case.

b) Find out the bearing of lines of an equilateral triangle ABC running clockwise, if the bearing of the line AB is 60°30′.

c) Write short notes on:
   i) Local attraction.
   ii) Magnetic declination.
   iii) Angle of dip.
   iv) Magnetic meridian.

PART-A

Q.4 a) What do you mean by surveying? What are primary divisions of surveying? Differentiate clearly between plane and geodetic surveying.

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c) Write short notes on:
   i) Local attraction.
   ii) Magnetic declination.
   iii) Angle of dip.
   iv) Magnetic meridian.
Q.4  a) What is a contour? What are its characteristics? Explain in detail.  
  
  b) The following staff reading were taken with a level. The instrument having been shifted after 4th, 7th and 10th readings R.L. of starting B.M is 100.00 m. Enter the readings in the form of a level book page and reduce the level by the collimation method (H.I. method) and apply the usual checks. 
  2.65, 3.74, 3.83, 5.27, 4.64, 0.38, 0.96, 1.64, 2.84, 3.48, 4.68 and 5.26.  

**PART-B**

Q.5  a) Describe the various methods of balancing of traverse.  
  
  b) The following are the length and bearing of the sides of a closed traverse ABCDA: 

<table>
<thead>
<tr>
<th>Line</th>
<th>Length (m)</th>
<th>Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>76.80</td>
<td>140° 12'</td>
</tr>
<tr>
<td>BC</td>
<td>195.60</td>
<td>36° 24'</td>
</tr>
<tr>
<td>CD</td>
<td>37.30</td>
<td>338° 48'</td>
</tr>
<tr>
<td>DA</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

Compute the length and bearing of the line DA.

Q.6  a) Explain in detail about the advantages and disadvantages of plane table surveying.  
  
  b) Drive the distance and elevation formula for staff held vertical and line of sight is inclined.

Q.7  a) Enumerate the classification of curves in engineering surveys.  
  
  b) What are various elements of a simple circular curves? Explain with a neat sketch.  

  c) Two tangent meet at chainage 1022 m, the deflection angle being 36°. A circular curve of radius 300 m is to be introduced in between them. Calculate the: 
  i) Tangent length.  
  ii) Length of circular curve.  
  iii) Chainage of tangent points.  
  iv) Length of long chord.  
  v) Degree of curve.  

2x5
End Semester Examination, Dec. 2015
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 a) Explain the limitation of DBMs.
b) Explain the strong entity with the help of example.
c) What is importance of functional dependencies in database design?
d) What do you mean by indexed-sequential file processing?
e) What is checkpoint? How it is used in recovery operation following a system crash?

4x5

PART-A

Q.2 a) Discuss the advantages and characteristics of the three-tier architecture.
b) Describe the structure of DBMS with its components and relationships between them with the help of diagram.

8 12

Q.3 a) Explain the following with their advantages and disadvantages:
   i) Network database model.
   ii) E-R database model.
   iii) Relational database model.
   b) An enterprise database to store information as follows:
      Employee (Emp_ID, Salary, Phone)
      Departments (Deptt_ID, Deptt_Name, Budget)
      Employee-Child (Name, age)
      Employee ‘work’ in departments each department is ‘managed by’ an employee. A child must be identified uniquely by ‘name’ when the parent (who is an employee) is known. Once the parents leaves the enterprise, the information about the child is not required.
      Draw an E-R diagram that captures the above information.

10 10

Q.4 a) What is relational algebra? What is its use? List relational operations.
b) What do you mean by relational calculus? What are the types of relational calculus?

10 10

PART-B

Q.5 a) Explain the differences between master files, transaction files and report files.
b) Explain the difference between the following:
   i) Primary vs secondary indexes.
   ii) Dense vs sparse indexes.

10 10

Q.6 a) What are ACID properties of database transaction? How there properties are relate to concurrency control.
b) How we can use immediate update technique during the database recovery.

12 8
Q.7  Short notes on:
a) Shadow paging  
b) Deadlock  
c) B-Tree index file  
d) Audit trails.
End Semester Examination, Dec. 2015
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 a) What are chemical admixtures?  
b) Define soundness of cement.  
c) Define workability of concrete.  
d) Name any four admixtures.  
e) What is alkali-aggregate reaction?  
f) What do you understand by M20 grade?  
g) What do you understand by concrete?  
h) List any four types of cement.  
i) Define heat of hydration.  
j) What does slump means in terms of workability? 2x10

PART-A

Q.2 a) What are the advantages of concrete?  
b) Explain ordinary Portland cement (OPC) and portland pozzolana cement (PPC) in brief.  
c) Mention the physical properties of cement and explain the same in detail. 10

Q.3 a) Define bulking of sand. How does it effect the concrete?  
b) Explain grading of aggregates with an example.  
c) How does aggregates classified according to?  
   i) Particle size and shape.  
   ii) Surface texture. 5x2

Q.4 a) Define workability of concrete. Explain any two methods to measure the workability.  
b) Write short notes on:  
   i) Durability.  
   ii) Impermeability in terms of concrete. 5  
c) Explain the role of water cement ratio on the various physical properties of fresh concrete. 5

PART-B

Q.5 a) What do you understand by admixtures? Explain mineral admixtures with an example and their effects on concrete. 10  
b) Briefly explain water reducing admixtures and their applications in concrete technology. 10

Q.6 a) Explain the concreting process in cold weather regions. 10  
b) Describe fiber reinforced and light weight concrete in brief. 10

Q.7 a) What is mix design? How is it different from a nominal mix? Explain its selection criteria. 10

145/3
b) Explain the mix design process in detail.
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
STRENGTH OF MATERIALS (C-306C)

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 elastic and plastic material.  
b) Explain plane stress condition.  
c) What is Poisson’s ratio?  
d) Show the variation of shear stress in:  
   i) Hollow circular section.  
   ii) T-section  
e) Define shear centre.  
f) Write down the equation for pure bending and explain the terms.  
g) Define polar moment of inertia.  
h) Explain Mohr’s circle.  
i) What do you understand by composite beam?  
j) Define eccentricity and write down the formula for combined stresses due to axial load and bending.

PART-A

Q.2  
a) Derive the expression for volumetric strain.  
b) Given figure shows a bar of three lengths. Find the stress in three parts and the total extension of the bar for an axial pull of 80 kN. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

Q.3  
Determine the normal stress, tangential stress and the stress resultant on an oblique plane inclined at an angle of $30^\circ$ with the $x$-axis for the following stresses:  
\[
\sigma_x = 80 \text{ MPa}, \quad \sigma_y = 40 \text{ MPa}, \quad \tau_{xy} = 70 \text{ MPa}.
\]  
(Tensile)  
(Tensile)  
Also find the principal stresses.

Q.4  
A flitched beam consists of two timber joists each 80 mm wide and 300 mm deep, with a steel plate 180 mm deep and 20 mm thick placed symmetrically between them. Calculate the total moment of resistance of the section if the allowable stress in timber joist is 15 N/mm$^2$. Take $E_s=20E_T$.

PART-B

147/3
Q.5 A 300 mm×500 mm I-girder has 15 mm thick flanges and 10 mm thick web. It is subjected to a shear force of 350 kN. What is the maximum shear stress in the flange? Also, calculate maximum shear stress in the web.

Q.6 A short masonry pier of 800 mm×1200 mm supports a compressive load of 80 kN as shown in the figure. Find the stresses at the four corners of the section.

Q.7 a) A shaft of 80 mm diameter is made from steel and maximum allowable shear stress is 50 MPa. Calculate the maximum torque that can be safely transmitted. Take G if required as 90 GPa.

b) A solid shaft is required to transmit 120 kW power at 200 rpm. Find the suitable diameter if the maximum torque exceeds the mean by 20%. Allowable shear stress is 70 N/mm².
Q.1  
a) Define Castigliano’s second theorem.  
b) Write Clapeyron’s theorem of three moments assuming notations for a continuous beam.  
c) Find the bending moment at any point in a 2-hinged arch.  
d) Define Maxwell’s reciprocal theorem.  
e) Draw ILD for reaction for simply supported beam.  
f) State Muller-Breslau principal.  
g) What is elastic centre?  
h) Write the expression for strain energy stored due to bending.  
i) What is the magnitude of minimum tension in a cable?  
j) Draw ILD for bending moment in case of over-hanging beams.

Q.2  
a) A train of 5 wheeled loads are shown in the figure crosses a simply supported beam of span $25 \text{m}$.  
i) Calculate maximum positive and maximum negative shear force at $12 \text{m}$ from left support.  
ii) Calculate absolute maximum bending moment.

b) A distributed live load of $80 \text{kN/m}$ run may occupy any position on girder as shown in the figure. Find max positive bending moment that can occur on section ‘C’.

Q.3  
Find the reaction at supports and draw bending moment diagram using strain energy for figure. Frame is having uniform flexural rigidity.
Q.4 Analyse the continuous beam using moment distribution method:

Q.5 Analyse the beam using column analogy method. Shown in the figure.

Q.6 a) A semi-circular arch of radius $R$ is subjected to udl of $w \text{kN/m}$ length over half of span in left side. EI is uniform. Find horizontal thrust.

b) Two hinged parabolic arch of span 50 m and rise 5 m is subjected to 60 kN of Central load. It has elastic supports which yields by $\alpha = 12 \times 10^{-6} / \degree C$, $E = 200 \text{kN/mm}^2$, $I = 5 \times 10^9 \text{mm}^4$. Rise in temp = 20 $\degree C$. Calculate horizontal thrust considering yielding and temperature effect.

Q.7 a) A cable is subjected to 10 kN/m udl over whole span. The two supports are 30 m horizontally apart. The left support is 3 m above the right support. Find:
   i) Horizontal thrust.
   ii) Max tension in cable.
   iii) Min tension in cable.
b) A cable having a span of 100\(m\) and dip 5\(m\) is subjected to a rise of temperature 15\(^\circ C\). Find increase in dip due to rise in temperature. 
\[ \alpha = 12 \times 10^{-6} \text{ / } ^\circ C \]
End Semester Examination, Dec. 2015  
M. Tech. (Structural Engineering) – Third Semester  
ADVANCED FOUNDATION ENGINEERING (C-MS-305)

Time: 3 hrs 
Max Marks: 75

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Answer in brief:
   a) Define shallow and deep foundations. 2
   b) List the factors for selection of type of foundation. 2
   c) Write minimum depth of foundation as per Rankine’s analysis. 2
   d) What two criterias should be satisfied to calculate allowable bearing pressure of soil? 1
   e) Mention the limitations of standard penetration test. 2
   f) What are the conditions where a pile foundation is more suitable than a shallow foundation? 2
   g) List different methods to find out bearing capacity of shallow foundation. 2
   h) What is objective of ground improvement? 2

Q.2 a) Write the steps for the selection of the type of foundation. 5
   b) Explain various types of foundations with the help of a neat sketch. 10

Q.3 a) Discuss various types of failure in soil. How ultimate bearing capacity in local shear is determined? 8
   b) Determine the allowable gross load and net allowable load for a square footing of 2m side and depth of 1.0 m. Use Terzaghi’s theory and assume local shear failure. Take $FOS = 3.0$, $\gamma = 18 \text{kN/m}^3$, $c' = 15 \text{kN/m}^3$, $\varphi = 25^\circ$. Take $N_c = 14.8$, $N_q' = 5.6$ and $N_r' = 3.2$. 7

Q.4 a) Discuss the various loads that are to be considered in the design of foundations. 7
   b) Design a reinforced cement concrete footing for a 1m wide concrete wall carrying a load of 800 kN/m. The allowable soil pressure is $= 200 \text{kN/m}^2$. 8

Q.5 a) What is raft foundation? Why is it required? Discuss the procedure for the design of raft foundation. 8
   b) Describe plate load test. What are its limitations and use? 7

Q.6 a) What is negative skin friction? What is its effect on the pile? 5
   b) How would you estimate group capacity of piles in: i) Sand ii) Clay 5
   c) A 30 cm diameter concrete pile is driven in a normally consolidated clay deposit 15m thick. Estimate the safe load. Take $c_u = 70 \text{kN/m}^2$, $\alpha = 0.9$ and $F.S = 2.5$ 5

Q.7 a) What preventative methods can be adopted before the construction of foundations on collapsible soils susceptible to wetting? 5
   b) What are the forces acting on a well foundation? Explain. 5
   c) What do you mean by grip length? What is its importance in well foundation? 5
End Semester Examination, Dec. 2015
M. Tech. (Construction Management) - First Semester
PROJECT PLANNING AND CONTROL (C-MC-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 Write short notes on any three of the following:
   a) Utility a transit mixer.
   b) Crashing of project activity.
   c) Earliest start time.
   d) Free float.

Q.2 Discuss how to complete a project in time and within the estimated cost. Give examples to support your argument.

Q.3 Draw PERT and mark critical path for the following case:

<table>
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<tr>
<th>Sr. No.</th>
<th>Activities</th>
<th>Activity Duration in Days</th>
<th>Proceeding Activity</th>
<th>Succeeding Activity</th>
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Q.4 Compute the material and labour required for manufacturing of 100 cu.m. of concrete of M 25 grade required for mass concreting. Take reinforcement density as $\frac{3}{20} \text{ m}^2\text{kg}$. Assume suitable rates of material and labour as per present market norms.

Q.5 Discuss the following:
   a) Slackness of activities. Give examples.
   b) Crashing of activities.
   c) Critical path of a PERT.

Q.6 List various methods of resource labeling and explain any one with an example.

Q.7 Explain various functions of a computer application in project management.
End Semester Examination, Dec. 2015  
M. Tech. (Construction Management) - First Semester  
QUALITY CONTROL AND SAFETY IN CONSTRUCTION (C-MC-102)

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 What do you understand by quality control and safety management? Discuss with two examples.  
15

**PART-A**

Q.2 Explain the various elements of quality control. Cite the examples.  
15

Q.3 Why taking “Greater care in detailing” while drawing contracts is important? Explain in detail.  
15

Q.4 Draw priority wise precedence over others from following list and explain with argument:  
a) Specification.  
b) Tender documents.  
c) General specifications.  
d) Bureau of Indian specification.  
e) Manufacture specification.  
f) Direction of architect or engineer-in-charge.  
15

**PART-B**

Q.5 What are personal safety appliances and equipments? Discuss their importance and uses in detail.  
15

Q.6 What do you understand by the term ‘Safety at site’? Discuss with two examples.  
15

Q.7 Write short notes on any three of following:  
a) Fall from height.  
b) Alcoholism of workers on duty.  
c) Storage of hazardous materials at site.  
d) Non-use of protective gear at construction site.  
e) Safety induction training.  
5x3
End Semester Examination, Dec. 2015
M. Tech. (Construction Management) - First Semester
CONSTRUCTION CONTRACT MANAGEMENT (C-MC-103)

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) Define a contract.
    b) What important information is provided in a tender notice?
    c) Mention the reasons for disqualification of any person from entering in a contract.
    d) Name any three financial aspects that are considered in awarding a contract.
    e) What do you understand by express contract?
    f) Explain arbitration in brief.
    g) Define trade union.
    h) Give any three silent features of Trade Union Act, 1926.
    i) What do you understand by an industrial dispute?
    j) Define 'labour law' in brief.

  1½x10

PART-A

Q.2  a) Discuss the essential elements of a void contract in detail.
    b) Describe the legal roles for a valid offer.

  8
  7

Q.3  Write short notes on any four:
    a) Termination of contract.
    b) Tender notice.
    c) Earnest money.
    d) Extension of time.
    e) Maintenance period.
    f) Penalty.

  15

Q.4  a) Write down all the steps in sequence from the stage of issue of the tender notice to acceptance of the tender.
    b) What do you understand by “two cover system”? Explain in detail.

  8
  7

PART-B

Q.5  a) Discuss the advantages of arbitration over civil court.
    b) List out the qualifications and powers of an arbitrator.
Q.6  a) Discuss the role or functions of a trade union.
    7
   b) As per labour Act, what facilities and requirements are to be provided for construction workers?
    8

Q.7  a) Describe in detail the pre-requisites for registration of a trade union.
    7
   b) "Industrial dispute are of many types", describe them in detail.
    8
End Semester Examination, Dec. 2015
M. Tech. (Construction Management) - First Semester
CONCRETE ENGINEERING AND TECHNOLOGY (C-MC-104)

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.

Use of IS 10262:2009 is permitted

Q.1 Attempt all parts:
a) Define Duff Abram’s Law.
b) Why volume batching is banned?
c) What is pozzolana?
d) How do size of aggregate affect strength of concrete?
e) What are deleterious substances?
f) Define dynamic modulus of elasticity.
g) Define grade of cement.
h) Explain carbonation of concrete.
i) Write a note on chloride attack.
j) What is well-graded aggregate?

Q.2 a) Name the compounds of cement and explain their functions and write their hydration reactions.

b) Write the features of Gap-graded aggregates.

Q.3 Write short notes on the following:
a) Air entraining admixture
b) Water reducer
c) Accelerator

Q.4 a) Write short note on compaction factor method.

b) Design a M-40 nominal mix of concrete having following properties. Grade of cement-OPC 43. Maximum size of nominal aggregate is 10 mm. Minimum cement content-320 kg/m³. Maximum cement content-450 kg/m³. Workability is 75 mm. Type of aggregate is crushed angular. Superplasticizers is used. Concrete is pumpable and exposure condition is severe. Fine aggregate is from zone III. Specific gravity of cement is 3.15, specific gravity of superplasticizer is 1.145, specific gravity of coarse and fine aggregate is 2.75 and specific gravity of flyash is 2.2. Consider any data if missing.

PART-A

PART-B
Q.5  a) What are the factors affecting workability of concrete?
   b) Which concrete sample would be having higher strength a cylindrical (150x300) or a cubical (150 mm x 150 mm x 150 mm) and why?
   c) Write the difference between static and dynamic modulus of elasticity.

Q.6  a) What is creep? What are the factors that governs the creep?
   b) How creep can be measured? What are the measures to prevent creep?

Q.7  Write short notes on the following:
   a) Polymer concrete
   b) High performance concrete
   c) Under water concreting

5x3
End Semester Examination, Dec. 2015  
M. Tech. (Construction Management) - First Semester  
TALL STRUCTURES (C-MC-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 Explain the following with neat sketches in brief.  
a) Tube-in tube system.  
b) Flat slab system.  
c) Infilled rigid frame.  
d) Shear wall system.  
e) Bundled tube structures.  

Q.2 a) What is composite steel-concrete floor system?  
b) Describe waffle flat slabs in brief.  
c) Elaborate braced system in brief.  

Q.3 a) What is human comfort criteria for design of tall buildings?  
b) What is the limitations of stiffness and drift in tall buildings?  
c) How wind load is considered in design of tall buildings?  

Q.4 Analyse the frame shown in figure by portal frame method.  

Q.5 a) How high rise buildings has evolved into present form? Explain its history in brief.
b) What are the different types of foundations used in high rise buildings? Explain in brief.

Q.6 Design a raft foundation for column of a high rise building as shown in figure. All columns are of $600\,mm \times 600\,mm$ and their spacing and loads are shown in figure.
Allowable bearing capacity of Soil = $100\,kN/m^2$
Concrete of grade M30 and steel of grade Fe415.

Q.7 Design a pile cap for supporting a column of section $500\,mm \times 500\,mm$ carrying an axial load of $1500\,kN$ at service state. The pile cap contains a group of four friction piles each of $300\,mm$ diameter for transfer of load from column to soil. Consider grade of concrete as $M25$ and grade of steel as Fe415.
End Semester Examination, Dec. 2015  
M. Tech. (Structural Engineering) - First Semester  
PRE STRESSED CONCRETE (C-MS-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) Draw stress-strain curve for high strength curve and high strength tensile steel.  5  
b) Why high strength materials are used in pre-stressed concrete.  5  
c) Explain with a neat sketch long-line system of pre-tensioning.  5

Q.2  
A pre-stressed concrete bridge deck comprises unsymmetrical I-section beams spanning over 16m. The cross-section of a typical beam is shown in figure. The beam is pre-stressed by seven freyssinet cables, each carrying an effective force of 500 kN located from 150 mm from the soffit at the centre of span section. If the total maximum bending moment at the centre of span of the girder is 4000 kNm. Estimate the resultant stress developed at the section using the internal resisting couple method.

Q.3  
a) Explain in brief about losses of pre-stress.  5  
b) A concrete beam is pre-stressed by a cable carrying an initial pre-stressing force of 250 kN. The cross-sectional area of the wire in the cable is 280 mm². Calculate the percentage loss of stress in the cable only due to shrinkage of concrete using IS:1343-2012 assuming the beam to be:  
i) Pre-tensioned  
ii) Post-tensioned.  
Assume $E_s = 2 \times 10^5 \text{ N/mm}^2$ and age of concrete at transfer=8 days.  10

Q.4  
a) List the factors influencing the deflection of pre-stressed concrete beam.  5  
b) A rectangular concrete beam of cross-section 150 mm wide and 350 mm deep is simply supported over a span of 8m and is pre-stressed by means of a symmetric parabolic cable, at a distance of 80 mm from the bottom of the beam at centre of span and zero eccentricity at supports. If the force in the cable is 400 kN and the modulus of elasticity of concrete is $4.2 \times 10^5 \text{ N/mm}^2$, calculate:  
i) Deflection at mid-span when the beam is supporting its own weight.  
ii) The UDL which will applied at complete span to restore it to the level of supports.  10

Q.5  
a) Write advantages of pre-stressed concrete over reinforced concrete.  5  
b) Classify different methods of pre-stressing.  5  
c) Discuss one-way, two-way and flat pre-stressed concrete slab.  5

Q.6  
A post tensioned T-section has a flange 1400 mm wide and 200 mm wide thick. The width and depth of the rib are 300 mm and 1600 mm respectively. The high tensile steel area is 5000 mm² and is located at the effective depth of 1650 mm. Considering
M50 grade concrete and steel of characteristic tensile strength of $2000 \, N/mm^2$.
Calculate moment of resistance of the section.

Q.7 Write short notes on the following:
   a) Concept of load balancing
   b) Bond in pre-tensioned and post-tensioned construction.
   c) End zone reinforcement
Q.1 Answer the following:
   a) Define logarithmic decrement.
   b) Discuss the characteristics of dynamics problem.
   c) Explain different types of dynamic loading.
   d) What do you understand by time period and natural frequency?
   e) What is dry or structural damping?

   **3x5**

**PART-A**

Q.2 a) Explain D’Alembert’s principle.

   **2**

b) What is negative damping?

   **3**

c) Derive the response for free vibration under damped SDoF system at 

\[ t = 0, u = u_0, \mu = v_0 \]

Draw a labeled response diagram.

   **10**

Q.3 A single storey building with rigid girder is supported by weightless columns. A free vibration is made on the roof system with a lateral displacement given by hydraulic Jack which is then released.

Given data:

- Jacking force \( P = 5000 \text{kg} \)
- Initial displacement \( \gamma_0 = 0.6 \text{cm} \)

After the instantaneous release of this displacement the maximum displacement on the first return \( \gamma_1 = 0.5 \) and the period of this displacement cycle \( T = 1.4 \text{sec}. \). Calculate the dynamic property of the structure with:

a) Effective weight of the girder.

b) Undamped frequency of vibration.

c) \( C \) and \( \omega_D \)

d) Amplitude after 6th cycle.

   **15**

Q.4 a) Calculate the effective stiffness of the system shown in the figure (EI=constant).
b) What are the consequences of vibration?

c) How many types of springs are there on the basis of mechanical characteristics?

PART-B

Q.5  a)  i) Derive the expression for force transmitted to the foundation.

ii) Explain the term transmissibility.

b) In an experiment of free vibration it was found that the maximum amplitude has reduced to 0.3 times to its value in 4 complete cycles. Find out the damping in the system.

Q.6  Derive the response expression for damped structure subjected to harmonic loading. Discuss the variations of dynamic amplification factor with damping ratio. Draw respective response graphs with labeling.

\[ F(t) = P_0 \sin \omega t \]

\[ m \ddot{u} + c \dot{u} + ku = P_0 \sin \omega t \]

Q.7  a) How multistoreyed building are classified? What are the basic assumptions in analysis of shear building?

b) A multistorey building subjected to free vibrations with \( x_{10} = 10 \text{ cm} \) to topstorey. Determine response of the structure.
Make the analytical model for the figure and derive the equation of motion.
End Semester Examination, Dec. 2015  
M. Tech. (Structural Engineering) - First Semester  
ADVANCED STRUCTURAL ANALYSIS (C-MS-103)

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  
(a) What is Kinematic indeterminacy?  
(b) Which of the beam is statically determinate?

(c) Explain in conjugate beam method in brief.  
(d) Develop a relationship between flexibility and stiffness matrix.  
(e) Compute the translational stiffness of joint B in the horizontal direction.

Q.2  
Beam ABC is loaded as below. Calculate the displacement due to the applied loads at co-ordinates 1 and 2. Also calculate displacement $\delta_{11}, \delta_{12}$ and $\delta_{22}$.

Q.3  
Analyse the portal frame ABCD as shown using displacement method.
Q.4 Analyse the continuous beam as shown below:

EI Const.

PART-B

Q.5 Determine the element of stiffness matrix for the portal frame with reference to the co-ordinate.

Q.6 A jib-crane carrying vertical load of 10kN at A. Determine the displacement of joint A. Also calculate the force AB and BC. Take $E = 200 \text{kN/mm}^2$.

Q.7 Determine the degree of freedom of the grid. Hence select a suitable system of co-ordinate and develop the stiffness matrix. The members are 300 mm in width and 600 mm in depth. Take $E = 12kN/mm^2$, $G = 5kN/mm^2$. 
End Semester Examination, Dec. 2015
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) Why tall building is required? Explain important reasons for it in brief.  
   b) Explain the factors affecting growth, height and structural system for building.  
   c) Explain basic structural form for tall buildings.
   
Q.2  
a) What are the loading acts on tall building?  
b) What is the limitation of tall building related to stiffness and drift?  
c) Explain design consideration for fire prevention in tall building.
   
Q.3  
a) Explain substitute frame method for analysis of multistoried rigid frames due to gravitational loading.  
b) Analyze the rigid frame, shown in the figure below, using any approximate method of analysis.

Q.4  
a) Explain foundation settlement and soil structure interaction in design.  
b) Explain creep, shrinkage and temperature effect on tall building.  
c) Differentiate between proportionate and non-proportionate shear wall system.
   
Q.5  
Explain with neat sketches:
   a) Bundled tube structure.  
   b) Coupled shear wall structure.  
   c) Tube in tube system.  
   d) Rigid frame structure.  
   e) Braced frame structure.

Q.6  Design a raft-foundation for the column and loading shown in figure below. Safe bearing capacity of soil is \( 80 kN/m^2 \) at a depth of 1.5m from general ground level.
Use M25 grade concrete and Fe 415 grade steel. Size of all column is 300 mm x 300 m.

Q.7 Design a pile cap for supporting a column of section $450 \times 450$ mm, carrying an axial load of 1200 kN at service state. The pile cap contains a group of 4 friction pile each of 300 mm diameter for transfer of load from column to soil. Use concrete of grade M 25 and steel of grade Fe 415.
End Semester Examination, Dec. 2015  
M. Tech. (Structural Engineering) - First Semester  
CONCRETE ENGINEERING AND TECHNOLOGY (C-MS-108)

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 Attempt all parts:
   a) Define fineness modulus.  
   b) Difference between quick setting and rapid hardening cement.  
   c) Define efflorescence.  
   d) Why do we test the concrete sample in saturated surface dry condition?  
   e) Explain carbonation of concrete.  
   f) Draw a neat graph showing the contribution of cement compounds to strength of cement.  
   g) Define poisson’s ratio.  
   h) What is low heat cement?  
   i) What is permeability of concrete?  
   j) Write a short note on sulphate attack.

Q.2
   a) Determine the fineness modulus of the following results:

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</tr>
</tbody>
</table>

   8

   b) Explain Portland pozzolana cement.  

   7

Q.3 Write short notes on the following:
   a) Air entraining admixture.  
   b) Mineral admixtures.  
   c) Retarders.  

   5x3

Q.4
   a) Write a short note on Vee-Bee consistometer.  

   3

   b) Design a M-40 nominal mix of concrete having following properties. Grade of cement OPC 43. Maximum size of nominal aggregate is 10 mm. Minimum cement content-320 kg/m³. Maximum cement content -450 kg/m³. Workability is 75 mm. Type of aggregate is crushed angular. Superplasticizer is used. Concrete is pumpable and exposure condition is severe. Fine aggregate is from zone III. Specific gravity of cement is 3.15. Specific gravity of flyash is 2.2. Specific gravity of coarse and fine aggregate is 2.75. Specific gravity of superplasticizer is 1.145.
Consider any data if missing.

12

**PART-B**

Q.5 a) Draw neat graph showing stress-strain curve of concrete and mark initial tangent, tangent modulus, and secant modulus on it. 
5
b) What are the factors that affect static modulus of elasticity? 
5
c) What is bleeding and segregation? 
5

Q.6 What is shrinkage of concrete? Explain different types of shrinkage of concrete. What are the factors that affect shrinkage of concrete? 
15

Q.7 Write short notes on the following:
   a) Fibre reinforced concrete. 
   b) Self compacting concrete. 
   c) Hot weather concreting. 
5x3
End Semester Examination, Dec. 2015
M. Tech. (Structural Engineering) - Third Semester
ADVANCED BRIDGE ENGINEERING (C-MS-301)

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 a) What are the various types under which bridge can be classified? Describe them in brief.
5
b) “Steel bridge is most suitable for long span”. Elaborate the above statement.
6
c) Name different types of steel bridge and describe any one in detail.
4

PART-A

Q.2 a) Describe IRC class AA loading with a suitable sketch.
8
b) Write short notes on:
   i) Secondary stress.
   ii) Longitudinal force.
   7

Q.3 a) An RCC culvert having width=12mtr. and clear span=5mtr. is to be provided on a state highway. No footpath is provided. The wearing course is 56mm thick asphaltic concrete. Find out the following for class AA tracked vehicle:
   i) Dead load bending moment.
   ii) Live load bending moment.
   iii) Design of deck slab based on above moments.
   7
b) Write a detailed note on T-beam bridge.
8

Q.4 a) Write a short note on abutment.
3
b) Find out the maximum and minimum stress at bottom of a pier both in dry as well as in flood situation due to:
   i) Dead load and self weight.
   ii) Buoyancy.
   iii) Longitudinal force.
   iv) Eccentricity of load.
   for following details:
   i) Dead load from each span= 2250kN
   ii) Reaction due to live load on one span= 900 kN
   iii) Dimension of pier as per figure given below:
PART-B

Q.5  a) “Pile foundation are assuming more importance everyday”. Describe in detail.

b) Draw a neat sketch of well foundation and show its various components and describe them briefly.

Q.6  a) What do you understand by expansion and fixed bearing? Differentiate between them.

b) Describe in detail the construction and functioning of elastomeric bearing.

Q.7  Write short notes on *(any four)*:

a) Various forces on abutment.

b) Scour depth.

c) Movable bridge.

d) Seismic force.

e) Pipe culvert.

f) Wing wall.
Q.1 Write a short note on any five from following:
   a) Axially compressed isotropic cylinder.
   b) Post buckling analysis.
   c) Elastic stability of two degree of freedom.
   e) Cylinder under bending.
   f) Cylinder under axial compression.
   \[3x5\]

**PART-A**

Q.2 Explain in detail:
   a) Buckling of ring and arch
   b) Locked and unlocked stresses
   c) Ideal elastic behaviour model
   d) Ideal rigid plastic behaviour model
   \[15\]

Q.3 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 vasing thickness with two subregions \(\Omega_1\) and \(\Omega_2\) 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 \(v_{cro}\).
   \[15\]

Q.4 Define the buckling co-efficient of long cylinder subjected to axial compression. Deduce the approximate buckling equation for supported isotropic circular cylinder.
   \[15\]

**PART-B**

Q.5 Derive equation of single degree of freedom by moment equilibrium condition and energy method with simple rigid beam length \(L\), hinge in one end and fixed in the other and having an angular spring attached to the hinge the beam is loaded with the force \(F\) acting in the compressive axial direction of the beam.
   \[15\]

Q.6 Explain the theorem of analysis of truss if the truss having two element, derive the equation for local co-ordinates for displacement, force and stiffness matrix.
   \[15\]
Q.7 Compose the conventional and modified Newton Raphson’s method state the method is accurate method compared to incremental method.
End Semester Examination, Dec. 2015
M. Tech. (Structural Engineering) - Third Semester
CONSTRUCTION MANAGEMENT (C-MS-303)

Time: 3 hrs
Max Marks: 75
No. of pages: 2

Note: Attempt any FIVE questions in all. Each question carries equal marks.

Q.1 Write short notes on any three of following:
a) Life cycle of construction project.
b) Use of PERT for project monitoring.
c) Arbitration and settlement of disputes.
d) Types of contracts.

Q.2 a) What are the duties of project manager?
b) Explain the working of project team by drawing the organization chart.

Q.3 a) What are the different stages of awarding contract? Discuss in detail.
b) Explain the various types of contracts.

Q.4 a) Define and explain any three:
   i) Earliest start time (EST)
   ii) Latest start time
   iii) Float
   iv) Slack
b) Draw PERT and mark critical path for the following case:

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<td>6</td>
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<td>7</td>
<td>G</td>
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<td>B, D</td>
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<td>8</td>
<td>H</td>
<td>10</td>
<td>A, C</td>
<td>J</td>
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<td>9</td>
<td>J</td>
<td>5</td>
<td>B, H</td>
<td>NIL</td>
</tr>
</tbody>
</table>

Q.5 Explain the working and uses of following equipments.
a) Bulldozer
b) JCB
c) Excavators
d) Boomplacer
e) Concrete pumping
Q.6 Calculate the quantity of material required and manpower required for the construction of the following one room studio set, above plinth level.

Size of Door and Window/Ventilator

\[ D_1 = 1.50 \text{m} \times 2.10 \text{m} \]
\[ D_2 = 1.00 \text{m} \times 2.10 \text{m} \]
\[ W = 1.20 \text{m} \times 1.20 \text{m} \]
\[ V_1 = 1.50 \text{m} \times 1.20 \text{m} \]

Q.7 Write notes on following:
   a) Crashing of activities
   b) Measurement book
   c) Batching plant
End Semester Examination, Dec. 2015
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 a) Differentiate between RAM and ROM.
b) Give two functions of operating system.
c) Give the difference between actual and formal parameters.
d) Differentiate between a compiler and an interpreter.
e) Explain the syntax of [for] loop.
f) What is ASCII code?
g) What is the use of pointers?
h) Differentiate between structure and union.
i) What is the use of header files?
j) Give the syntax of declaring 2-D array with an example.

PART-A

Q.2 a) Explain CPU along with a block diagram. Write its functions in brief.
b) Do the following conversions:
   i) \((F74)_{16}\) → (?)_8
   ii) \((89.625)_{10}\) → (?)_2
   iii) \((10110011)_{2}\) → \((00101000)_{2}\)
   iv) \((101101)\times(1111)\)
   v) \((1256)_{8}\) → (?)_16

Q.3 a) i) Differentiate between problem oriented and procedural oriented languages.
   ii) Write short notes on:
       Linker, Loader, Assembler.
   b) Differentiate between an algorithm and a flowchart. Write an algorithm and also
draw a flowchart for finding average of three numbers.

Q.4 a) Write a program to make a calculator using switch case statements.
b) Write a program to find sum of two matrices.

PART-B

Q.5 a) Write a program to print name, price and number of pages for three books using
structures.
b) Define recursion. Write a program to find factorial of a number using recursion.

Q.6 a) Explain these functions with an example:
   i) strlen()
   ii) strrev()
   iii) strcpy()
   iv) strcat()
   b) What is dynamic allocation? Explain all the functions used for dynamic allocation.
Q.7  a) i) Explain the procedure of opening and closing of files.  
     ii) Write a program to copy contents of one file to another file.  

b) Write short notes on:
   i) Pointer array.        ii) Array pointers.
INTRODUCTION TO COMPUTER SYSTEMS (CS-102A)

Q. 1 

a) Define intruders.
b) How wired LAN different from wireless LAN?
c) Write short note on Pen-drive.
d) What is CPU? Explain its functions.
e) Define the term Intranet.
f) What is multiprocessing?
g) Explain the working principle of VDU.
h) What is the need of operating system (OS)?
i) Explain the booting process.
j) Write a short note on assembly language.

Q. 2 

a) Convert the following number system.
   i) \((102.626)_{10} = \) (?)\(_2\)
   ii) \((1011.111)_{2} = \) (?)\(_{10}\)
   iii) \((C2F)_{16} = \) (?)\(_8\)
   iv) \((523)_{8} = \) (?)\(_{10}\)
   v) \((F2A)_{16} = \) (?)\(_{10}\)

b) Write an explanatory note on the classification and components of computer on the basis of their configuration.

Q. 3 

a) Define the following terms:
   i) Hard disk drive.
   ii) Printer.

b) Explain the working principle of cache memory.

c) Differentiate between RAM and ROM and also explain their types.

Q. 4 

a) What is the need of system software? Explain various types of system softwares with use.
b) Differentiate between high level language and low level languages. Explain their classification.

10

**PART-B**

Q.5  
a) Explain the architecture of an operating system. What are the various functions that an operating system can manage?

10

b) Write short notes on:
   a) Disk Operating System.
   b) Compiler.
   c) Interpreter.

10

Q.6  
a) What is a computer network? Explain need of computer network.

4

b) Explain the working principle of all types of network topology.

8

c) Define the following terms:
   i) Switch.
   ii) Hub.
   iii) Bridge.
   iv) Router.

8

Q.7  
a) Differentiate between virus and worms? Explain techniques used to prevent threats from virus and worms.

10

b) Write short notes on the following terms:
   i) Trojan horse.
   ii) Password cracking.
   iii) Security threats.

10
End Semester Examination, Dec. 2015
B. Tech. – First / Second Semester
PROGRAMMING IN ‘C’ (CS-103)

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 the statement #include<stdio.h>.
b) Enlist the different format specifiers in C.
c) Explain fopen() function with an example.
d) How do you declare a structure? Give its syntax.
e) Explain the difference between a variable and a constant.
f) What is the use of strcat() function?
g) What do you understand by pointers?
h) Explain the break statement with an example.
i) What is the significance of return statement?
j) Define an array with the help of an example.
2x10

PART-A

Q.2 a) Explain for loop and while loop with the help of an example for each.
10
b) Explain the primary datatypes in C.
3
c) Write a program in C to reverse digits of a number, entered as input through keyboard.
7

Q.3 a) Discuss the declaration and initialization of an array. Write a program to print the even and odd numbers from an array of integers.
10
b) Discuss strrev() and strcpy() string functions and write a program in C for each of these functions.
10

Q.4 a) Elaborate how structure elements are stored in memory. Write a program and explain the concept of array of structures in C.
12
b) Discuss the difference between a Union and a Structure. Write a program in C to implement a Union.
8

PART-B

Q.5 a) Write a program in C to implement pointer to an array.
10
b) Explain the significance of * and & operators in pointers. Write a C program to implement pointer to a pointer.

10

Q.6  a) Explain the difference between call-by-value and call-by-reference with the help of an example.

10

b) What do you understand by recursion? Write a program in C to find the factorial of a number using recursion.

10

Q.7  a) Explain the following operations on a file in detail:
    i) Opening an existing file.
    ii) Reading from a file.
    ii) Writing to a file.
    iv) Closing a file.

10

b) Write a program in C to count the number of characters, spaces, tabs and newlines in a file.

10
End Semester Examination, Dec. 2015
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 is de jure standard? Give examples.
b) Give at least four examples of closed source projects.
c) What do you understand by collaborative innovation?
d) How a closed source can become open source?
e) What are the two methods of adoption of open standards?
f) Differentiate between freedom 1 and freedom 3 for open source, as defined by Stallman.
g) What is ASEAN? Explain briefly.
h) What do you understand by SCOSTA? Explain briefly.
i) What is Brook’s law?
j) Explain briefly open source community.

Q.2
a) Describe benefits of open standards.
b) Differentiate between open and ceased standards with example.

Q.3
a) Explain in detail development stages of a standard.
b) Explain the different methods of adoption of an open standard.

Q.4
a) What are the different adoption barriers of open standards?
b) What are the major principles of open standards? Explain briefly along with the attributes of open standards.

Q.5
a) Write the advantages and disadvantages of open source.
b) Differentiate between copy left and copy right.
c) Explain briefly GNU general public license.

Q.6
a) What is the definition of open source? Explain briefly with examples.
b) Explain briefly open source development process.
c) Explain briefly license review process.

Q.7
a) What are the various attributes to be considered for open source software assessment?
b) Explain briefly IT @ school project.
Q.1 a) Draw the Venn diagram for $A^c \cap B^c \cap C^c$.
    b) Explain:
       i) Reflexive relation.      ii) Transitive relation.
    c) Define statement and proposition with an example.
    d) State DeMorgan’s law.
    e) What is the probability of getting 53 Sundays in a leap year?
    f) Solve the difference equation:
        \[ a_r - 3a_{r-1} + 2a_{r-2} = 0 \]
    g) Let $(S, \ast)$ be a commutative semi group. Show that if $x \ast x = x$ & $y \ast y = y$, then $(x \ast y) \ast (x \ast y) = x \ast y$.
    h) Define a group and give an example.
    i) Explain the concept of graph coloring.
    j) Define a weighted graph. Give an example.  

\[ \text{PART-A} \]

Q.2 a) Consider $f, g$ and $h$, all functions on the integers by $f(n) = n^2$, $g(n) = n + 1$ and $h(n) = n - 1$.
    Determine:
    i) $hofog$.      ii) $fogoh$.      iii) $gofoh$.  6
    b) Prove $(A \cup B)^c = A^c \cap B^c$.  4
    c) Explain different types of functions with an example.  6
    d) If $P$ and $Q$ are two non-disjoint sets then prove $|P \cup Q| = |P| + |Q| - |P \cap Q|$.  4

Q.3 a) Construct the truth table for:
    \[ (p \rightarrow (q \rightarrow r)) \rightarrow (((p \rightarrow q) \rightarrow (p \rightarrow r)) \]
    b) Express the following formula using only \( \sim \) and \( \land \).
    \[ (p \downarrow q) \uparrow R \quad \text{where} \quad \downarrow \text{denotes NOR and} \uparrow \text{denotes NAND}. \]
    c) What do you mean by quantifier? Explain its types with an example.  10

Q.4 a) Prove by mathematical induction:
    \[ 1(1!) + 2(2!) + \ldots + n(n!) = (n + 1)! - 1 \]
    b) In a shipment, there are 40 floppy disks of which 5 are defective. Determine:
       i) In how many ways we can select five floppy disks?
       ii) In how many ways we can select five non-defective floppy disks?
       iii) In how many ways we can select five floppy disks containing at least 1 defective floppy disks?  12
**PART-B**

Q.5  
   a) Solve the difference equation \( a_r - 4a_{r-1} + 4a_{r-2} = 3r + 2^r \)  
   b) Solve the recurrence relation \( a_{r+3} + a_{r+2} - 8a_{r+1} - 12a_r = 2r^2 + 5 \)

Q.6  
   a) Explain the concepts of homomorphism, isomorphism and automorphism with the help of an example.  
   b) Consider an algebraic system \( (G, \cdot) \) where \( G \) is the set of all non zero real number and \( \cdot \) is a binary operation defined by \( a \cdot b = \frac{ab}{4} \). Show that \( (G, \cdot) \) is an abelian group.

Q.7  
   a) Determine the preorder, postorder and inorder traversal of the binary tree as shown in the following figure:

   ![Binary Tree Image]

   b) Define the following terms with examples.
      i) Infinite region.
      ii) Shortest path in a graph.
      iii) Hamiltonian circuit
      iv) Spanning tree.
End Semester Examination, May 2015
B. Tech. – Second Semester
WEB PROGRAMMING THROUGH PHP AND HTML (CS-205)

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 databases are supported by PHP?
b) How PHP file is embedded in an HTML document?
c) How constants are declared in PHP?
d) List down any six string manipulation functions.
e) Briefly describe break and continue.
f) What are local and global variables?
g) Which functions are used to convert an array to string and vice-versa?
h) List down the functions to sort an array in descending order.
i) Can a try block have multiple catch blocks? Explain.
j) What is DOM? 2x10

PART-A

Q.2 a) What are the various advantages of PHP? Is it case sensitive? 10
b) Write a PHP script and link it with an HTML form. 10

Q.3 a) Write a program to check whether a given character is vowel or not using switch-case. 10
b) Write a program to swap two numbers using call by reference. 10

Q.4 a) Create an array and show outputs after applying sort(), asort(), ksort() functions. 10
b) What are various file opening modes? Write code to search a record from a file. 10

PART-B

Q.5 a) What do you mean by Exception Propagation? Give an example to create custom exceptions. 10
b) How Java is different from C and C++? What are the various packages in JSL? 10

Q.6 a) What are cookies? Create an HTML form and apply validations on various fields using JavaScript. 10
b) What is DOM parser? Give an example to read an XML file. 10

Q.7 a) Write a short note on eclipse. 5
b) What is a session? How do you start and destroy a session in PHP? 5
c) Create a table in SQL. Show outputs after applying various aggregate functions on it. 10
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
DISCRETE STRUCTURES (CS-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) State pigeonhole principle.
b) How many lines can be drawn through 10 points on a circle?
c) Explain universal quantifier with an example.
d) Define equivalence relations with examples.
e) Define automorphism.
f) What do you understand by cyclic groups? Give an example.
g) Prove \((A \cup B)^c = A^c n B^c\).
h) Define complete graphs. Give an example.
i) What do you understand by generating functions? Give an example.
j) Two dice are tossed once. Find the probability of getting an even number on first dice or a total of 8.

2x10

PART-A

Q.2
a) Let \( A = \{4, 6, 8, 10\} \) and \( R = \{(4,4),(4,10),(6,6),(6,8),(8,10)\} \) is a relation on set A. Determine the transitive closure of R using Warshall’s algorithm.

8

b) 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

c) Consider the function \( f, g : R \rightarrow R \) defined by \( f(x) = x^2 + 3x + 1 \); \( g(x) = 2x - 3 \) Find (i) \( fof \) (ii) \( fog \) (iii) \( gof \)

6

Q.3
a) Prove that following is a tautology:
\[ \overline{A\overline{V}B\overline{C}} \rightarrow (A\overline{V}\overline{B}) \overline{V}C \]

8

b) Determine whether the following are equivalent using bi-conditional statement:
i) \( P \leftrightarrow q \equiv (p \land q) \lor (\neg p \land \neg q) \)
ii) \( P \rightarrow q \equiv (\neg q \rightarrow \neg p) \)

12

Q.4
a) Prove \( \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1} \) by mathematical induction.

8
b) Shanu speaks truth in 60% cases and Nanu in 70% cases. In what % of cases are they likely to contradict each other in stating same fact?

4

c) In a shipment, there are 40 floppy disks of which 5 are defective. Determine in how many ways:
   i) We can select 5 floppy disks.
   ii) We can select 5 non-defective floppy disks.
   iii) We can select 5 floppy disks containing exactly three defective floppy disks.
   iv) We can select 5 floppy disks containing at least 1 defective floppy disks.

8

PART-B

Q.5  
   a) Solve the recurrence relation \( a_{r+2} - 5a_{r+1} + 6a_r = 5^r \). Find homogenous and total solution.

10
   b) Solve the recurrence relation \( a_{r+2} - 2a_{r+1} + a_r = 2^r \) by the method of generating functions with initial conditions \( a_0 = 2 \) and \( a_1 = 1 \).

10

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 positive integers.

5
   b) Explain different properties of Binary operations.

5
   c) 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.

10

Q.7  
   a) Find the shortest path between \(a\) and \(z\) in the graph shown in the figure.

10
   b) Draw the minimum spanning tree of the following graph.
10
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
DATA STRUCTURES AND ALGORITHMS (CS-302)

Time: 3 hrs  
Max Marks: 100  

Note: Attempt FIVE questions in all; Question 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 balance factor of a height balance tree?  
b) Give time complexity of insertion sort and selection sort.  
c) What is the need of priority queue?  
d) Explain adjacency matrix.  
e) What is recursion?  
f) Give the difference between array and link list.  
g) What is meant by collision in hashing?  
h) Give the applications of queue computers.  
i) Define minimum spanning tree  
j) Explain shell sort?

2x10

PART-A

Q.2 a) Define data structure. Write down advantages and disadvantages of static and dynamic implementation of linked list.  

5  
b) Give an algorithm to display Fibonacci series using recursive function.  

7  
c) Convert the given infix expression into post fix expression. Also explain the algorithm used for this conversion.  

6\times453/2\times9- \quad 8

Q.3 a) Give the linked list representation of queue. Explain the algorithm for insertion and deletion of an element from the circular queue.  

10  
b) Write down the algorithm for the following operations.  
i) Deletion of a node from link list.  
ii) Insertion of a node into the link list.  
iii) Calculate the number of nodes in doubly link list.  

10

Q.4 a) What is pre-order, post-order and in-order traversal? Explain.  

5  
b) Write down the properties of Binary tree and explain their implementation.  

5  
c) What is AVL Tree? Explain the algorithm for LL, RR, LR, RL rotation with suitable example.  

10
**PART-B**

Q.5  
   a) Write and explain the Kruskal’s algorithm for minimum spanning tree with an example.
   
   5  
   b) Explain Krushkal algorithm to find shorted path.
   
   7  
   c) Differentiate between depth-first and breadth-first traversal with example.
   
   8  

Q.6  
   a) Write and explain the algorithm for quick sort. Sort the following list in decreasing order using quick sort. Also find its time complexity 19, 23, 4, 8, 32, 12, 20.
   
   15  
   b) Write down algorithm for selection sort.
   
   5  

Q.7  
   a) How binary search is better than linear search? Explain the algorithm of binary search and find its time complexity.
   
   10  
   b) What is hashing? Explain all hasing techniques with the help of suitable examples.
   
   10
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
COMPUTER ARCHITECTURE AND ORGANISATION (CS-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) Differentiate between the synchronous and asynchronous serial data transfer.  
b) Explain combinational circuits with the help of an example.  
c) Describe the 20 bits of micro-instruction format.  
d) Explain the stored program control concept with the help of an example.  
e) How the throughput of a system can be enhanced with parallel mechanisms?

5x4

**PART-A**

Q.2  
a) What is ISA? Define the role of ISA in computer architecture.  
10  
b) What is operating systems? Define the different services of operating systems.  
10

Q.3  
b) What is computer instruction? How we recognize the memory, register and input-output reference instruction formats with the help of bits.  
8  
a) Differentiate between RISC and CISC.  
12

Q.4  
a) What is addressing mode? How effective address is calculated in the following addressing modes:  
i) Direct  
ii) Indirect  
iii) Immediate  
iv) Relative  
14  
b) Explain the meaning of following instructions:  
\[T_0 : AR \leftarrow PC\]  
\[T_1 : IR \leftarrow M[AR], PC \leftarrow PC + 1\]  
\[T_2 : Do......D_7 \leftarrow \text{Decode } IR(12\rightarrow 4), AR \leftarrow IR(0\rightarrow 11), I \leftarrow IR(15).\]  
6

**PART-B**

Q.5  
a) What do you mean by cache memory? Draw and explain the block diagram of memory system.  
10  
b) Discuss the advantages of interleaved memory.  
10
Q.6  a) What is cache coherence problem? How multiprocessors resolve this problem?  

b) Explain the Flynn’s classification of digital computer.

Q.7  a) Write short notes on:
   i) MIPS.
   ii) Super scaling.
   iii) Virtual memory.
   iv) SBR.
   
   b) Write and explain any five goals for parallel processor design.
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-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) Distinguish between data abstraction and data encapsulation.
b) What are objects? How are they created?
c) What is a constructor? Is it mandatory to use constructor in a class?
d) What is an operator function? Describe the syntax of an operator function.
e) What are the different forms of inheritance?
f) What is a virtual base class?
g) What are the various classes available for file operation?
h) What is generic programming? How it is implemented in C++?
i) What are the advantages of using exception handling mechanism in a program?
j) What should be placed inside a try block? Give syntax.

PART-A

Q.2
a) Explain the basic concepts of object oriented programming.

b) What are the main characteristics of object oriented programming? How is it different from procedure-oriented programming?

Q.3
a) What are special characteristics of static data members? Explain the use of static data members with the help of a suitable program.

b) Define constructors. Explain the uses of default constructor and parameterized constructor. Write a program which uses both types of constructors in the same class.

c) What do you understand by polymorphism?

Q.4
a) Define operator overloading. Give C++ operators which cannot be overloaded. Explain unary operator overloading with the help of a suitable program.

b) What is a friend function? Give a simple example that illustrates the use of a friend function.

PART-B
Q.5  a) Explain how the access control mechanism works in inheritance in various situations with the help of neat diagrams.  
   7

   b) Explain multilevel inheritance with the help of suitable program. How it is different from multiple inheritances?  
   10

   c) What is a virtual base class?  
   3

Q.6  a) Explain class templates and function templates. When and how they are useful?  
   8

   b) Detection of the end-of-file condition is useful. Why?  
   2

   c) Write a program to create two files with the names “country” and “capital”. Country file enter the names of three countries and in capital file enter the respective capitals. Read both the files simultaneously and display one line from country and another line from capital respectively for all the three countries and capitals.  
   10

Q.7  Write short notes on: 
   a) Exception handling mechanism.  
   7

   b) Differentiate Errors and exceptions.  
   7

   c) File modes.  
   6
End Semester Examination, Dec. 2015
B. Tech. – Third / Fourth Semester
DATABASE MANAGEMENT SYSTEMS (CS-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  a) Explain external schema.
b) Differentiate between primary and foreign key.
c) Describe tuple and relation.
d) Differentiate between entity integrity and referential integrity constraints.
e) Define simple and composite attributes.
f) Define generalization.
g) Give advantages of strict two phase locking protocol.
h) Define superkey with an example.
i) What is difference between single valued and multivalued attributes?
j) What is a log file?

**PART-A**

Q.2  a) What are the basic components of a DBMS?  
   b) Explain the advantages of DBMS over a traditional file system.
   c) Explain various categories of DBMS users.

Q.3  a) Write short notes on the following:
   i) Data independence    ii) Strong and weak entities
   b) Compare the three traditional data models. According to you, which is the best model and why?

Q.4  a) Write short notes on:
   i) Loss-less join decomposition    ii) Dependency preservation
   b) Consider the following relation schema \( (A, B, C, D, E, F, G) \) with the following functional dependencies:
   \[ AB \rightarrow C, \ A \rightarrow DE, \ B \rightarrow FG \]
   Describe 1NF, 2NF and 3NF of this relation scheme.

**PART-B**

Q.5  a) Discuss various set-theoretic operators in relational algebra.
   b) Discuss COUNT and AVG aggregate functions of SQL.
   c) Explain different types of ‘Joins’.

Q.6  a) Explain the following:
   i) Clustering Index and Multi-Level index.
   b) B-Tree index files.

Q.7  a) What is transaction? Explain acid properties of transaction.
b) What are deadlocks? What are the necessary conditions for deadlock to occur?
c) What is dirty read problem in transaction processing?
Q.1  a) Define polymorphism.
b) What is recursion?
c) What is exception?
d) Define time complexity. Give the complexity of bubble sort.
e) What is min heap?
f) Define priority queue.
g) What are properties of binary tree?
h) Define data structure.
i) What is circular queue?
j) How do you redirect standard output?

2x10

PART-A

Q.2  a) What is function? Write a function to find the sum of two integers.
10
b) Define an array. Write a program to insert and delete an element from an array.
10

Q.3  a) Differentiate between class and object. Explain the process of creating objects with an example.
10
b) What is method overloading? Explain with the help of an example.
10

Q.4  a) Define stack. Explain array implementation of stack with an example.
10
b) List and explain application of stack in computers by taking suitable example.
10

PART-B

Q.5  a) Define inheritance. Explain with an example.
10
b) Define hashing. What are the properties of a hash function?
10

Q.6  a) Write a program to print Fibonacci numbers using recursion.
10
b) Write an algorithm to search an element using binary search. Consider the following list and show steps of binary search algorithm 57, 11, 10, 15, 25, 69, 85,
Q.7  
   a) What is binary search trees? Write an algorithm to insert an element in BST. 
   10 
   b) What is binary heap? Consider the following elements \{3,1,6,5,2,4\} sort this list 
      using heap sort. 
   10
End Semester Examination, Dec 2015
B. Tech. – Third Semester
INTRODUCTION TO IT INFRASTRUCTURE AND LANDSCAPE
(CS-308)

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 briefly the following database terms:
   i) Characters
   ii) Fields
   iii) Records
   iv) Files
   v) Database and database management system 1x5
b) Explain briefly the following file based protocols used by networks attached storage:
   i) NFS
   ii) SMB/CIFS
   iii) NCP 1x3
c) Explain briefly data centre bridging technology. 2

d) What do you understand by operating system? 1
e) Define the following features of operating system:
   i) Multi-user
   ii) Multiprocessing
   iii) Multitasking
   iv) Multithreading 1x4
f) Explain briefly the following common threats that are spread over the internet:
   i) Identity theft
   ii) Virus, worms and Trojan horse
   iii) Spyware, adware
   iv) Zero-hour attacks
   v) Denial of service attacks 1x5

PART-A

Q.2
a) Explain briefly the various SQL constraints with the help of an example. 5
b) Explain briefly with examples the types of joins in SQL statements. Also write the syntax of equi-join and right-outer-join. 5
c) What is JDBC? Give its architecture and also discuss the common components of JDBC. 10

Q.3
a) Explain briefly RAID functions and RAID types. 5
b) What is FC-AL? What is the advantage of this technology? What are the properties of FC-AL topology? 5
c) Differentiate between SAN and NAS storage networks technology. 5
d) What is storage virtualization? Define its types along with its advantages and disadvantages. 5
Q.4  a) What is hypervisor? Explain briefly the types of hypervisor along with its features.  
b) Explain briefly blade server.  
c) What do you understand by server deployment?  
d) Explain briefly the various server workloads.  

**PART-B**

Q.5  a) What is LDAP protocol? Give its overview along with the process of LDAP client server interaction.  
b) Explain briefly LDAP functional model.  
c) What is replication in LDAP? Discuss all the major replication topologies in detail.  

Q.6  a) Discuss commonly used network topologies with the help of an example.  
b) What is routing? Discuss the various types of routing in brief.  
c) Write short notes on:  
i) VLAN  ii) Network security  

Q.7  a) What is middleware? Explain message oriented middleware in brief.  
b) Define application servers and discuss its services including cluster deployment.  
c) What is datawarehouse? Explain its dimensional model with the help of an example, including the basic concepts of dimensional modeling.
End Semester Examination, Dec. 2015  
B. Tech. – Fourth / Seventh / Eighth 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  
a) Classify and explain the network types on the basis of geographical area span.  
b) In CSMA channel access method what a station can do if the channel is found busy. Explain.  
c) State the difference between ISDN and B-ISDN.  
d) Draw IPv6 header format and explain its fields.  
e) In electronic mail, what is MIME.  

**PART-A**

Q.2  
a) Explain OSI reference model, detailing the functionality and protocols used at each layer with neat labeled diagram.  
b) What are various transmission media? Discuss all with examples.  

Q.3  
a) Discuss IEEE 802.15 standard (Bluetooth). Draw its layered architecture and explain functioning of each layer in detail.  
b) Explain the two architectures of Bluetooth network.  
c) Explain the various types of transmission modes.  

Q.4  
a) Give the architecture of SONET. Also discuss the functionality of each SONET layer.  
b) What is an ATM cell? Discuss the layered architecture of ATM in detail.  

**PART-B**

Q.5  
a) What are IP datagram’s? Draw the IPv4 header format and explain all its fields.  
b) State the difference between TCP and UDP.  
c) i) Find the class of the following IP address:  
   - 200.17.21.128  
   - 10101111.11000000.11110000.00011101  
   ii) Find the range of address is the following blocks:  
      - 17.34.16.0/23  
      - 123.56.77.32/29  

Q.6  
a) Explain SNMP protocol in detail.  
b) What is DNS? What do you understand by term name space? How is it distributed over Internet? Explain.  

Q.7  
a) Define the terms “Encryption” and “Decryption”. State and explain the various cryptographic techniques.  
b) Write short notes on (any two):  
   i) VLAN.
ii) IPsec.
iii) Firewall.
End Semester Examination, Dec. 2015  
B. Tech. – Fourth Semester  
ANALYSIS AND DESIGN OF ALGORITHMS (CS-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 asymptotic upper bound?  
b) State the principal of optimality.  
c) Why do we need algorithm analysis?  
d) How Strassen’s matrix multiplication algorithm is better than iterative matrix multiplication?  
e) Define space and time complexity for a given algorithm.  
f) Write a condition for possible moves of a queen from a position (I, J)  
g) Discuss divide and conquer approach.  
h) Define matrix chain multiplication problem.  
i) Discuss greedy approach for designing an algorithm.  
j) Discuss best case analysis for merge sort.  

2x10

PART-A

Q.2  
a) Write an algorithm for insertion sort. Analyze its best, average and worst case time complexities.  
b) Give the best, average and worst case time complexities for the following algorithms: Bubble sort, selection sort, insertion sort, merge sort, Quick sort.  
c) Solve the following recurrence relation using recursion tree method:  
\[ T(n) = 2T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + cn \]  

5

Q.3  
a) Discuss Knuth-morris-pratt string matching algorithm with the help of an example.  
b) Working Modulo \( q = 11 \), how many spurious hits does Rabin Karp matcher encounter in the text \( T = 3141592653589793 \), when looking for pattern \( P = 26 \)?  

10

Q.4  
a) Analyze the efficiency of quick sort algorithm in best, average and worst cases.  
b) Discuss matrix multiplication using divide and conquer approach. Analyze its efficiency.  
c) Analyze the complexity of binary search algorithm using divide and conquer.  

10

PART-B

Q.5  
a) Define spanning trees. Discuss design steps in Prim’s algorithm to construct a minimum spanning tree with the help of an example using Greedy approach.  
b) Let \( n = 5, (P_1, P_2, \ldots, P_5) = (100, 15, 10, 27, 40) \) and \( (d_1, d_2, \ldots, d_5) = (2, 1, 2, 1, 3) \). Find all the feasible solution and an optimal solution for job sequencing with deadline problem.  

15

Q.6  
a) Explain the single source shortest path algorithm using divide and conquer.  

10

205/3
b) Discuss 0/1 knapsack problem. Discuss the algorithm using dynamic programming approach.

Q.7 a) Let \( w = \{5, 7, 10, 20, 15, 12\} \) and \( m = 35 \). Find all possible subsets of \( w \) that sum to \( m \). Draw the portion of state space tree that is generated.

b) Write short notes on:
   i) NP Hard problems.
   ii) NP complete problems.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
ANALYSIS AND DESIGN OF ALGORITHMS (CS-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 understand by complexity of an algorithm?
b) Define recurrence relation.
c) What is string-matching problem?
d) Discuss the complexity of binary search method.
e) What is minimum cost spanning tree?
f) Explain greedy approach using a suitable example.
g) Define largest common subsequence problem.
h) Define asymptotic notations using a suitable example.
i) What do you understand by backtracking?
j) What is the difference between P and NP-problem?
   2x10

PART-A

Q.2 a) Show the sequence of following data at different stages of insertion sort. Discuss its complexity.

   9  80  5  100  23  39  15  11

   10
b) State master theorem using suitable examples.
   10

Q.3 a) Write and explain Naïve string matching algorithm.
   10
b) Explain the procedure of string matching using automata.
   10

Q.4 a) Explain strassen’s matrix multiplication algorithm. Discuss its complexity.
   10
b) Write and explain quick sort algorithm. What is its complexity?
   10

PART-B

   10
b) Write and explain the procedure to find the minimum spanning tree using Prim’s approach.
   10
Q.6  
      \[\text{10}\]
   b) How to find single source shortest path using dynamic approach? Explain. 
      \[\text{10}\]

Q.7  
   a) Explain the solution of 8-queens problem using backtracking approach. 
      \[\text{10}\]
   b) Explain the classification of problems into P-problems, NP-problems, NP-hard problems and NP-complete problems. 
      \[\text{10}\]
Q.1  a) Define system calls and system programs.
b) What are schedulers?
c) Differentiate between preemptive and non-preemptive CPU scheduling.
d) How we can recover from deadlock?
e) Explain the critical section problem?
f) What is virtual memory?
g) What is TLB?
h) Write short note on I/O Hardware.
i) What is disk management?
j) List the design principles of windows XP operating system.

2x10

PART-A

Q.2  a) Define kernel. Explain different types of kernels.  
b) State reasons why time sharing operating system are more complex than multiprogrammed operating system?
c) What is multi-threading? Explain by taking an example.

Q.3  a) Define Process Central Block. Give its structure and function.
b) Consider the following set of process, with the length of the execution time given in milliseconds.

<table>
<thead>
<tr>
<th>Process</th>
<th>Execution Time</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>P₂</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P₃</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>P₄</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>P₅</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

The processes are assumed to be arrived in the order P₁, P₂, P₃, P₄, P₅ all at time zero. Draw the Gantt chart illustrating the execution of these processes using FCFS, SJF and RR (quantum=1) scheduling. What is the turnaround time and waiting time of each process for each of the scheduling algorithm?

Q.4  a) Define semaphores. How mutual exclusion is implemented using semaphores?
b) Define deadlock? Explain Banker’s algorithm for deadlock avoidance using an example.

PART-B

Q.5  a) What is segmentation? Explain with the help of a diagram, how logical address is converted into physical address in case of segmentation?
b) What is thrashing?
c) Explain the concept of demand paging. Why page replacement is needed?
Q.6  
a) Explain various directory structures with diagrams.  
b) What are different file access methods? Also explain their advantages and disadvantages?  
c) Differentiate between the following:
   i) SCAN and C-SCAN.  
   ii) Look and C-Look.  

Q.7  
Explain the design principle, process management, scheduling of LINUX operating system.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
THEORY OF AUTOMATA AND COMPUTATION (CS-404A)

Time: 3 hrs
No. of pages: 2
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) Construct a Mealy Machine which is equivalent to the Moore Machine defined by:

<table>
<thead>
<tr>
<th>Present State</th>
<th>Next State</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>→q₀</td>
<td>q₃</td>
<td>1</td>
</tr>
<tr>
<td>q₁</td>
<td>q₁</td>
<td>q₃</td>
</tr>
<tr>
<td>q₂</td>
<td>q₂</td>
<td>q₂</td>
</tr>
<tr>
<td>q₃</td>
<td>q₀</td>
<td>q₂</td>
</tr>
</tbody>
</table>

b) If L is regular set then Lᵀ is also regular set. Prove

c) Define PDA with its block diagram.

d) Remove the unit production from the following CFG: S→A/bb
   A→B/b
   B→S/a

e) Does the PCP with two lists x=(b, bab³, ba) and y=(b³, ba, a) have a solution?

PART-A

Q.2 a) State and prove equivalence of DFA and NDFA.
   b) Construct a minimum state automaton equivalent to finite automaton given in table:

<table>
<thead>
<tr>
<th>State/Σ</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>→q₁</td>
<td>q₂</td>
<td>q₆</td>
</tr>
<tr>
<td>q₂</td>
<td>q₁</td>
<td>q₆</td>
</tr>
<tr>
<td>q₃</td>
<td>q₇</td>
<td>q₁</td>
</tr>
<tr>
<td>q₄</td>
<td>q₈</td>
<td>q₂</td>
</tr>
<tr>
<td>q₅</td>
<td>q₁</td>
<td>q₇</td>
</tr>
<tr>
<td>(q₆)</td>
<td>q₈</td>
<td>q₃</td>
</tr>
<tr>
<td>(q₇)</td>
<td>q₁</td>
<td>q₄</td>
</tr>
<tr>
<td>(q₈)</td>
<td>q₁</td>
<td>q₃</td>
</tr>
</tbody>
</table>

Q.3 a) If G is given by production S→aS/bS/a/b; find L(G).
   b) Construct a grammar G generating language L={aⁿbⁿcⁿ/n≥1}
   c) Explain different types of language and their relation corresponding automata.

Q.4 a) State and prove pumping lemma for regular sets. Show that L={aⁿ| P is a prime } is not regular.
   b) Give the regular expression for the set of all strings ending with either double ‘b’ or single ‘a’.
c) Find the regular expression from the following automata.

![Automaton Image]

**PART-B**

Q.5  

a) Convert the grammar \( S \rightarrow AB; A \rightarrow BS|b; B \rightarrow SA|a \) into GNF.  

b) Consider the following production:  
   
   \[
   S \rightarrow aB|bA \\
   A \rightarrow aS|bAA|a \\
   B \rightarrow bS|aBB|b
   \]
   
   For the string aaabbabba, find:
   
   i) Leftmost derivation.
   
   ii) Rightmost derivation.
   
   iii) Parse tree.

Q.6  

a) Construct a PDA equivalent to the following grammar \( S \rightarrow 0BB, B \rightarrow 0S|1S|0 \). Test whether \( 010^4 \) is in \( N(A) \).

b) Design a PDA for language \( L = \{a^n b^{2n} | n \geq 1 \} \) accepted by null store. Also, show the acceptance of string \( a^3 b^6 \).

Q.7  

a) Explain Turing machine with its block diagram and tuples. Also design a turing machine that accepts \( L = \{0^n 1^n | n \geq 1 \} \).

b) State and prove Halting problem of Turing machine.

c) Define \( n! \) by recursion.
End Semester Examination, Dec. 2015  
B. Tech. – Fourth / Fifth Semester  
CYBER SECURITY (CS-405)

Time: 2 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) Define URL.  
   5  
b) Explain various categories of networks based on geographical area.  
   5

**PART-A**

Q.2  
a) Explain malware and DNS poisoning.  
   6  
b) Define term hacker and list various types of hackers.  
   4

Q.3  
a) What is cyber stalking? What are its consequences? How it can be prevented?  
   5  
b) Which guidelines need to be followed to protect against auction frauds and identity theft?  
   5

Q.4  
a) Explain actual attacks.  
   6  
b) What is cross-site scripting? Explain.  
   4

**PART-B**

Q.5  
a) What do you mean by a cyber crime? List down some of the cyber crimes.  
   3  
b) How will you find evidence of cyber crime on the PC, in the browser and in system logs?  
   7

Q.6  
Explain cyber laws, their scope and coverage in detail.  
   10

Q.7  
Briefly explain the following terms:  
a) Phishing.  
   10  
b) Sneakers.  
c) Network topology.
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
INFORMATION STORAGE AND MANAGEMENT (CS-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 in brief:  
a) What do you mean by cache mirroring?  
b) Discuss iSCSI.  
c) What is CAS?  
d) Write a short note on RAID3.  
e) What is charge backup report?  
f) Define unified NAS connector.  
g) What do you mean by volume manager?  
h) Write down the difference between MTBF and MTTR.  
i) Discuss disaster restart.  
j) Define network virtualization.  

2x10  

**PART-A**

**Q.2**  
a) Explain five pillars of technology in detail.  
10  
b) Explain data, information and storage. State value of information to business.  
10  

**Q.3**  
a) Differentiate between RAID4 and RAID6.  
5  
b) Explain the DAS and also its types.  
5  
c) Discuss the intelligent storage system architecture in detail.  
10  

**Q.4**  
a) Define NAS. Explain the file sharing protocols.  
10  
b) i) Discuss the CAS terminology.  
5  
ii) What are the different components of SAN?  
5  

**PART-B**

**Q.5**  
a) Explain the backup granularity and operation.  
10  
b) Discuss Host-based local replication techniques in detail.  
10
Q.6 Write short notes on:
   a) Reactive and proactive management.  
      10  
   b) SNMP.  
      10  

Q.7 a) Explain the block-level and file-level virtualization.  
      10  
   b) Explain threat against BURA and its available contents.  
      10  

End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
COMPUTER GRAPHICS (CS-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) What are major application areas of computer graphics?
b) Define the term resolution.
c) Discuss DVST graphic display device.
d) Find the width of an image having height of 5 inches and aspect ratio 1.5.
e) What are composite transformations?
f) Give the 3-D rotation matrix for rotating an arbitrary point about \( x - axis \).
g) Define the term control points.
h) What is transparency?
i) What do you mean by ambient light?
j) What are cavalier projections?

2x10

PART-A

Q.2
a) Differentiate between random scan and raster scan.
5
b) Discuss and derive an expression for Bresenham’s line drawing algorithm. Plot a line with end points \((0, 0)\) and \((6, 18)\) using the algorithm.
15

Q.3
a) Discuss 2-D transformations. Describe the transformation which reflects an object about a line \( y = x + 2 \).
12
b) Discuss scanline polygon filling algorithm.
8

Q.4
a) Discuss window to viewport mapping. Find the normalization transformation for window to viewpoint which uses rectangle whose lower left corner \((2, 2)\) and upper right corner \((6, 10)\) as a window and the viewport that has lower left corner at \((0, 0)\) and upper right corner at \((1, 1)\).
12
b) Discuss Sutherland Hodgeman polygon clipping algorithm in detail.
8

PART-B

Q.5
a) Differentiate between parallel and perspective projections.
10
b) Give the mathematical formulation for parallel projections.
10
Q.6  a) What are Bezier curves and surfaces? Discuss the properties of Bezier curves.  
     b) How do we represent the curve using hermite interpolations?

Q.7  a) Discuss Z-buffer hidden surface removal algorithm. How this algorithm is used in area subdivision algorithm.  
     b) What are shading models? Discuss gourad shading model.
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
COMPONENT BASED PROGRAMMING TECHNOLOGY (CS-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 distinguished features of C# language, as compared to C/C++ language?
b) Explain the difference in switch-case statement implementation in C# and C/C++ languages.
c) Compare the process of boxing and unboxing with an example.
d) Define property and indexer.
e) Differentiate between windows and web applications.
f) Explain the role of JIT compiler.
g) What is window form? Name some properties of form class specifying their purpose.
h) Explain the key features of ADO.NET technology.
i) Explain the concept of assemblies.
j) Name the languages supported by .NET framework. How multiple languages are supported in .NET?

PART-A

Q.2 a) Explain distinguished features of arrays in C# as compared to arrays in C/C++. Define jagged arrays. Give syntax for declaring, creating and initializing 1-D and 2-D arrays.
b) Differentiate between value types and reference types giving example of each. Also specify size of primitive types. Is process of boxing an explicit conversion? Comment.
c) Compare mutable and immutable strings. Give an example for performing the following string operations on immutable strings:
i) Reading string from the keyword.
ii) Finding substrings.
iii) Inserting strings.

Q.3 a) Explain the purpose of the following .NET collections:
i) Stack.
ii) Queue.
iii) Array list.
iv) Hash table.
b) Which type of inheritance is not supported in C# through classes? Write a program for implementing multiple inheritance in C# language.
c) What is the role of finally block in exception handling? Explain the concept of exception handling using program.

Q.4 a) Give detailed architecture of .NET framework with diagram. Explain functionality of each component.
b) Explain the concept of “automatic garbage collection” in .NET. What are the methods to explicitly enforce garbage collection in .NET?
c) Explain the following:
   i) Managed and unmanaged code.
   ii) Significance of MSIL or IL.  

**PART-B**

Q.5  

a) Give detailed steps of designing a GUI for developing a windows application for calculating factorial of a number entered by a user at run time.  

b) Define SDI and MDI. How MDI applications are developed? 

c) What is the role of controls in developing applications? Explain the function of the following controls.
   i) Radio button control.  
   ii) Check box control.  
   iii) Combo box control.  
   iv) List box control.  

Q.6  

a) Give complete ADO.NET architecture and explain its significance in windows and web application development.  

b) Explain the difference between data grid and data grid view control with an example.  

c) What do you mean by data binding? Explain the concept of simple and complex data binding with an example.  

Q.7  

a) Design a GUI for a web application that allows students to enter their name, roll no., semester and aggregate percentage on first webpage “Information.aspx”. On clicking a button on first webpage, another webpage –Show.aspx” appears displaying the information entered on the first webpage by the student.  

b) Explain the concept of code-access and role based security policies.  

c) Discuss the security architecture of .NET in terms of web applications.
End Semester Examination, Dec. 2015  
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 DNS? Why is it required? | 2x10 |
|     | b) What is meta-search engine?     |      |
|     | c) Define cyber crime.             |      |
|     | d) What is the difference between width="100" and width="100%"? |      |
|     | e) What is a web browser? Name two web browsers. |      |
|     | f) What is identity theft?         |      |
|     | g) What are plug-ins?              |      |
|     | h) Describe any two HTML tags.      |      |
|     | i) Explain PWS.                    |      |
|     | j) What are meta-tags? Give an example. |      |

**PART-A**

| Q.2 | a) Explain the concept of MIME and MIME headers. | 7 |
|     | b) Explain the working of DNS server briefly.    | 5 |
|     | c) Describe the steps involved when a web browser request for and obtains a web page from a web server. | 8 |

| Q.3 | a) What are the different types of bullets available for an unordered list? How are they created? | 6 |
|     | b) What is XML schema? Explain with an example in detail. | 10 |
|     | c) Write a short note on HTML DOM. | 4 |

| Q.4 | a) Demonstrate how to create arrays in Javascript. | 5 |
|     | b) Write a Javascript program to multiply two numbers and display the result of multiplication in a separate text box. | 7 |
|     | c) Write short notes on: | 8 |
|     | i) Cookies. | |
|     | ii) Hidden fields. | |

**PART-B**

| Q.5 | a) What is a servelet? Explain the phases in the servelet lifecycle. | 8 |
|     | b) What are various server-side technologies? Explain in detail. | 12 |

| Q.6 | a) Explain the procedure for finding evidence on system log during a cyber crime. | 10 |
|     | b) What are the general guidelines for document trial? | 5 |
|     | c) How do we secure the evidence in a cyber-crime? | 5 |

| Q.7 | a) Discuss the steps for protecting against identity theft. | 6 |
|     | b) What is cyber law? Explain the role and importance of cyber law. | 7 |
|     | c) Discuss the need of legal protection from cyber crime. | 7 |

220/3
End Semester Examination, Dec. 2015
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) What are the problems with top down passing? Explain.
     b) What are various parameter passing mechanism?
     c) Calculate operator precedence relation for the grammer:
        \[ E \rightarrow E + E \ | \ E - E \ | \ E \cdot E \ | \ E / E \ | \ E^(E) \ | \ -(E) \ | \ id \]
     d) What is the purpose of DAG? How would you represent the following equation using the DAG?
        \[ a = b^* - c + b^* - c \]
        5x4

PART-A

Q.2  a) Describe sequence control.
     10
     b) What are elementary data types? Explain specification and implementation of elementary data types.
     10

Q.3  a) What is compiler? Explain various phases of compiler in detail, with a neat sketch.
     Write down the o/p of each phase for expression \[ a = b + c * 50 \].
     15
     b) Elaborate specification of tokens.
     5

Q.4  Consider the following grammer:
     \[ E \rightarrow E + T \ | \ T \]
     \[ T \rightarrow TF \ | \ F \]
     \[ F \rightarrow F^* \ | \ a \ | \ b \]
     Construct SLR parse table for the grammar.
     20

PART-B

Q.5  a) What do you understand by syntax directed definitions? Write syntax directed definitions to implement a desk calculation with an LR Passer and show the evaluation of expression \( 95*4+5 \).
     15
     b) What is the difference between parse tree and syntax tree?
     5
Q.6 a) How names can be looked up in symbol table? Discuss.
   10
b) What are semantic phase errors? Explain error recovery techniques in detail.
   10

Q.7 a) Discuss various issues in code generation with suitable examples.
   10
b) What are basic blocks? How do you identify basic blocks?
   10
End Semester Examination, Dec. 2015  
B. Tech. – Sixth / Seventh Semester  
SOFTWARE DEVELOPMENT PROCESSES (CS-702)

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 visual modeling.  
b) What is role name?  
c) Define class.  
d) Write the notation used for an object.  
e) Explain the concept of encapsulation using an example.  
f) Define reflexive relationship.  
g) Define actor.  
h) What is the need of consistency checking?  
i) Define state.  
j) Explain control class.  
2x10

PART-A

Q.2  a) Differentiate between traditional and object oriented methodology.  
10  
b) Explain the capabilities of UML.  
10

Q.3  a) Explain object oriented software development process w. r. t. time.  
10  
b) Explain different types of use case relationships.  
5  
c) Draw activity diagram of ATM.  
5

Q.4  a) Explain the classes with its stereotypes with the help of diagram.  
10  
b) Explain multiplicity indicators.  
10

PART-B

Q.5  a) Draw and explain the sequence diagram of ATM.  
10  
b) Draw and explain the collaboration diagram of ATM.  
10

Q.6  a) What is the need for architecture? Explain 4+1 architecture in detail.  
15  
b) Write short notes on:
i) Combining classes.
ii) Splitting classes.

Q.7  

a) What are the benefits of iteration planning process?  

b) Write notes on:  
   i) Emergence of pattern.  
   ii) Designing relationships.  
   iii) Designing attributes and operations.
End Semester Examination, Dec. 2015
B. Tech. – Sixth / Seventh / Eighth Semester
SYSTEM PROGRAMMING AND SYSTEM ADMINISTRATION (CS-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) What do you mean by programming environment?
b) What are the functions of loaders?
c) What is demand paging?
d) Write any four commands for directory navigation.
e) What are macros?
f) Give some examples of software tools.
g) Name the three sources of standard I/P and O/P.
h) How will you display all processes running on your system?
i) What is the significance of PID and PPID?
j) Explain binding.

2x10

PART-A

Q.2 a) What is system software? Explain why do we need it? Explain machine architecture for system software.
10
b) Explain program generators and debug monitors.
10

Q.3 a) Explain direct linking loaders.
10
b) What are assemblers? Explain the process of Pass-I assembler with the help of flow chart.
10

Q.4 a) Explain UNIX architecture with its features.
8
b) Write short notes on swapping and demand paging.
7
c) Name the three modes of Vi and how you can switch from one mode to another.
5

PART-B

Q.5 a) Write a shell script to find the largest of three numbers.
7
b) Write the difference between borne and C-shell.
5
c) Explain the UNIX command for comparing and sorting files with example.
8

Q.6 a) What are the roles and responsibilities of system administrator? Explain the system administrative commands for user management.
10
b) Explain any five filter commands with example.
5
c) Explain the mechanism of process creation.
5

Q.7 a) Differentiate between system software and application software.
8
b) Write short notes on:
   i) Virus control management.
   ii) Re-directional files.
   iii) I/O devices and drivers.
12
Q.1 a) What is data confidentiality? Explain selective-field confidentiality.
b) Explain denial of service.
c) What is asymmetric encryption?
d) Differentiate between diffusion and confusion.
e) Explain the mechanism of secrecy in public key cryptosystems.
f) What is a hash code? State hash function.
g) What is a worm? How does worm replicate itself?
h) State the principle for design of firewall.
i) What is DSL? State its functionality.
j) What is ATM? Explain its layers.

2x10

PART-A

Q.2 a) Encrypt the following text using play fair cipher: “A BUBBLE IS A TROUBLE”  
 b) Explain OSI security architecture with its components.

Q.3 Explain block cipher with its modes of operation.

Q.4 a) Explain the principles of public key cryptosystems.
b) Explain Diffie-Hellman key exchange algorithm with an example.

PART-B

Q.5 a) Explain Pretty Good Privacy (PGP) with respect to e-mail security.
b) What is authentication? Explain authentication requirements in detail.

Q.6 a) Explain the different generations of antivirus software.
b) What is a firewall? Explain the different types of firewall in detail.

Q.7 Write short notes on any two:
a) ATM.
b) TMN management layers.
c) Secure electronic transactions (SET).
End Semester Examination, Dec. 2015
B. Tech. – Eighth Semester
ADVANCED COMPUTER ARCHITECTURE (CS-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  a) What are the categories of multiprocessors?
b) What is the major limitation of pipeline techniques?
c) What is called loop-level parallelism?
d) State the principle of locality.
e) Define:
   i) Paging.
   ii) Segmentation.
f) What do you mean by direct mapping cache?
g) What is the cache miss and cache hit?
h) Write the Amdahl’s law.
i) Define sequential consistency.
j) What do you mean by hardware parallelism? Give an example. 2x10

PART-A

Q.2 Describe the basic structure of shared memory multiprocessor in detail, Explain its models with suitable an example. 20

Q.3  a) What do you mean by program flow mechanism? Explain control flow and data flow computers with an example. 12
    b) What are the differences between string reduction and graph reduction machines? Explain. 8

Q.4 Explain various I/O performance measures with an example. 20

PART-B

Q.5  a) Compare the superscalar processor and VLIW processor. 5
    b) Explain the temporal locality, spatial locality and sequential locality associated with program. 10
    c) Describe hit ratios and effective access time of a memory hierarchy. 5

Q.6  a) With a neat diagram, explain the backplane bus system. 10
    b) Explain the following terms associated with memory management:
       i) Swapping memory system and examples.
       ii) Hybrid memory system and examples.
       iii) The role of a memory manager in an OS kernel. 10

Q.7  a) Explain the models of memory consistency in multiprocessor system. 10
    b) With the necessary diagrams, explain the following types of linear pipeline processors:
       i) Asynchronous. 10
       ii) Synchronous.
End Semester Examination, Dec. 2015
B. Tech. – Sixth / Seventh / Eighth Semester
SOFTWARE TESTING (CS-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) State the objectives of testing a program.
   b) Describe bug-life cycle with help of a neat diagram.
   c) What are the objectives of PTS?
   d) Differentiate between static and dynamic testing.
   e) Write a short note on ‘quality standards’.

PART-A

Q.2 a) How does testing lead to a quality software? What are software errors? Explain different categories of software errors.
   b) A program reads three numbers A, B and C within the range $[1, 100]$ and prints the largest number. Design test cases for this program using following techniques:
      i) Boundary value checking
      ii) Robust testing
      iii) Equivalence class testing.

Q.3 a) What are reproducible bugs? Explain the tactics for analyzing a reproducible bug.
   b) What are problem reports? How does one write an effective report? Explain the characteristics of a good report.

Q.4 a) Explain all the steps involved in handling the problem report through a problem tracking system.
   b) State who are the users of the tracking system.

PART-B

Q.5 a) Describe visible state transition. Support with an example. What is the role of testers here?
   b) “Test plan can either be a product or a tool”. Explain this statement with help of suitable example.

Q.6 a) What is automated testing? Why is it needed?
   b) Explain translucent box testing.
   c) Write short notes on:
      i) Load runner
      ii) Test directive

Q.7 What do you understand by term software quality management? Explain SQA in detail. What are various activities involved in SQA?
Q.1 a) What is a heuristic search? Explain with an example.
b) Describe scripts by giving a suitable example.
c) Differentiate between procedural and declarative knowledge.
d) Explain min-max procedure.
e) Write a short note on Bayesian network.

Q.2 a) Explain various list manipulation features in LISP.
b) Explain any two AI problems in detail.

Q.3 a) Explain and give A* algorithm.
b) Show how mean-end analysis could be used to solve the problem of getting from one place to another. Assume that the available operators are walk, drive, take the bus, take a cab and fly.

Q.4 a) Consider the following sentences:
   - John likes all kinds of food.
   - Apples are food.
   - Chicken is food.
   - Anything anyone eats and isn’t killed by is food.
   - Bill eats peanuts and is still alive.
   - Sue eats everything Bill eats.
   i) Translate these sentences into formulas in predicate logic.
   ii) Convert the formulas of part(a) into clause form.
   iii) Prove that John likes peanuts using resolution.
b) Describe semantic net and frames with a suitable example.

Q.5 Write short notes on:
a) Monotonic and non-monotonic reasoning.
b) Conjunction and disjunction of conclusion.

Q.6 a) Discuss in detail the structure of various agents with suitable diagrams.
b) How knowledge-acquisition interface works in expert system?

Q.7 a) What is natural language processing? Explain in brief various phases in natural language understanding.
Q.1  a) Define hue and saturation of an image.
    b) What do you understand by image restoration?
    c) Give sobel operator for edge detection.
    d) Illuminate on histogram equalization.
    e) Explain the concept of spatial filtering.
    f) Write about arithmetic mean filter.
    g) Why segmentation is required in image processing?
    h) What do you understand by pattern matching?
    i) Write a short note on error free compression.
    j) Explain region based segmentation.

    \(2 \times 10\)

PART-A

Q.2  a) Explain the components of image processing system with a neat sketch.

    \(10\)

    b) Explain the concept of sampling and quantization of an image. Explain how images
    are digitally represented?

    \(10\)

Q.3  a) Describe about histogram equalization and image subtraction.

    \(10\)

    b) What is the use of Fourier transform in digital image processing?

    \(10\)

Q.4  a) What is image degradation model? How different types of noise are handled?

    \(10\)

    b) How does the color help in better image analysis? Discuss various color models to
    specify a color in a standard way.

    \(10\)

PART-B

Q.5  a) What is the need of error free compression? List various techniques to achieve
    this.

    \(10\)

    b) List the techniques for detecting gray level discontinuities in digital image.

    \(10\)

Q.6  a) What do you understand by representation of an image?

    \(7\)
b) Differentiate between a region and a boundary. Describe regional descriptors in detail.

Q.7 Write short notes on *(any two)*:
   a) Pattern recognition.
   b) Pattern matching.
   c) Applications of image processing.

10x2
End Semester Examination, Dec. 2015
B. Tech. – Fifth / 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 is thred?
b) Discuss advantages of DOS over personal computers.
c) Why Cristian’s algorithm used?
d) Discuss ‘write through’ policy for cache management.
e) What is meant by UMA?
f) Discuss any two process management primitives in MACH.
g) Discuss closed v/s open groups in group communication.
h) What is role of ATM management layer?
i) Discuss Ostrich algorithm in short.
j) Which is more flexible NOS or DOS? Justify.

PART-A

Q.2 a) Discuss client server model of communication in DOS. Also include all design primitives.

b) What is DOS? Discuss hardware and software concepts of DOS.

Q.3 a) Discuss Chandy-Misra-Haas algorithm for deadlock detection in DOS.

b) Discuss Bully Election Algorithm in DOS.
c) What are atomic transactions?

Q.4 a) What are design issues for processor allocation algorithms?

b) Discuss and draw a workstation model and a processor pool model.

PART-B

Q.5 a) What are consistency models? Explain strict sequential and casual consistency in detail.

b) Explain how to find owner of pages in distributed shared memory.

Q.6 a) Compare upload / download model of file service model with remote access model with explanatory note.

b) Discuss various trends in distributed file systems.

Q.7 a) Discuss memory management in MACH.

b) Discuss Unix emulation in MACH.
End Semester Examination, Dec. 2015
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 high level language and low level language. 4
b) What is binary number system? 4
c) Define interpreter. 4
d) Explain different types of operating systems. 4
e) Write a note on various operators used in C language. 4

PART-A

Q.2 a) Draw the anatomy of a basic computer system and explain function of each component in brief. 10
b) Write a note on different types of printers. 10

Q.3 a) Compare binary, octal, decimal and hexadecimal number systems. 10
b) Do as directed:
   i) \((3978)_{10} = (?)_{2}\)
   ii) \((1010111110)_{2} = (?)_{10}\)
   iii) \((273)_{8} = (?)_{2}\)
   iv) \((275.35)_{10} = (?)_{2}\)  10

Q.4 a) Compare single user and multi user system. 10
b) Write a note on classification of computer languages. 10

PART-B

Q.5 a) Define operating system and explain its functions. 10
b) Differentiate between Windows and UNIX operating system. 10

Q.6 a) Draw various symbols used for a flow chart with their purpose. 10
b) Write a program to find factorial of a given number. 10

Q.7 a) Define an array. Write a program to demonstrate working of an array. 10
b) Write a C program to demonstrate working of a "for loop". 10
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Second Semester
FUNDAMENTALS OF COMPUTERS AND PROGRAMMING-II (CS-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) What is meant by basic data type?
b) Explain switch-case statement in brief.
c) What is the advantages of array?
d) What is the use of EOF in file handling?
e) Differentiate between class and object in C++.
f) Give the advantages of pointer.
g) Explain the syntax for union.
h) Give the difference between global and local variables.
i) Explain function prototype with a suitable syntax.
j) Give two advantages of use of header files.

2x10

PART-A

Q.2  
a) Write a program to find smallest of three numbers using if-else statement.
   7
b) Explain the difference between for, while and do-while loops.
   5
c) Write a program to find an element in an array.
   8

Q.3  
a) Differentiate between function and recursion with examples.
   10
b) What is structure in C? Explain it with an example.
   10

Q.4  
Write a program to show the use of strlen(), strrev(), strcat(), strcy, gets() and puts() functions in string.
   12
b) Write short notes on the following terms:
   i) Preprocessor directives.
   ii) Standard library functions.
   4x2

PART-B

Q.5  
a) Differentiate between call-by-value and call-by-reference.
   5
b) Explain how pointer access elements of an array.
   5
c) Write a program to swap two numbers using call-by-reference.
   10
Q.6 a) What is file? Explain all file handling functions and file opening modes with their syntax.
12
b) Write a program to read the content of a file.
8

Q.7 a) What is inheritance? List out the types of inheritances present in C++ with suitable examples.
12
b) Differentiate between private, protected and public data element in C++.
5
c) Define encapsulation and its advantages.
3
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Second Semester
FUNDAMENTALS OF COMPUTER AND PROGRAMMING (CS-I-202)

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) What is a pointer? How a variable is declared to the pointer? What are its uses?
   b) What is a variable? Differentiate between declaring a variable and defining a variable.
   c) What is the purpose of the function main()? Briefly describe the types of functions.
   d) Why is it necessary to give the size of an array in an array declaration? Also, compare arrays and structures.
   e) Write a C program to generate Fibonacci series upto 200.

PART-A

Q.2 a) Describe in detail about algorithm. Write an algorithm to compute the factorial of a numbers “n”.
   10
   b) Explain flow chart in detail. Express an algorithm to get two numbers from the user (dividend and divisor), testing to make sure that divisor number is not zero and displaying their quotient using flowchart.
   10

Q.3 Explain the following with a suitable example:
   a) While and do-while loop.
   b) Break and switch statements.
   c) If, If-else and Nested-If.
   d) Local variables and global variables.
   5x4

Q.4 a) Differentiate between call-by-value and call-by-reference. What is meant by recursion function? Explain it with a suitable program using C.
   10
   b) Explain briefly about the formatted and unformatted I/O functions in “C” with suitable examples.
   10

PART-B

Q.5 a) What are two-dimensional arrays? Differentiate between arrays and pointers.
   8
   b) Write a C program to search an element using array. How arrays are declared?
   12
Q.6  a) What are pointers? How these pointers are declared and initialized? Why these pointers are used and when?  
    10  
   b) How variable can be accessed through pointers? Explain with a suitable example program. Also, discuss null pointer, pointer to pointer, pointer to array. 
    10  

Q.7  a) How structures are declared? Explain with suitable example including structure initialization.  
    10  
   b) Differentiate between structure and union. How structure members can be accessed? 
    10
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Fourth Semester
RELATIONAL DATABASE MANAGEMENT SYSTEMS (CS-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) What are the advantages for DBMS?
   b) Define data model.
   c) What is meant by entity set?
   d) What are the responsibilities of DBA?
   e) Define attribute.
   f) What do you mean by primary key?
   g) Briefly describe the concept of metadata.
   h) What is RDBMS?
   i) Define DML.
   j) What is the function of update and delete command?  2x10

PART-A

Q.2 a) What do you mean by database and database management system?  6
   b) What are the various components of a database system?  6
   c) What do you mean by RDBMS? What are its characteristics?  8

Q.3 a) Draw a system architecture of DBMS. Explain each component in detail.  12
   b) Explain data independence and its types.  8

Q.4 a) What is meant by E-R model? Explain with a proper example.  8
   b) Explain various types of data models in detail.  12

PART-B

Q.5 a) What is the need of relational model? Explain with example.  5
   b) Explain entity integrity and referential integrity rule in detail with a suitable example.  10
   c) Define:
      i) Domain constraint.
      ii) Key constraint.  5

Q.6 a) What do you mean by a functional dependency? Explain with an example.  5
   b) Define normalization. Take a relation and normalize it upto 3 NF, explaining each step.  15

Q.7 a) Explain with the help of a suitable example, the following clauses used in SQL: where, order by, group by, like.  12
   b) What is SQL? Explain the purpose and use of SQL in RDBMS.  8
End Semester Examination, Dec. 2015
B.Tech. (Integrated) – Fourth Semester
COMPUTER PROGRAMMING AND APPLICATIONS (CS-I-409)

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 to create a file in SQL? Give an example.
b) Can default be placed as the first case in switch case statement.
c) List down the types of operators.
d) Explain the term CAD.
e) Differentiate between ‘getch’ and ‘putch’ statement.
f) Discuss the advantages of database for information storage.
g) Give an example of ‘Nested if-else’ statement.
h) Define primary key and candidate key.
i) Discuss the term commercial data processing.
j) Difference between compiling and executing the C program.

2x10

PART-A

Q.2
a) Differentiate constant and variable. Write down the various rules to declare a variable in C.
7
b) Give description of any four data types in C with an example.
8
c) How do you manage input-output operations in C?
5

Q.3
a) Write a program to check whether year is leap year or not.
5
b) Write syntax of ‘while’ and ‘do-while’ statement.
5
c) Write a program to enter 10 integers in an array. Add 5 to each element and display the new array.
10

Q.4
a) What is the need for information storage? Explain.
6
b) Define:
   i) Foreign key
   ii) Alternate key
   iii) Super key
   iv) Secondary key
8
c) Discuss different types of database language with an example.
6

PART-B

Q.5
Write short note on:
Q.6  
a) What do you mean by engineering computation? Explain in detail with a suitable example.  

b) Discuss various business data processing applications.  

Q.7  
Discuss the various applications in the area of electronics and communication engineering.  

20
End Semester Examination, Dec. 2015
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 are the different types of video display adaptor?
    b) Explain pen drive.
    c) Name different types of RAM.
    d) What are the disadvantages of LAN?
    e) What are the purpose of using a bus in a computer system?
    f) Name the common faults of mouse.
    g) What are the motherboard components?
    h) Explain SCSI.
    i) How can a PCI be replaced in a motherboard?
    j) Differentiate between switch and bridge.

    2x10

PART-A

Q.2 a) What are the technology used in CRT monitor? Explain in detail.
    b) Explain the working of video display adaptor with a diagram.

    10

Q.3 a) Define printer and explain its types in detail.
    b) Write a short note on any two:
       i) Scanner
       ii) Keyboard
       iii) Digitizer

    5x2

Q.4 a) Explain ISA with a diagram.
    b) What’s the difference between ‘COM’, ‘USB’, ‘Serial Port’?
    c) How to map a virtual COM port to a physical USB port?

    7

    7

    6

PART-B

Q.5 a) What is the principle of floppy disk drive and explain its construction with a diagram.
    b) Differentiate between Hard Disk Drive and Floppy Disk Drive.

    10

    5
c) Explain the common fault of Hard Disk Drive. 5

Q.6 a) Explain the different types of motherboard in detail. 10
    b) What are the various steps involved in installation of computer system? 10

Q.7 a) Write short note on:
      i) Router
      ii) Hubs
      iii) Switches 15
    b) Differentiate between local area network and wide area network. 5
End Semester Examination, Dec. 2015
M. Tech. (CSE) - First Semester
CLOUD COMPUTING (CS-M108)

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 cloud computing architecture. Discuss GAE and Microsoft Azure cloud platform architectures in detail. 15

Q.2 What are the common characteristics of cloud? Discuss its benefits and challenges in detail. 15

Q.3 What do you understand by virtualization? Why it is needed and what are its types? 15

Q.4 Discuss in detail threats, vulnerabilities and attacks in cloud. Also, explain Identity and Access Management (IAM) in detail. 15

Q.5 How virtual data centers are different from virtualized data centers and how virtualized data centers can be managed? 15

Q.6 How local and remote replication can be done using host and array based replication technologies? What are the basic considerations for migration to cloud? 15

Q.7 Write short notes on any three:
   a) Amazon AWS.
   b) Google file system.
   c) Yahoo hadoop.
   d) Aneka SDK. 5x3

Q.8 Discuss the following hybrid storage networking technologies:
   a) iSCSI
   b) FCIP
   c) FCoE 15

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End Semester Examination, Dec. 2015  
M. Tech. (CSE) - First Semester  
ADVANCED ANALYSIS AND DESIGN OF ALGORITHMS (CS-M-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 do you understand by a recurrence relation? Explain using suitable examples.  
 b) Differentiate between the following:  
 i) big Oh (O) and little oh(O)  
 ii) big omega (Ω) and little omega (ω)  
 c) Explain insertion sort algorithm. Discuss its complexity.

Q.2  a) Explain divide and conquer strategy with the help of a quick sort algorithm. Discuss the complexity of quick sort in best, worst and average case.  
 b) What are the properties of a red-black tree? How do we handle violations occurred during insertion of an element?

Q.3  a) Explain properties of binomial trees and binomial heaps.  
 b) Explain time complexity to search an element in a binary search tree.  
 c) Write an algorithm to find minimum spanning tree using Kruskal’s approach.


Q.5  a) Write and explain the solution of n-queens problem using backtracking approach.  
 b) Explain FIFO branch and bound problem. Describe the state space and bound function by using a suitable puzzle.

Q.6  a) Write and explain the algorithm to find the largest element among n-elements in O(1) time using $n^2$ processors.  
 b) What do you understand by approximate algorithm? Write an algorithm to find approximate solution for vertex cover problem.

Q.7  a) Write the algorithm for counting sort. Explain its working strategy.  
 b) Explain amortized analysis and aggregation method by taking stack operations into consideration.

Q.8  Explain the following:  
 a) NP-completeness and reducibility.  
 b) Clique-decision problem.  
 c) Travelling salesman problem.

5x3
End Semester Examination, Dec. 2015  
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 the trade-offs between circuit-switched and packet switched networks. Give an example for each type of network.  
7  
b) Both UDP and TCP use port numbers to identify the destination entity when delivering a message. Give two reasons for why these protocols invented a new abstract ID (port numbers), instead of using process IDs, which already existed when these protocols were designed.  
8

Q.2  
a) What are the reasons for using layered protocols?  
7  
b) Two networks each providing reliable connection oriented service. One of them offers reliable byte stream and the other offers a reliable message stream. Are these identical? If so, what is the distinction made? If not, give an example how they differ.  
8

Q.3  
Write short notes on:  
a) TCP variations for performance enhancement.  
7  
b) Features of IPv6 in the context of advanced communication networks.  
7  
c) B-ISDN.  
5x3

Q.4  
a) Briefly explain the addressing mechanism of ATM.  
8  
b) ATM traffic contracts form part of the mechanism by which "quality of service" (QoS) is ensured. What are four types which have a set of parameters describing the connection?  
7

Q.5  
a) The user datagram protocol (UDP) is one of the core members of the internet protocol suite. Explain UDP header and its working in detail.  
7  
b) Differentiate between channel access in GSM and GPRS.  
8

Q.6  
a) Why do we need IGMP and ICMP? Why can’t we simply use IP packets?  
7  
b) How to identify the name servers associated with a domain.  
8

Q.7  
a) Explain any five issues associated with transport control protocol.  
7  
b) Explain the TCP connection management.  
8

Q.8  
a) Differentiate between fast ethernet and gigabit ethernet.  
7  
b) Differentiate between hub, bridge, switch, router and gateway.  
8

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End Semester Examination, Dec. 2015  
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? What are the various types of advanced operating systems used? Explain.  
b) What are the features of a message passing system?  

Q.2 a) Explain in details the various thread usage models. Also highlight their application areas.  
b) Discuss the various design issues that we need to consider before designing a processor allocation algorithm.  

Q.3 a) Explain the basic RPC operation followed in distributed operating systems.  
b) Explain how the system responds to the following situations in case of RPC failure.  
   i) Client is unable to locate the server.  
   ii) Request message from client to the server is lost.  
   iii) Reply message from the server to the client is lost.  
   iv) Server crashes after receiving a request.  
   v) Client crashes after sending request  
   2x5

Q.4 a) Why shared memory is used in the distributed operating systems? What page replacement strategy is best suited for distributed operating systems?  
b) Explain why systems having distributed shared memory using caching prefer to use write-invalid in place of write-upload?  

Q.5 a) What is the difference between physical and logical clocks? Discuss the Cristian’s algorithm for clock synchronization.  
b) Discuss the distributed algorithm approach used for mutual exclusion.  

Q.6 a) What do you understand by resource security? Explain.  
b) Discuss in details the implementation of access matrix model.  

Q.7 a) Explain the different approaches followed for the design of distributed shared memory.  
b) Explain the bully algorithm used for a distributed system.  

Q.8 a) What are the various caching techniques used to perform caching in distributed operating systems?  
b) Write notes on:  
   i) IPC.  
   ii) Buffering.  
   iii) Multi-datagram.  
   iv) Process addressing.  

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End Semester Examination, Dec. 2015  
M. Tech. (CSE) – First Semester  
ADVANCED MATHEMATICAL TECHNIQUES (CS-M-104)

Time: 3 hrs  
Max Marks: 75  
No. of pages: 2

Note: Attempt FIVE questions in all. Each question carries equal marks.

Q.1  
a) Let \( A, B \) be fuzzy sets defined on a universal set \( X \). Prove that  
\[
|A| + |B| = |A \cup B| + |A \cap B|
\]
where \( \cap, \cup \) are the standard fuzzy interaction and union, respectively.  

b) Let \( A \) be a fuzzy set defined by  
\[
A = 0.5/x_1 + 0.4/x_2 + 0.7/x_3 + 0.8/x_4 + 1/x_5
\]
List all \( \alpha \)-cuts and strong \( \alpha \)-cuts of \( A \).

c) Let \( f: X \rightarrow Y \) be an arbitrary crisp function. Then, for any \( \alpha \) \( AC f(X), f \) fuzzified by the expansion principle satisfies the equation.  
\[
f(A) = \bigcup_{\alpha \in [0,1]} f(\alpha + A)
\]

Q.2  
a) Let \( A, B \) be two fuzzy numbers whose membership function one  
\[
A(x) = \begin{cases} 
\frac{(x+2)}{2} & \text{for } -2 < x \leq 0 \\
\frac{(2-x)}{2} & \text{for } 0 < x < 2 \\
0 & \text{otherwise}
\end{cases}
\]
\[
B(x) = \begin{cases} 
\frac{(x-2)}{2} & \text{for } 2 < x \leq 4 \\
\frac{(6-x)}{2} & \text{for } 0 < x < 6 \\
0 & \text{otherwise}
\end{cases}
\]
Find:  
i) \( A + B \)  
ii) \( A - B \)  
iii) \( \text{MIN} (A, B) \)

b) Every fuzzy complement has at most one equilibrium, prove it.

Q.3  
a) Give an example from daily life of fuzzy proposition introduced and express the proposition in its canonical form.  
b) \[
Z_{\text{max}} = 3x_1 + 2x_2 + 5x_3
\]
subject to  
\[
\begin{align*}
x_1 + 2x_2 + x_3 & \leq 430 \\
3x_1 + 2x_3 & \leq 460 \\
x_1 + 4x_2 & \leq 420 \\
x_1, x_2, x_3 & \geq 0
\end{align*}
\]
Use simplex method to solve.

Q.4  
a) Use Graphical Method to solve the following problem:  
Maximize  
\[
Z = 3x_1 + 4x_2
\]
subject to  
\[
\begin{align*}
x_1 - x_2 & \geq 0 \\
2.5x_1 - x_2 & \leq -3, \\
x_1, x_2 & \geq 0
\end{align*}
\]
b) Solve the following L.P.P. by the method of dynamic programming:

\[ Z_{\text{max}} = 2x_1 + 5x_2 \]

subject to
\[ 2x_1 + x_2 \leq 430 \]
\[ 2x_2 \leq 460 \]
\[ \forall x_1, x_2 \geq 0 \]

Q.5  

a) In a bank 20 customers on the average are served by a cashier in an hour. If the service time has exponential distribution, what is the probability that:

i) It will take more than 10 minutes to serve a customer.

ii) A customer shall be free within 4 minutes.

b) Customers arrive at a one window drive in bank according to a Poisson distribution with mean 10/hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window, including that for the serviced car can accommodate a maximum of three cars. Other cars can wait outside this space.

i) What is the probability that an arriving customer can drive directly to the space in front of the window?

ii) What is the probability that an arriving customer will have to wait outside the indicated space?

iii) How long is an arriving customer expected to wait before starting service?

Q.6  

a) A company has six jobs, A to F. All the jobs have to go through two machines \( M_1 \) and \( M_2 \). The time required for the jobs on each machine in hours is given below. Find the optimum sequence that minimizes the total elapsed time.

<table>
<thead>
<tr>
<th>Job</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M_1</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>M_2</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

b) Draw the network and determine the critical path for the given data. Also calculate all the floats involved in CPM.

<table>
<thead>
<tr>
<th>Jobs</th>
<th>1–2</th>
<th>1–3</th>
<th>2–4</th>
<th>3–4</th>
<th>3–5</th>
<th>4–5</th>
<th>4–6</th>
<th>5–6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

Q.7  

a) Explain the Programme Evaluation and Review Technique (PERT) procedure step by step.

b) A manufacturing company keeps stock of a special product. Previous experience indicates the daily demand as given below:

<table>
<thead>
<tr>
<th>Daily</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</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>

Simulate the demand for the next 10 days. Also find the daily average demand for the product on the basis of simulated data.
End Semester Examination, Dec. 2015  
M. Tech. (CSE) – First Semester  
OBJECT ORIENTED MODELING 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 different kinds of object oriented models.  
b) How object oriented software development is different from traditional software development.  

Q.2  
a) How aggregation is different from composition. Explain it with an example.  
b) Prepare a class diagram for a graphical document editor that supports grouping. Assume that a document consist of several sheets.

Q.3  
a) What is the purpose of models in designing? Which diagram(s) show(s) the concept of inheritance? What are the challenges in designing with inheritance (single/multiple)?  
b) What kind of errors do you make if you directly rush into the implementation phase of software project? How do you decide which classes, associations and generalization should be eliminated.

Q.4  
a) What is abstract class? Mention its use. Can concrete class be super class? If yes, give an example, if no, give a reason. Create a class hierarchy to organize the following drink classes: Mineral water, wine, alcoholic, nonalcoholic, grape juice, soda, bears.  
b) Draw the use case diagram for a hotel information system. There are two types of customers. Tour group customers and individual customers. Both can book, cancel, check-in and check-out of a room by phone or via the internet. There are booking process clerk and reception staff who manages it. A customer can pay his bill by credit card.

Q.5  
a) What are the similarities/dissimilarities between a sequence diagram and collaboration diagram? Draw the interaction diagram for an ATM-used for card based banking system.  
b) What is the use of “include” and “extends” relationships in use case diagram? Draw the use case diagram for online admission process for engineering students in MRIU.

Q.6  
a) What is software development process? Enlist steps of software development process? Differentiate between iterative process model from waterfall model.  
b) Explain the purpose of activity diagram? In which situation activity diagram is not necessary? Explain the use of following concepts for activity diagram: Synchronization bar, swimlane and sending – receiving signals.

Q.7  
a) Differentiate state and event. List different states and events for a photocopier machine.
b) Define the purpose of following terms with a suitable example and UML notations with respect to class model:

Q.8 Write short notes on:
a) Robustness. b) Reusability. c) Extensibility.
End Semester Examination, Dec. 2015
M. Tech. (CSE) - First Semester
NETWORK PROGRAMMING (CS-M-106)

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 Unix system architecture with its key features.
     b) Explain the usage and syntax of the following commands:
        i) Cat
        ii) Chmod
        iii) Is

Q.2  a) Differentiate between named and unnamed pipe. Explain the system calls with respect to pipes.
     b) What is a signal? Describe reliable and unreliable signals.

Q.3  a) What is a message queue? Explain message queue with its system calls.
     b) Differentiate between the following:
        i) Iterative vs Concurrent server.
        ii) Advisory locking vs Mandatory locking.

Q.4  a) What are mutexes and condition variables? Describe condition variables in waiting, signaling and broadcast mode.
     b) Explain producer consumer problem with multiple producer threads and single consumer thread.

Q.5  a) Define a socket. Explain elementary system calls for TCP client and server.
     b) Explain the different socket options with their syntax.

Q.6  a) What is TLI? Explain elementary TLI functions with respect to UDP.
     b) Explain stream pipes in detail.

Q.7  Write short notes on the following:
     a) Semaphores.
     b) Shell metacharacters.
     c) Input / Output multiplexing.
End Semester Examination, Dec. 2015
M. Tech. (CSE) - First Semester
ADVANCED COMPUTER ARCHITECTURE (CS-M-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) Write a detailed note on VLIW architecture.  7
     b) Explain in detail about data parallel architecture. Make a proper diagram.  8

Q.2  Explain the cache coherence problem in computer architecture. Also discuss the various cache coherence methods.  15

Q.3  Explain different types of vector memory access schemes in detail.  15

Q.4  Consider the reservation table of a static pipeline.

<table>
<thead>
<tr>
<th></th>
<th>t₀</th>
<th>t₁</th>
<th>t₂</th>
<th>t₃</th>
<th>t₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) Write the forbidden list.
b) Draw the state diagram.
c) Calculate the MAL.  15

Q.5  Explain in detail, the different models of cache memory consistency.  15

Q.6  a) Distinguish between hardware and software parallelism.  7
     b) Describe dependencies between instructions.  8

Q.7  a) Explain the concept of superscalar processor in detail.  7
     b) Write a note on virtual channel.  8

Q.8  a) Explain MESI protocol in detail.  7
     b) What is pipelining? Compare linear and nonlinear pipeline architecture in detail.  8
Q.1 Explain the working of following intelligent agents:
   a) Model based reflex agents.
   b) Learning agents.
   c) Goal driven agents.

Q.2 a) Explain the AO* algorithm in detail with the help of an example.
    b) What is depth limited search? Explain.

Q.3 a) Convert the following sentences into predicate logic:
       i) Every child loves every candy.
       ii) Any one who loves some candy is not nutrition fanatic.
       iii) Any one who eats any pumpkin is a nutrition fanatic.
       iv) Any one who buys any pumpkin either carves it or eats it.
       v) John buys a pumpkin.
    b) Explain the algorithm for ‘resolution’ with the help of an example.

Q.4 a) Discuss the Dempster-Shafer theory in detail.
    b) Write short notes on:
       i) Probabilistic reasoning.
       ii) Bayesian networks.

Q.5 a) What are the different forms of learning? Explain.
    b) Write a short note on: ‘learning decision trees’.

Q.6 a) What is an expert system? Explain the general architecture of expert system with the help of a diagram.
    b) Discuss robotics and its applications in brief.

Q.7 Explain the alpha-beta pruning algorithm for game playing in detail with an example.
End Semester Examination, Dec. 2015
M. Tech. (CSE) - Second Semester
MOBILE AND WIRELESS COMMUNICATION (CS-M-221)

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 reason for higher performance of slotted ALOHA over the classical ALOHA. 5
       b) Explain the architecture and radio interface of GSM. 6
       c) Why a specialized MAC is required in case of wireless networks. 4

Q.2 a) Discuss the reference model of wireless communication in detail. 10
       b) Write notes on:
           i) Types of antennas. 2½
           ii) Modulation. 2

Q.3 a) Discuss how power management is handled in case of 802.11 devices. 5
       b) How do we maintain security in Bluetooth? 5
       c) Discuss the different types of satellites and their application areas in brief. 5

Q.4 a) Explain the basic mechanism of IP packet delivery system. 5
       b) Write notes on:
           i) Tunneling. 5
           ii) Agent discovery. 5
       c) Discuss the DSR algorithm in details. 5

Q.5 a) Explain how a lost packet/acknowledgement is handled in case of I-TCP. 7
       b) What is selective retransmission? 4
       c) Discuss transaction-oriented TCP in brief. 4

Q.6 Write notes on:
   a) Wireless datagram protocol. 5
   b) WAP architecture. 3
   c) Wireless application environment. 3

Q.7 a) List and explain various security services offered by GSM. 8
       b) Draw an elaborative diagram to explain an inter-MSC handover. 7

Q.8 a) What are the components of MSS? Explain functions of each in brief. 7
       b) What is localization? Explain the difference between infrastructure and ad-hoc network. 8
Q.1 Explain waterfall model and spiral model in detail together with their advantages and disadvantages.

Q.2 Write in detail on:
   a) Quality assurance plan.
   b) Product quality metrics.
   c) Metrics for software maintenance.

Q.3 What is bug? What are the different states that a bug attains in its life cycle? Explain.

Q.4 What is static testing? What are the advantages of static testing as compared to dynamic testing? Explain different types of static testing.

Q.5 a) A mobile phone service provider uses a program that computes the monthly bill of a customer as follows:
   - Minimum Rs.300/- for up to 120 calls
   - Plus Re 1 per call for the next 70 calls
   - Plus Re 0.80 per call for the next 50 calls
   - Plus Re 0.40 per call for the next 240 calls
   Design test cases for this program using equivalence class testing technique.
   b) Explain cyclomatic complexity. What is its significance?

Q.6 a) Explain feature-based testing of object-oriented classes.
   b) What are the issues in testing a class?

Q.7 Consider the following program segment:
   ```c
   int number, index;
   printf("enter a number");
   scanf("%d", & number);
   index=2;
   while (index<=number-1)
   {
       if(number % index==0)
       {
           printf("Not a prime no");
           break;
       }
       Index++;
   }
   ```
If (index == number)
    printf("prime number");
}

a) Draw the DD graph for the program.

b) Calculate the cyclomatic complexity of the program using all the methods.

c) List all the independent paths and design testing cases.

Q.8 Write short notes on:

a) System testing
b) Testing principles.
c) Verification and validation.
End Semester Examination, Dec. 2015  
M. Tech. (CSE) – Third Semester  
BUSINESS INTELLIGENCE (CS-M-331)

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) Define the term business intelligence. Explain the important features of business intelligence.  
c) Describe business intelligence framework.  

Q.2  a) Compare and contrast structured, unstructured and semi-structured data.  
b) Is it possible to convert XML data into structured format? Explain with the help of an example.  

Q.3  a) Define OLTP. List the challenges of OLTP system. Explain the queries which cannot be answered by an OLTP system.  
b) Explain various operations performed in OLAP system by taking a suitable example.  

Q.4  a) Explain the difference between two different approaches for building a data warehouse.  
b) Explain schema integration and instance integration with the help of a suitable example.  

Q.5  a) Discuss balance scorecard as a strategy map. Justify your answer.  
b) Define key performance indicators. Explain their need in an organization.  

Q.6  a) Explain salient features of conceptual model.  
b) Define dimensional modeling. Explain various dimensional models by taking suitable examples.  

Q.7  a) Differentiate between fact and dimension tables.  
b) Whether data in a university should be warehoused or not? Justify your answer by taking a suitable example.  
c) State and explain UIMA.  

Q.8  a) What is metadata? Explain different types of metadata.  
b) Discuss the best practices for managing growth of unstructured data.  
c) Explain attributes of a good metric.
End Semester Examination, Dec. 2015
M. Tech. (P.S.E.D.) - Third Semester
LOAD AND ENERGY MANAGEMENT (EE-M-324)

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 maximum demand of a power plant is 40 MW. The capacity factor is 0.5 and utilization factor is 0.8. Find:
   i) Load factor  
   ii) Plant capacity
   iii) Reserve capacity  
   iv) Annual energy production.  

b) Explain the significance of peak diversity factor.  

c) Explain chronological curve, load duration curve and energy load curve in brief.  

Q.2  a) What do you mean by load forecasting? What are the different methods of load forecasting?  

b) What are the causes of low power factor and how can power factor be improved?  

Q.3  a) A steam station has two 110 MW units.

The cost data is under:

<table>
<thead>
<tr>
<th>Unit</th>
<th>VC₁=Rs. 18000 per kW</th>
<th>VC₂=Rs. 30000 per kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCR₁</td>
<td>10 percent</td>
<td>FCR₂=10 percent</td>
</tr>
<tr>
<td>CF₁</td>
<td>0.55</td>
<td>CF₂=0.60</td>
</tr>
<tr>
<td>Fuel consumption=0.7 kg/kWh</td>
<td>Fuel consumption=0.65 kg/kWh</td>
<td></td>
</tr>
<tr>
<td>Fuel cost= Rs. 2000 per 1000 kg.</td>
<td>Fuel cost = Rs. 1500 per 1000 kg</td>
<td></td>
</tr>
<tr>
<td>OM₁=20 percent of annual fuel cost</td>
<td>OM₂=15 percent of annual fuel cost</td>
<td></td>
</tr>
<tr>
<td>Utilization factor =1</td>
<td>Utilization factor=1</td>
<td></td>
</tr>
</tbody>
</table>

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 both stations.  

b) What do you mean by depreciation? Explain various methods to charge depreciation.  

Q.4  a) Explain the concept of demand side management and discuss the steps involved in demand side management (DSM) and its implementation.  

b) Explain the concept of peak clipping, valley fitting and load shedding in reference to DSM.  

Q.5  a) Explain the objective tariff. Discuss the different types of tariffs used for charging the consumer of electric energy.  

b) Write a short note on spot pricing.  

Q.6  a) Discuss the various options available for captive power generation and what are the government policies for encouraging captive power generation.  

b) Write a short note on energy wheeling.  

Q.7  What is energy audit? What are the various types of energy audit? Explain its goals.  

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Q.8  
a) Explain the role of Central Electricity Regulatory Commission (CERC) for implementation of deregulation in India. Also enumerate the salient features of Indian Electricity Act, 2003.  
b) Explain power system restructuring efforts made in foreign countries.
Q.1 a) Differentiate between conductors, semiconductors and insulators.
    b) Compare JFET and BJT.
    c) What does Bipolar mean in case of BJT?
    d) Define peak inverse voltage.
    e) Draw the V-I characteristics of ideal diode.
    f) What is diffusion capacitance?
    g) What are the specifications of A/D converter?
    h) Draw the truth table of JK and SR Flip-Flop.
    i) What is microprocessor?
    j) Differentiate between combinational and sequential circuits.

Q.2 a) What is a Zener diode? How is it different from normal P-n diode? Explain the
    working of Zener diode as a regulator.
    b) Explain the working of:
       i) Schottky diode.
       ii) Varactor diode.

Q.3 a) Explain the working principle of emitter follower.
    b) Explain the working of n-channel JFET along with a neat diagram.
    c) Write a brief note on transistor as oscillator.

Q.4 a) What is race around condition? The problem occurs in which Flip-Flop and how can
    it be overcome. Explain the working of SR flip-flop along with its truth table.
    b) Convert the following:
       i) \( (3287.5100098)_{10} = (\_\_\_\_\_\_\_\_\_\_\_)_{8} \)
       ii) \( (0.1EB4)_{16} = (\_\_\_\_\_\_\_\_)_{8} \)
    c) Design OR gate using NAND and NOR gates only.

Q.5 a) Give a brief on various elements of Op-amp along with a block diagram. List its
    ideal characteristics.
    b) Explain the working of Op-amp as:
       i) Integrator.
       ii) Summing amplifier.

Q.6 a) Explain the working of R-2R ladder type D/A converter.
    b) Explain parallel comparator type A/D converter.

Q.7 a) Explain the working of 8085 microprocessor along with its block diagram.
    b) Compare microprocessor and microcontroller.
End Semester Examination, Dec. 2015
B. Tech. – Second Semester
ANALOG ELECTRONICS (EC-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 capacitance in P-N junction diode.
c) What is voltage multiplier? Define it.
d) Define full wave rectifier with \( \pi \)-filter.
e) What is a transistor? Why is it so called?
f) What is the importance of operating point?
g) What do you understand by the term thermal instability?
h) What is stability factor? Derive an expression for it?
i) Explain FET as VVR?
j) What are the differences between series and shunt voltage regulator? 2x10

**PART-A**

Q.2  a) Discuss the switching characteristics of a diode. Derive an expression for the diffusion capacitance. 8
b) Explain characteristics of a photo diode and draw the V-I characteristics of such a diode. 7
c) The current in a certain P-N junction at room temperature is \( 2 \times 10^{-7} \) amp, when a large reverse biased voltage is applied. Calculate the current flowing when 0.1 V is applied. 5

Q.3  a) What is a filter? Obtain the ripple factor of a full wave rectifier with shunt capacitor filter. 10
b) What do you mean by clipping circuit? Discuss P-N diode clipping circuits. Also tell how it is different from clamper circuit? 10

Q.4  a) Sketch input and output characteristics of common emitter configuration of transistor. Also indicate the cut off, active and saturation regions of it. 10
b) Explain transistor as an amplifier with the help of a circuit diagram. 10

**PART-B**

Q.5  a) Draw a self bias circuit. Explain qualitatively why such a circuit is an improvement on the fixed bias circuit as far as stability is concerned. 12
b) Explain:
   i) Stabilization technique.
   ii) Compensation technique of transistor. 8

Q.6  a) Draw the drain characteristics of a common source JFET and label different regions. 8
b) Distinguish between depletion and enhancement MOSFET. 6
c) Explain modes of operation of a MOSFET. 6

Q.7 a) Draw a circuit of regulated power supply and explain its working. 8
b) Explain performance parameters of three terminal IC regulators. 6
c) Explain emitter follower regulator. 6
End Semester Examination, Dec. 2015  
B. Tech. – Second Semester  
DIGITAL ELECTRONICS AND CIRCUITS (EC-202)

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 digital signal and analog signal.  
b) What are universal logic gates?  
c) What is multiplexer? What are its applications?  
d) Differentiate between a latch and a Flip-Flop.  
e) Define modulus of a counter. How many flip-flops are required to design Mod-12 counter?  
f) If four bit DAC has maximum full scale output of 15 V then find out its resolution.  
g) What is the main advantage of flash type of ADC over successive approximation type ADC?  
h) What are FAN IN and FAN OUT in a digital IC?  
i) Differentiate between synchronous and asynchronous counters with an example.  
j) Solve \((111111)_2 + (111111)_2 = (?)_2\)

2x10

PART-A

Q.2  
a) Subtract the following decimal numbers using 1’s and 2’s complement:  
   i) 16 from 29.  
   ii) 39 from 20.  
   b) If we have hamming code 1000010 at receiver end. Is it correct /Incorrect? If incorrect, then detect the error and write correct Hamming code.  
   c) Prove that:  
      i) \(AB + A \bar{B} + \bar{A} B = A + B\)  
      ii) \(AB + ABC + ABCD + ABCDE + ABCDEF = AB\)

7  
6

Q.3  
a) Minimize the following function using QM method:  
   \[F(A, B, C, D) = \sum m(0, 2, 4, 5, 8, 9, 12)\]  
   b) Design and realize the circuit of 4 bit binary to gray code converter.

12  
8

Q.4  
a) Do the following Flip-Flop conversions:  
   i) JK to SR.  
   ii) JK to D.  
   b) Draw and explain the working of Master Slave Flip-Flop.

8  
12

PART-B

Q.5  
a) Design synchronous decade counter using T Flip-Flop.  
   b) Draw and explain the working of bidirectional shift register.

10  
10

Q.6  
a) What is the major advantage of R-2R ladder type DAC as compared to weighted resistor type DAC? Draw and explain 4 bit R-2R ladder type DAC.  
   b) Draw and explain dual slope type analog to digital converter.

14  
6
Q.7  
a) Why ECL is called emitter coupled logic? Explain it’s working as NOR/OR logic. 10
b) Explain the following characteristics of digital ICs:
   i) Propagation delay time.  
   ii) Noise margin. 
   iii) Operating temperature.  
   iv) Power dissipation. 10
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
ELECTRONIC DEVICES AND CIRCUITS (EC-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) What is switching time of diode?  
b) Draw constructional diagram of a varactor diode.  
c) What is meant by the term ‘common’ in transistor?  
d) Derive relation between $\alpha$ and $\beta$.  
e) What is frequency response of an amplifier?  
f) State Miller’s theorem.  
g) What are the basis of classification of power amplifiers?  
h) Draw the block diagram of feedback amplifier.  
i) Define sensitivity of feedback amplifier.  
j) Draw a circuit diagram of crystal oscillator. Also define its principle.

2x10

PART-A

Q.2  
a) Draw V-I characteristics of PN junction diode. Also derive diode current equation.  

12

b) Explain V-I characteristics of tunnel diode.  

8

Q.3  
a) Draw input and output characteristics of common emitter configuration of PNP transistor.  

10

b) What is biasing? Explain potential divider biasing in detail.  

10

Q.4  
a) Draw a circuit diagram of two stage RC-coupled amplifier. Derive an expression for voltage gain in mid frequency region.  

14

b) Explain distortion in amplifier.  

6

PART-B

Q.5  
a) Explain class-B power amplifier and calculate its overall efficiency.  

10

b) Draw the circuit diagram of a push-pull amplifier. Explain its operation. Discuss the advantages and disadvantages.  

10
Q.6  a) Explain a feedback amplifier with the help of a block diagram. 
    10
 b) Explain effect of negative feedback on amplifier characteristic. 
    10

Q.7  a) Draw the circuit diagram of Colpitt’s oscillator. Also derive expression for
     resonance frequency. 
    10
 b) Explain the principle of working of wein-bridge oscillator circuit. Also derive
     expression for resonance frequency of it. 
    10
End Semester Examination, Dec. 2015  
B. Tech. – Third / Fourth Semester  
DIGITAL ELECTRONICS (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) Why are digital circuits called switching circuits?  
b) What is the main advantage of octal and hexadecimal systems?  
c) Convert (2598.675)\textsubscript{10} to hexadecimal.  
d) Define a priority encoder.  
e) What are the merits of ECL i.e. is emitter coupled logic?  
f) What do you understand by the term fan out?  
g) What is meant by race around condition in flip-flops?  
h) State the difference between synchronous and asynchronous counters.  
i) Define modulus of a counter.  
j) What is resolution of a digital to analog converter (DAC)?  
k) What do you understand by a positive logic system?  

PART-A

Q.2  a) Test the following Hamming code sequence for a 11-bit message and correct it if necessary (101001011101011).  
b) Simplify the Boolean function using K-Map in SOP and POS forms:  
\[ F = \sum m(0,1,2,4,7,8,12,14,15,16,17,18,20,24,28,30,31) \]  

Q.3  a) Design an even parity generator for a 4 bit input.  
b) Implement the logic function given using 8x1 MUX:  
\[ F(A,B,C,D) = \sum m(1,3,4,11,12,13,14,15) \] .

Q.4  a) Implement the two Boolean functions with a PLA.  
\[ F_1(A,B,C) = \sum m(0,1,2,4) \]  
\[ F_2(A,B,C) = \sum m(0,5,6,7) \]  
b) Draw and explain standard TTL circuit for 2 input NAND gate using TOTEM pole O/P.

PART-B

Q.5  a) Draw the diagram of a master slave JK flip-flop and explain its operation in detail.  
b) Explain the conversion of JK flip-flop to T flip-flop.

Q.6  a) Explain in detail a 4 bit universal shift register.  
b) Design a synchronous 3 bit UP counter.

Q.7  a) Explain in detail a R-2R ladder type DAC with 4 bit digital input.
b) Determine the resolution of a 6 bit digital to analog converter (DAC).
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
SIGNALS AND SYSTEMS (EC-303A)

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 causal and anti causal signal.  
b) What is unit step function? How can it be obtained from unit impulse function?  
c) State superposition principle.  
d) Find Laplace transform of $e^{1/\alpha}$.  
e) State Dirichlet’s condition.  
f) What is ROC?  
g) Calculate DTFT of $\alpha^n \cdot u(n)$.  
h) What are LTI systems?  
i) Prove time shifting property of Fourier transform.  
j) What do you mean by unit impulse response?  

PART-A  

Q.2  
a) Calculate the average power of the square wave shown as:  

\[ x(t) = \begin{cases} +1 & \text{for } 0 \leq t < T \\ -1 & \text{for } T \leq t < 2T \end{cases} \]

b) Determine whether the following signal is periodic or not. If periodic, find periodicity $x(t) = 2\cos 1.5\pi t + \sin 3.5\pi t$.  
c) Explain basic manipulations on discrete time signals.

Q.3  
a) A discrete time signal $x(n)$ is applied to a discrete time LTI system: Find the output or response $y(n)$ if given that  
\[
\begin{align*}
x(n) &= 2^n \cdot u[-n] \\
h(n) &= u(n)
\end{align*}
\]

b) Consider the system $y(t) = x^2(t-t_0) + 2$. Determine whether the system is  
i) Linear  
ii) Stable  
iii) Causal.  
Justify your answer.

Q.4  
a) Determine the partial fraction expansion and hence inverse Laplace transform of following function.
\[ X(S) = \frac{S^2 + 2S - 2}{S(S + 2)(S - 3)} \quad \text{ROC: } \text{Re}(S)>3. \]

b) Determine the Laplace transform of following sinusoidal function:
\[ x(t) = A\sin \omega_t t \cdot u(t) \]

**PART-B**

Q.5 a) Obtain the trigonometric Fourier components of periodic square wave signal shown as:

![Square Wave Signal](image)

b) State and prove Parseval’s identity for Fourier series.

Q.6 a) A certain function of time has the following Fourier transform.
\[ F(j\omega) = \frac{1}{\omega^2 + 1} e^{-2\omega^2/(\omega^2 + 1)} \]

Using the properties of Fourier transform, write the Fourier transforms of:

i) \( f(2t) \)  

ii) \( f(t-2)e^{i\pi} \)  

iii) \( 4\frac{d}{dt} f(t) \)

b) State and prove Rayleigh’s energy theorem for Fourier transform.

Q.7 a) Determine IDTFT of following expression:
\[ X(e^{j\omega}) = \begin{cases} 1 & \text{for } |\omega| \leq w \\
0 & \text{for } w < |\omega| < \pi \\
\end{cases} \]

b) State and prove differentiation in frequency domain property of DTFT.
Q.1
a) State uniqueness theorem.

b) If \( \phi (x, y, z) = x^2 y - y^3 z^2 \), find \( \nabla \phi \) at the point \((1, -2, -1)\).

c) What is VSWR?

d) Explain the significance of pointing vector.

e) What is surface impedance?

f) Define the term ‘Brewster angle’.

g) Explain Faraday’s law.

h) Draw the field lines for two equal and opposite charges.

i) Convert point \( P(-2, 6, 3) \) from cartesian to spherical co-ordinates.

j) Define input impedance of a transmission line.

PART-A

Q.2
a) Show that \( \vec{\mathbf{\rho}} \) is an irrotational vector for any value of \( n \) but is solenoidal only for \( n = -3 \), where \( \vec{r} \) is the position vector and \( r \) is its magnitude.

b) State and prove Gauss’s divergence theorem.

Q.3
a) Show that at a boundary between dielectrics, normal component of \( \vec{D} \) and tangential component of \( \vec{E} \) are continuous.

b) Deduce an expression for the energy stored in an electrical field having point charges.

c) Derive Poisson’s equation.

Q.4
a) Derive an expression for the magnetic field intensity, due to a circular loop of radius \( R \) carrying current \( I \), at a point on its axis.

b) Write a short note on magnetic vector potential.

c) Define self and mutual inductance.

PART-B

Q.5
a) Discuss and derive equation of continuity for time varying fields. Also define inconsistency of Ampere’s law.

b) State Maxwell’s electromagnetic equations for time varying fields.

Q.6
a) Derive an expression for depth of penetration of e.m. wave in good conducting medium.

b) Derive from Maxwell’s equations the wave equations in vector form for \( \vec{E} \) and \( \vec{H} \) fields in a conducting medium of conductivity \( \sigma \) and permittivity \( \varepsilon \).
Q.7  

a) A lossless transmission line is 80 cm long and operates at a frequency of 600 MHz. The line parameters are $L = 0.25 \mu H/m$ and $C = 100 p F/m$. Find the characteristic impedance, the phase constant and the phase velocity.

b) Write a short note on Smith chart.

c) An r.f. line of characteristic impedance 600 ohms is terminated in an impedance of $(400 + j 200) ohms$. Calculate the voltage standing wave ratio.
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
ANALOG ELECTRONIC CIRCUITS-I (EC-321)

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 meant by the term common in transistor?  
b) Draw h-parameter model of transistor.  
c) Define FET as VVR.  
d) Draw \( \pi \)-model of transistor.  
e) Derive relation between ac drain resistance \( r_d \), trans conductance \( g_m \) and amplification factor \( \mu \).  
f) What is the difference between BJT and FET?  
g) Define Miller’s theorem.  
h) What do you mean by 3dB?  
i) What is the need of cascading?  
j) What is the basis of classification of power amplifier?  

PART-A

Q.2 a) Draw input and output characteristics of common emitter configuration of transistor. Also clarify active region, cutoff region and saturation region on characteristic curve.  
b) Derive general formula for input impedance, voltage gain and current gain in terms of h-parameters.  

Q.3 a) Calculate various conductance parameters for high frequency common emitter configuration of transistor.  
b) Calculate current gain for common emitter short circuit configuration of high frequency response of transistor.  

Q.4 a) Draw the static drain characteristics and transfer characteristics for N-channel field effect transistor. Also derive drain current equation of field effect transistor.  
b) Derive expression for input impedance, output impedance and voltage gain for common configuration of N-channel field effect transistor (including effect of \( R_s \)).  

PART-B

Q.5 Draw circuit diagram of single stage transistor amplifier. State the function of each component used in this circuit. Also derive expression for current gain voltage gain, input resistance output resistance and power gain of transistor amplifier operating in common emitter mode.  

Q.6 a) Explain two stage RC coupled amplifier. Why does gain fall of at low and high frequencies?  
b) Derive expression for lower and upper cut off frequency for 2 stage RC coupled amplifier.
Q.7  
a) Explain Class B power amplifier and calculate its overall efficiency.  
b) Draw circuit diagram of push pull amplifier. Explain its operation. Also discuss its advantages and disadvantages.
End Semester Examination, Dec. 2015
B. Tech. – Fourth / Fifth Semester
MICROPROCESSORS AND INTERFACING (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) Differentiate between stack pointer and program counter.
   b) Explain $BHE/S_7$ signal of 8086 microprocessor.
   c) Assume $(CL) = 03H$, $(AX) = 0846$. Determine the new contents of $AX$ and $CF$ after the execution of $SAR AX, CL$.
   d) Explain interrupt vector table.
   e) Differentiate between $SUB$ and $CMP$ instruction of 8085 microprocessor.
   f) What is maskable and non-maskable interrupt?
   g) What will be the contents of PC after the execution of $RST 5$?
   h) Memory address of starting address of $4K$ byte memory is $2FOEH$. Find the address of last location.
   i) Define partial and absolute decoding.
   j) What is polling?
   k) Define IRR and IMR of $PIC 8259$.
   l) Write the control word for $8255$ IC for $BSR$ mode to reset bits $PC_2$ and $PC_4$.

   $2 \times 10$

   **PART-A**

Q.2 a) How address and data lines are demultiplexed in 8085 microprocessor? 7
   b) Explain programming model of 8085 microprocessor. 6
   c) Define the addressing modes of 8085 microprocessor. 7

Q.3 a) Explain the maximum mode configuration of 8086 microprocessor. 10
   b) Describe the action taken by 8086 microprocessor when NMI pin is activated. 4
   c) Explain the interrupt structure of 8086 microprocessor. 6

Q.4 a) Write a program for 8086 microprocessor to copy a block of data starting from $0000:0100H$ to the destination starting from $0000:0200H$. The block consists of 10 bytes.

   OR

   Write a program for 8086 microprocessor to arrange a set of 8 bit no(s) in ascending order. 12
   b) What are assembler directives and operators? Give five examples of each. 8

   **PART-B**

Q.5 a) Interface $4K$ ROM and $8K$ RAM with 8085 microprocessor. Draw interfacing circuit and write its memory map too. 15

275/3
b) What are the various methods used for address decoding?

Q.6  a) Write down the control word to configure 8255 in mode 1 with port A and B as I/P ports. Write the set of instructions to read from port A and then store the received byte at location 3200H. Use control register and port address of 8255 as 80H, 81H, 82H and 83H respectively.

b) Explain the following terms:
   i) Programmed I/O
   ii) Interrupt driven I/O
   iii) Burst mode
   iv) Cycle stealing mode

Q.7  a) Draw the block diagram of 8259 PIC and explain its working.

b) How the control word registers and various counters are selected in 8253 IC? State the various modes of operation in 8253 and explain any two modes using timing diagram.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
COMMUNICATION SYSTEMS (EC-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) Draw the block diagram of a communication system.
b) State and prove time shifting property of Fourier transform.
c) An AM signal with a carrier of 1 kW power has 200 Watt in each sideband. Find the percentage modulation.
d) What do you mean by coherent detection?
e) A 15 kHz audio signal is frequency modulated with modulation index, $\beta = 5$. Calculate the transmission bandwidth of FM signal.
f) Draw the block diagram for generation of PM signal using FM modulator.
g) What is the role of mixer in superheterodyne receiver?
h) Explain the need for pre-emphasis and de-emphasis in FM receiver.
i) Define noise temperature. How is it related to noise figure?
j) Explain how image frequency signals are received in a superheterodyne receiver. How can these signals be rejected?

2x10

PART-A

Q.2
a) What is modulation? Why is it needed?
8
b) Find the Fourier series expansion of half-wave rectified sine wave.
8
c) What is Hilbert transform? What is its significance?
4

Q.3
a) Explain the generation of SSB signal using filter method. Give the advantages and disadvantages of this method.
7
b) Derive the expression for power in AM wave.
8
c) Explain vestigial sideband system. Give its application.
5

Q.4
a) What is the difference between external and internal noise. Explain different types of internal noise.
10
b) What is meant by noise figure? A mixer stage has a noise figure of 25 dB and stage before it is an amplifier with a noise figure of 20 dB and an available power
gain of $10 \, dB$. Find the overall noise figure referred to input.

**PART-B**

Q.5  

a) A carrier is frequency modulate with a sinusoidal signal of $2 \, kHz$ resulting in a maximum frequency deviation of $5 \, kHz$.

i) Find the bandwidth of modulated signal.

ii) The amplitude of modulating sinusoid is increased by a factor of 3 and its frequency is lowered to $1 \, kHz$. Find the maximum frequency deviation and bandwidth of the new modulated signal.

b) Explain in detail, direct method for FM generation.

c) Describe the operation of ratio detector.

Q.6  

a) Name the constituent stages of AM radio transmitter and briefly give the function of each stage.

b) Write the features of broadcast receiver.

c) What is AGC? How AGC is obtained in a practical diode detector.

Q.7  

a) Derive an expression for the output SNR of a PM receiver and hence obtain its figure of merit.

b) Show that the figure of merit of an AM receiver is $K_a^2/(K_a^2 P_m)$, where $P_m$ denote output signal power.
End Semester Examination, Dec. 2015
B. Tech. – Fourth/ 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) Define: i) CMRR  ii) Offset voltage and current.
b) Draw a circuit diagram of level shifter and explain its working.
c) Draw a circuit diagram of current to voltage converter and explain its working.
d) What is deboo integrator? Draw its circuit.
e) Define sample and hold circuit with the help of a circuit diagram.
f) What is a super diode?
g) Define single op-amp band pass filter with the help of a circuit diagram.
h) Define basis of classification of filter.
i) Why distortion occurs in sawtooth generator at a low frequency?
j) Write features of an IC regulator.

Q.2 a) Explain: i) Current mirror. ii) Active load with the help of a circuit diagram.
b) Derive expression for ac analysis of dual-input balanced output differential amplifier.
c) Draw block diagram of op-amp and explain its each block. Also write features of 741 IC.

Q.3 a) The input to the differentiator circuit is a sinusoidal voltage of peak value 4 mV and frequency of 1 kHz. Find the output voltage if $R_f = 50k\Omega$ and $C = 1 \mu F$. Sketch input and output voltage.
b) Draw a neat circuit diagram of three input non-inverting amplifier using operational amplifier, and obtain expression for its output voltage. (Assume averaging condition).
c) Explain instrumentation amplifier.

Q.4 a) Compare inverting and non-inverting comparator. Also write important characteristics and applications of it.
b) Derive output expression for OTA with the help of a neat sketch.

Q.5 a) Derive expression for transfer function of Sallen and Key low pass filter.
b) Explain state variable filter with the help of a neat diagram. Also derive an expression for it.

Q.6 a) Draw block diagram of 555 timer. Also explain its astable mode of operation.
b) Draw a circuit diagram of multi op-amp function generator and explain it in brief.
Q.7  
   a) Draw functional block diagram of three-pin voltage regulator and explain it in brief.  
   b) Explain switch mode power supply with the help of a circuit diagram.
Q.1  a) Define a signal. What are different types of signals?
    b) Discuss merits of digital communication over analog communication.
    c) State and prove frequency shifting property of Fourier transform.
    d) Find the Fourier transform of \( \delta(t) \), an impulse of unit strength.
    e) What is the percentage of the power saving in SSB transmission as compared to DSB signal? (Take modulation index as 1).
    f) What do you mean by coherent detection?
    g) State Carson’s rule for determining the bandwidth for a FM signal. A 15 KHz audio signal is FM with modulation index \( \beta = 5 \). Calculate the transmission bandwidth of FM signal.
    h) Draw the block diagram for generation of PM signal using FM modulator.
    i) Discuss the role of mixer in superheterodyne receiver.
    j) The noise figure of an amplifier is 0.2 dB. Find the equivalent temperature, \( T_e \).

**PART-A**

Q.2  a) What are the elements of a communication system? Explain the need of modulation in a communication system.
    b) Explain different types of systems with suitable examples.

Q.3  a) Find the Fourier series expansion of the following waveform:

    \[
    g(t) = A\sin(\omega_0 t)
    \]

    b) State Parseval’s energy theorem. Using it find the energy content of the following signal:

Q.4  a) Sketch the circuit of a practical diode detector and explain its working. What is negative peak clipping? Calculate the maximum modulation index that the above detector can tolerate without causing negative clipping.
    b) What is the vestigial sideband transmission? Explain how is it used for transmission of TV signals. Discuss the method for generation of VSB.
PART-B

Q.5  a) Explain reactance modulator used for FM-generation, using transistor.  
     b) A FM signal is represented by: 
        \[ v(t) = 6 \cos \left( 6 \times 10^{6} \pi t + 3 \sin 1000t \right) \]
        Determine the following: 
        i) Carrier frequency.  
        ii) Modulating signal's frequency.  
        iii) Modulation index.  
        iv) Power dissipated in 1Ω resistor.  
     c) Explain Foster seeley discriminator in detail.  

Q.6  a) Name the constituent stages of AM radio transmitter and briefly give the functions of each stage.  
     b) What are the functions of AGC in radio receiver? How AGC is obtained in a practical diode detector?  
     c) Discuss the need for limiter and de-emphasis circuit in FM receivers.  

Q.7  a) Define noise. List and explain different types of noise that occur in an electronic circuit.  
     b) For a bandwidth of 150 KHz, calculate the thermal noise voltage generated by two resistors of 50 kΩ and 10 kΩ, when they are connected in series and in parallel.  
     c) What is meant by noise equivalent bandwidth? Derive an expression for noise equivalent bandwidth.
Q.1 a) Define signal. What are different types of signals?
b) What are the functions of transmitter in a communication system? Draw the block diagram of a transmitter.
c) Find the Fourier transform of impulse function, \( \delta(t) \).
d) State and prove time shifting property of Fourier transform.
e) The rms voltage of a carrier wave is 5 V before modulation and 5.9 V after modulation. What is the percentage of modulation? Calculate the modulated power if the unmodulated power is 2 kW.
f) What is the difference between NBFM and WBFM?
g) What is intermediate frequency and what is its significance?
h) Explain the need of pre-emphasis and de-emphasis in FM receiver.
i) Define noise temperature. How is it related to noise figure?
j) Given an angle modulated signal
\[
s(t) = 10\cos[(10^8)\pi t + 5\sin 2\pi(10^3)t]
\]
Determine the maximum frequency deviation and bandwidth.

2x10

PART-A

Q.2 a) What is the need for modulation in a communication system?

\[8\]
b) Define system. Explain the difference between:
   i) Linear and non linear system.
   ii) Time invariant and time variant system.

Determine whether the following is a LTI system:
\[
y(n) = n\cos[x(n)]
\]

\[12\]

Q.3 a) Find the Fourier series expansion of half wave rectified sine wave.

\[8\]
b) State and prove Parseval’s energy theorem. Consider the signal, \( g(t) \), defined by:
\[
g(t) = \sin c(t)
\]
Find the energy content of \( g(t) \).

\[12\]

Q.4 a) Compare different types of amplitude modulation techniques i.e. DSB, DSB-SC, SSB and VSB.

\[8\]
b) Explain synchronous demodulation method. Evaluate the effect of phase and frequency error in the local oscillator on synchronous DSB demodulation.

6

c) Describe filter method for generation of SSB signal.

6

**PART-B**

Q.5 a) A carrier is frequency modulated with a sinusoidal signal of 2 kHz resulting in a maximum frequency deviation of 5 kHz.

i) Find the bandwidth of modulated signal.

ii) The amplitude of modulating sinusoid is increased by a factor of three and its frequency is lowered by 1 kHz. Find the maximum frequency deviation and bandwidth of the new modulated signal.

8

b) Draw a circuit of Foster Seeley discriminator and explain it in detail.

6

c) Explain the generation of FM using VCO method.

6

Q.6 a) Draw the block diagram of AM transmitter and briefly give the function of each stage.

6

b) What is AGC? How AGC is obtained in a practical diode detector?

6

c) Explain FM receiver with the help of a suitable block diagram.

8

Q.7 a) Write short notes on:

i) Equivalent noise bandwidth.

ii) Noise figure.

iii) S/N ratio.

iv) Thermal noise.

10

b) Two resistors of 50 KΩ and 100 KΩ are at room temperature (290 K). For the bandwidth of 50 KHz, calculate the thermal noise for the following conditions:

i) For each resistor.

ii) Two resistors in parallel.

iii) Two resistor in series.

10
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
ANTENNA AND WAVE PROPAGATION (EC-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) Define characteristic impedance.  
b) What is radiation resistance? What is its significance?  
c) Differentiate between directive gain and power gain of an antenna.  
d) What is antenna efficiency?  
e) State Poynting theorem.  
f) Explain the term ‘critical frequency’.  
g) What is noise figure of an antenna?  
h) Mention any two applications of lens antenna.  
i) Why is flaring required in a horn antenna?  
j) Define uniform linear array.  

Q.2  
a) Derive an expression for radiation resistance of a short dipole.  
b) Derive the wave equation in terms of electromagnetic potential.  

Q.3  
a) Differentiate between power gain, directive gain and directivity.  
b) An antenna has a loss resistance of 10 ohms, power gain of 20 and directivity 22. Calculate its radiation resistance.  

Q.4  
a) What is the operating principle of log periodic dipole antenna? What is its gain? Mention its characteristics and applications.  
b) What is a loop antenna? Explain its ability for direction finding with the help of a neat diagram.  

Q.5  
a) Derive an expression for the far field pattern of two isotropic point sources of same amplitude and phase.  
b) What do you understand by multiplication of patterns? Explain it with examples. What are its applications?  

Q.6  
a) Discuss in detail, phenomenon of sky wave propagation in detail.  
b) Derive an expression for refractive index of ionosphere.  

Q.7  
a) With the help of a diagram, explain the set up for measurement of radiation pattern.  
b) What is antenna efficiency? Briefly explain how is its measurement carried out.
End Semester Examination, Dec. 2015
B. Tech. – Fifth / Sixth Semester
DIGITAL SIGNAL PROCESSING (EC-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) Plot the signal \( y(n) = u(-n + 2) \).
b) Calculate z-transform of \( x(n) = u(n) + u(n+1) \).
c) Find linear correlation between \( x(n) = \{1, 2, 3\} \) and \( x_s(n) = \{-1, 2\} \).
d) Find DTFT of \( x(n) = a^n u(n-1) \).
e) State and prove periodicity property of phase factor \( W^n \).
f) What is finite word length effect in DSP?
g) Write expression for Hanning window function.
h) Differentiate between FIR and IIR digital filters.
i) What is frequency warping?
j) Draw the block diagram of interpolator.

**PART-A**

Q.2 a) Determine \( x(n) \) if \( X(z) = \frac{z + 2}{2z^2 - 7z + 3} \) when ROC is given as:
i) \( |z| > 3 \)
ii) \( |z| < \frac{1}{2} \)

b) Find \( y(n) \) by using convolution property of z-transform when \( x(n) = [1, 2, 3, 1, -1, 1] \) and \( h(n) = [1, 1, 1] \).

Q.3 a) Find 4-pt DFT of the sequence \( x(n) = \cos \left( \frac{n\pi}{4} \right) \).

b) Find circular convolution of following sequences:
   \( x(n) = [1, 2, 1, 2] \) and \( h(n) = [2, 3, 2, 4] \)

Q.4 a) Find out 8-pt. DFT of following sequence using DIT –FFT algorithm \( x(n) = [1, 1, 1, 0, 0, 1, 1] \).

b) Explain DIF-FFT butterfly algorithm.

**PART-B**

Q.5 a) The desired response of a low pass filter is:
   \[
   H_d(e^{j\omega}) = \begin{cases} 
   e^{-j3\omega} , & -3\pi/4 \leq \omega < 3\pi/4 \\
   0 , & 3\pi/4 < |\omega| < \pi
   \end{cases}
   \]
   Determine \( H(e^{j\omega}) \) for \( n = 5 \) using Hamming window function.

b) Explain the term Gibbs phenomenon.

b) Describe butterworth filter and comment on their passband and stopband characteristics.  

Q.7  

a) How can sampling rate be altered by a fraction number.  
b) Explain the working of multistage decimator and interpolator using block diagram.
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
DIGITAL SYSTEM DESIGN (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 the hardware description language? List extensively used hardware description languages.
b) Perform the following operations:
   i) 10110010 srl +3
   ii) 11010100 sla -3
c) What is delta delay? Why is it required?
d) Why are generics required in VHDL? Write an example.
e) Define sensitivity list. Is it necessary to specify a sensitivity list in behavioral modeling?
f) Write VHDL code for following Boolean expression in dataflow modeling:
   \[ Y = (A + B) \cdot C \]
g) Correct the following statements of an entity declaration:
   library IEEE
   Use IEEE_std_logic 1164_all;
   Entity decoder
   Port (BIN in: bit (1 down to 0);
   DEC : out bit (2 down to 0);)
   End decoder
h) Write the statement which makes the flip-flop as:
   i) Positive Edge Triggered
   ii) Negative Edge Triggered
i) How many address and data lines are required for a memory of 2048 bytes?
j) What are the advantages of PLD over a fixed function IC?

PART-A

Q.2 a) Discuss the impact of inertial and transport delay model on a signal driver.
b) How can a memory space of 32 x 8 bit be declared in VHDL?

Q.3 a) Explain subprogram overloading and describe various ways through which a particular subprogram is “called” among the overloaded subprograms.
b) Explain for loop with an example.
c) Explain the difference between “Exit” and “Next” statement.

Q.4 a) Write VHDL code of 1:4 demultiplexer using behavioral modeling.
b) Write VHDL code of full subtractor using structural modeling.

PART-B

Q.5 a) Write VHDL code for 4-bit SIPO shift register.
b) Write VHDL code for 4-bit down counter.

Q.6 a) Explain architecture of a simple microcomputers system.
b) Write VHDL code for a 16-bit ALU which can perform at least eight operations on input data.

Q.7

a) Explain the architecture of FPGA in detail.
b) Implement a full adder circuit using PLA.
c) Implement the following function using ROM:
   \[ F_1(A, B) = \{0, 1, 3\} \]
   \[ F_2(A, B) = \{0, 2\} \]
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
DIGITAL SYSTEM DESIGN (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  
1. a) What are CAD tools? Give some examples.
   b) Write the syntax and an example of declaring a constant. What is a deferred constant?
   c) Define sensitivity list is it necessary to specify a sensitive list in behavioural modeling?
   d) What does the following statement imply? Wait for 0 ns;
   e) Write VHDL code of AND gate using behavioral modeling.
   f) Write VHDL code for following Boolean expression in data flow modeling: $y=(A+B)C$
   g) What is the difference in architectures of a latch and a flip-flop?
   h) Write data flow architecture of PIPO shift register.
   i) What is the role of ALU unit in processor?
   j) Define PLD list various type of PLDs.

**PART-A**

Q.2  
1. a) What is a scalar data type? Discuss various scalar data types with suitable examples.
   b) Explain transport and intertial delay models.

Q.3  
1. a) Explain variable assignment statements and signal assignment statement. What are their differences? Explain how do they behave when written within a process.
   b) Why are generics used? Write VHDL code for an n-input AND gate using the concept of generics.

Q.4  
1. a) Write VHDL code of full subtractor using structural modeling.
   b) Write VHDL code of 1 bit comparator using behavioral modeling.

**PART-B**

Q.5  
1. a) Write VHDL code for description of a 3 bit up counter using behavioral modeling.
   b) Write VHDL code for J-K Flip-Flop using case statement and for D Flip-Flop using if statement.

Q.6  
1. a) Explain the architecture of a simple processor.
   b) Write short notes on various type of memories used by computer.

Q.7  
1. a) Describe the architecture of CPCD in detail.
   b) Implement half adder using ROM.
Q.1 a) Define TDD and FDD.
b) What is a co-channel cell?
c) Define co-channel reuse ratio. Will the value of reuse ratio effect the capacity of the system?
d) Define coherence bandwidth and coherence time.
e) Define small scale fading.
f) What is 1G system? List few examples.
g) Differentiate between hard and soft handoff techniques.
h) What are various diversity techniques?
i) What is interleaving in GSM system?
j) Consider a GSM system that uses 25 MHz for a forward link with channel bandwidth of 200 KHz. If 8 speech channels are supported on a single radio channel, find the no. of users that can be accommodated in GSM. Assume no guard band. 2x10

PART-A

Q.2 a) With the help of a diagram explain various upgraded paths for 2G technologies. Explain 3G wireless networks also. 10

b) What are various channels in a GSM system? Explain the role of control channels in detail. 10

Q.3 Explain the path loss for the two ray ground reflection model. Show that the received power falls off with distance raised to the fourth power. 20

Q.4 a) Write short notes on:
   i) Bluetooth and PAN ii) 4G 5x2

b) Explain the evolution of 2.5G TDMA standards. 10

PART-B

Q.5 a) Explain linear equalization and derive the output of the receiver. 10

b) What is the need of diversity technique? List them all and explain any one in detail. 10
Q.6  a) Discuss the concept of frequency reuse. Prove that $C = M \cdot S$, where $M$ is the number of times the cluster replicates and $S$ is the number of duplex channels available.

10

b) Briefly discuss handoff strategies.

10

Q.7  Write short notes on any two:

a) Spread spectrum techniques.

b) Slotted ALOHA and Pure ALOHA.

c) Space division multiple access.

d) Packet radio protocol.

10x2
Q.1  a) State sampling theorem. Find the Nyquist rate for the following signal:
\[ x(t) = 10 \cos^2 1000 \pi t. \]
b) If the encoding bits/sample in PCM is increased from 4 bits to 6 bits, what will be the increase in SNR?
c) Explain binary PSK modulation scheme.
d) What is a matched filter? Give expression for probability of error of matched filter.
e) Define cumulative distribution function (CDF). Write different properties of CDF.
f) Explain Gaussian distribution.
g) A source generates one of five possible messages, Q1 to Q5 having probabilities $\frac{1}{16}, \frac{1}{16}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}$ respectively every microsecond. Calculate the information rate.
h) Find the channel capacity of the given BSC: $P(Y/X) = \begin{bmatrix} 0.8 & 0.2 \\ 0.2 & 0.8 \end{bmatrix}$.
i) The power spectral density of a stationary random process is given by:
\[ S_X(f) = \begin{cases} A, & -k \leq f \leq k \\ 0, & \text{otherwise} \end{cases} \]
Determine the autocorrelation function.
j) What is the difference between wide sense stationary (WSS) process and ergodic process?

PART-A

Q.2  a) Explain the working of PCM communication system. Discuss the tradeoff between BW and SNR in PCM systems.

Q.3  a) Draw the block diagram of DPSK modulator and explain how synchronization problem is avoided for its detection.

Q.4  a) Find the expression for probability of error for baseband signal receiver.

Q.5  a) Find mean and variance of random variable $X$ which is uniformly distributed between $a$ and $b$ ($a < b$).

b) The joint pdf of two random variables $X$ and $Y$ is given by:
\[ f(x, y) = \begin{cases} kxy, & 0 < x < 2 \land 1 < y < 3 \\ 0, & \text{otherwise} \end{cases} \]

Find:

i) \( k \)

ii) Marginal density function \( f_X(x) \) and \( f_Y(y) \)

iii) Are \( X \) and \( Y \) independent?

c) A random variable \( V = b + X \), where \( X \) is a Gaussian distributed random variable with mean \( 0 \) and variance \( \sigma^2 \), and \( b \) is a constant. Show that \( V \) is a Gaussian distributed random variable with mean \( b \) and variance \( \sigma^2 \).

Q.6  
a) Explain the term power spectral density. Show that the power spectrum of a (real) random process is real, i.e. \( S_{xx}(-f) = S_{xx}(f) \).

b) Let \( X(t) \) and \( Y(t) \) are defined by

\[ X(t) = A \cos(\omega t + \theta) \]
\[ Y(t) = A \sin(\omega t + \theta) \]

Where \( \omega \) and \( A \) are constants and \( \theta \) is a random variable uniformly distributed over \([0, 2\pi]\). Find the cross correlation of \( X(t) \) and \( Y(t) \).

c) Write short note on – Random process transmission through linear filters.

Q.7  
a) Consider a binary memoryless source \( X \) with two symbols \( x_1 \) and \( x_2 \). Show that \( H(X) \) is maximum when \( x_1 \) and \( x_2 \) are equiprobable.

b) For a signal of bandwidth 3kHz and SNR of 31:

i) Calculate the channel capacity.

ii) If the bandwidth is increased of 4kHz, the signal is transmitted over the same channel, calculate the required SNR and percentage change in the signal power.

iii) Compare coding efficiency of Shannon-Fano coding and Huffman coding when five source messages have probabilities \( m_1 = 0.45, m_2 = 0.15, m_3 = 0.15, m_4 = 0.15, \) and \( m_5 = 0.10 \).
Q.1 a) Define modulation. Give its various types. 
b) Differentiate between analog and digital signal. 
c) Define Carson rule. 
d) What is aliasing? How can it be avoided? 
e) Explain ASK modulation. 
f) Define modulation index. 
g) Define the term: multiplexing. 
h) What do you mean by PN sequence? 
i) Explain the term: pre-emphasis. 
j) Define the term: noise temperature.

PART-A

Q.2 a) Discuss in detail various types of communication systems with its applications. 10 
b) Explain the need for modulation in communication system. 10

Q.3 a) Define amplitude modulation. Calculate the total power transmitted in amplitude modulation system. 10 
b) Explain the concept of low level and high level modulation. 10

Q.4 a) Compare AM, FM and PM system. 10 
b) What is frequency modulation? Explain any method of generation of FM in brief. 10

PART-B

Q.5 a) What is pulse modulation? Explain its various types in detail. 10 
b) State and prove sampling theorem. 10

Q.6 a) Discuss various types of digital modulation techniques. 10 
b) What is the difference between direct sequence system and frequency hopped spread spectrum system? 5 
c) How differential PSK can be generated? 5

Q.7 a) What is noise? Classify the various types of noise. 10 
b) Derive an expression for noise calculation for cascaded networks. 10
Q.1  a) What are active microwave components? Give examples.
b) Give two points of similarities between transmission lines and waveguide.
c) Define guide wavelength of a waveguide.
d) Give two properties of S matrix.
e) Explain any one application of magic tee.
f) What is strapping in case of a magnetron?
g) Give two applications of PIN diode.
h) Two identical directional couplers are used in a waveguide to sample the incident and reflected powers. The o/p of the two couplers is found to be $2.5 \, mW$ and $0.15 \, mW$. Find the value of VSWR in the waveguide.
i) What are linear beam tubes? Give an example
j) If the peak power of a radar is $800 \, kW$, pulse width is $1.5 \, \mu s$ and pulse repetition period is $1 \, ms$, calculate its average power.

2x10

**PART-A**

Q.2  a) What are the major applications of microwave frequencies?

10

b) List the important advantages of microwave frequencies.

10

Q.3  a) Show that a waveguide acts as a high pass filter.

10

b) The TE_{10} mode is propagated in a rectangular waveguide of dimensions $a = 6 \, cm$ and $b = 4 \, cm$. By means of a travelling detector the distance between a maxima and minima is found to be $4.55 \, cm$. Find the frequency of the wave.

10

Q.4  a) Derive the scattering matrix of a directional coupler

10

b) Explain in detail the working and operation of a circulator.

10

**PART-B**

Q.5  a) What are slow wave structures? Explain how a helical TWT achieves amplification.

12
b) Explain any three limitations of a conventional tube operating at microwave frequencies.

Q.6 Write short notes on (any two):
   a) Tunnel diode.
   b) Gunn diode.
   c) IMPATT diode.

Q.7 a) Describe the various techniques of measuring unknown frequency of a microwave generator.
   b) Explain the block diagram, working and operation of RADAR.
End Semester Examination, Dec. 2015  
B. Tech. – Fifth / Sixth / Seventh / Eighth Semester  
MICROCONTROLLER AND APPLICATIONS (EC-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) Discuss function of PSO and PSI bits in PSW register.  
b) What is the difference between overflow flag and carry flag?  
c) How do RET and RETI instructions differ?  
d) What is difference in the timer lengths in mode 0, mode 1 and mode 2?  
e) What instructions are used to enable and disable all the interrupts of 8051 microcontroller?  
f) What is meant by the term interrupt service routine (ISR)?  
g) What is function of IT bit in serial communication?  
h) For XTAL=12 MHz, find the TH1 value for 1200 baud rate.  
i) What is the function of OE pin in ADC?  
j) What is the function of RS pin in LCD?

2x10

**PART-A**

Q.2  
a) Draw and explain the architecture of 8051 microcontroller.  
b) Explain the following signals of 8051 microcontroller:  
  ALE, TXD, RXD, TO, INTO

10  
10

Q.3  
a) Explain the following instruction with an example:  
  i) AJMP.  
  ii) JB.  
  iii) MOVx.  
  iv) CLR.  
b) Write a program to add five 8 bit numbers stored in RAM locations SSH to S9 H. Store the result in memory location SOH and S1H.

10  
10

Q.4  
Explain various modes of operation of timer of 8051 microcontroller.

20

**PART-B**

Q.5  
a) Explain mode-1 operation of serial port of 8051 microcontroller.  
b) Explain the following registers of 8051 microcontroller:  
  SMOD, SCON  
c) Write a note on serial port baud rates.

6  
8  
6

Q.6  
a) Write a program to generate a square wave of 100 kHz on pin. P1.0 using interrupts.  
b) Explain the function of IE and IP registers.

12  
8

Q.7  
Interface **any two** of the following with 8051 microcontroller:  
a) ADC.  
b) 8255 PPI  
c) DAC.

20
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
MICROCONTROLLER AND APPLICATIONS (EC-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 is the difference between a microcontroller and a microprocessor?  
b) What are the functions of bits PSW.3 and PSW.4?  
c) What are the function of PUSH and POP instruction?  
d) Explain the MUL and DJNZ instructions.  
e) How will you select different modes in a timer operation?  
f) What is interrupt vector table of 8051?  
g) What is SCON register?  
h) What is the process to double the band rate?  
i) Show the instruction to enable every interrupt of 8051.  
j) What is the function of EA pin in an external ROM?

2x10

PART-A

Q.2  
a) Draw and explain the pin diagram of 8051 microcontroller.  
  
 12  
b) Explain the stack in 8051.  
  
  8

Q.3  
a) Explain the different addressing modes of 8051 with an example.  
  
 12  
b) Write a program to toggle the bits of part with delay which depends on the value of number in R0.  
  
  8

Q.4  
a) Explain the operation of mode 1 and mode 2 timer mode.  
  
 10  
b) With the frequency of 11.059 MHz, generate a frequency of 100 KHz on Pin P2.3 by using timer 1 in mode 1.  
  
 10

PART-B

Q.5  
a) Explain TCON register in detail.  
  
 8  
b) Write the programming steps of 8051 to transmit and receive data serially.  
  
 12

Q.6  
a) Explain various interrupts of 8051 microcontroller.  
  
 10
Q. 7  

a) Interface DAC with 8051 microcontroller.  
   10  

b) Interface 8KX8 data ROM with 8051 microcontroller.  
   10  

b) Explain the functions of IP and IE registers.  
  10
End Semester Examination, Dec. 2015  
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 do you mean by multiple access technique? List them all.  
b) Define co-channel reuse ratio and write the expression for the same.  
c) Define path loss exponent in the mobile radio system.  
d) What is the role of Abis and A-interface in GSM system?  
e) Define interleaving.  
f) Define coherence channel bandwidth.  
g) What is a vocoder?  
h) Define doppler shift.  
i) What is fast and slow frequency hopping?  
j) What is small scale fading?  

2x10

PART-A

Q.2  
a) In a digital cellular system, explain how the call is initiated by a landline user to the mobile user with the help of a neat block diagram.  
10  
b) Explain the role of wide area paging system with the help of a block diagram.  
10

Q.3  
a) What is small scale fading and what are the factors affecting small scale fading?  
10  
b) Explain small scale fading based on doppler spread.  
10

Q.4  
a) Explain signal processing in GSM.  
10  
b) Write a brief note on:  
i) EDGE  
ii) GPRS  
5x2

PART-B

Q.5  
a) Assume distance between co-channel cell as ‘D’ and radius of hexagonal cell as ‘R’. Derive an expression for the worst case scenario for the signal to interference ratio (S/I). Assume interference from first tier co-channel cells for the N-cell cellular system.  
10  
b) How to improve the coverage and capacity of the cellular system?  
10
Q.6  
   a) Explain the features of TDMA system. How to calculate the efficiency of the TDMA frame?  
       10  
   b) What is the need of speech coding? List its various characteristics.  
       10  

Q.7  Write short notes on any two:  
   a) DS-SS technique.  
   b) FH-SS technique.  
   c) Equalization in communication system.  
   d) Intelligent cell concept.  
       10x2
End Semester Examination, Dec. 2015  
B. Tech. – Sixth / Seventh 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) Which radar parameter determines its range resolution?  
b) A radar has a duty cycle of 0.2 and peak power of 100W, what will be its average power?  
c) List any two remedial measures to overcome blind speed problem in an MTI radar.  
d) What is the effect on maximum unambiguous range of a radar, when its p.r.f. is reduced.  
e) Write any two limitations of a CW radar.  
f) If an echo signal is received in a radar after 800 μsec, what will be target range?  
g) If the received echo signal has higher frequency than transmitted signal, the target is moving away from radar. (True or False)  
h) Mono pulse tracking radar has better accuracy. (True or False)  
i) Define noise figure.  
j) What is the advantage of using staggered frequency in MTI radar?  
2x10

PART-A

Q.2  
a) Briefly explain the operation of a pulse radar with the help of a block diagram.  
10  
b) How is range of a target and angular position determined in a radar? Which parameter determines maximum unambiguous range?  
10

Q.3  
a) Starting from fundamentals, derive radar range equation. What are its various forms?  
10  
b) Two aircrafts are flying at same radial range of 30 km and at same elevation angle. The aircrafts are separated in azimuth by a distance of 1 km. Determine, what will be maximum permissible HPBW (Half Power Beam Width) of the radar, if these aircraft are to be resolved in azimuth.  
10

Q.4  
a) With the help of a block diagram, describe the operation of a FMCW radar. What are its applications?  
10  
b) What are the limitations of a CW radar? Explain in detail the operation of a multi frequency CW radar.  
10

PART-B
Q.5  
   a) What is a mono-pulse tracking radar? How does it operate? What are its features? Comment on its accuracy.  
      10
   b) What are the salient features of Single Target Tracking Radar and Automatic Detection And Track (ADT)? Make a comparison between the two.  
      10

Q.6  
   a) Two MTI radar systems are operating at the same p.r.f, but at 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 uses power amplifier as transmitter.  
      10

Q.7  
   a) What is a radar duplexer and what are its types? Explain the operation of a balanced duplexer?  
      10
   b) Write short notes on any two:  
      i) SONAR  
      ii) Receiver Protectors  
      iii) Synthetic Aperture Radar  
      5x2
Q.1  
a) Reduce the following expression using theorems:
\[ F(A, B, C) = A + B + AB + C \]
b) Implement XOR gate using NAND gates only.
c) What do you mean by factoring?
d) Draw OR gate using NMOS logic.
e) Draw 4:1 MUX using three 2:1 MUX.
f) What do you mean by wired logic?
g) Draw parallel-in-serial-out shift register.
h) Draw excitation table of J–K and D Flip-flops.
i) What is one hot encoding?
j) What is state assignment problem?

PART-A

Q.2  
a) Implement \[ f = \sum \bar{m} (2, 3, 4, 6, 7) \] using NAND gates only.  
10
b) What is digital hardware? Explain the development process of digital hardware.  
10

Q.3  
a) Realize following function using CMOS logic:  
\[ f = \bar{x}_1 + \bar{x}_2 \bar{x}_3 \]  
8
b) Implement following using PLA:
\[ f_1 = x_1 x_2 + x_3 \bar{x}_3 + \bar{x}_1 \bar{x}_2 x_3 \]  
7
\[ f_2 = x_1 x_2 + \bar{x}_1 \bar{x}_2 x_3 + x_1 x_3 \]  
5
c) Implement NAND gate using CMOS logic.

Q.4  
a) Design a 4-bit binary to gray code converter.  
10
b) Use a MUX having three data select input to implement the logic for the function:
\[ F = \sum \bar{m} (0, 1, 2, 3, 4, 10, 11, 14, 15) \]  
10

PART-B

Q.5  
7
b) Design and implement MOD-6 asynchronous counter using T flip-flops.  
7
c) Draw and explain edge triggered J–K flip-flop.  
6

Q.6  
a) Design an FSM that has an input \( \omega \) and an output \( z \). The machine is a sequence detector that produces \( z = 1 \), when the previous two values of \( \omega \) were 00 or 11. 
Otherwise \( z = 0 \)  
10
b) Design a counter using sequential circuit approach. The counting sequence is:
0, 1, 2, 3, 4, 5, 6, 7, 0, 1......  
10

Q.7  
Write short notes on the following:
a) State reduction. 7
b) Hazards and their significance. 6
c) Cycle and races. 7
End Semester Examination, Dec. 2015
B. Tech. – Sixth / Seventh Semester
OPTICAL COMMUNICATION (EC-723A)

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 any four advantages of optical communication.
    b) Explain spectral line width of LEDs.
    c) What is the principle of operation of optical fibers?
    d) A multimode S.I fiber with core diameter 60 \( \mu \)m relative refractive index difference 1% has a normalized frequency of 52.1. Calculate the approximate number of modes.
    e) Define scattering. What are its types?
    f) What is recombination process?
    g) What is dark current in a photo detector?
    h) How is refractive index related to velocity of light?
    i) Define population inversion with the help of a characteristic diagram.
    j) Determine signal attenuation in dB through the fiber with mean output optical power is 3 \( \mu \)W and mean input optical power is 90 \( \mu \)W.

2x10

PART-A

Q.2 a) Differentiate between step index and graded index fibers.

b) Draw the block diagram of optical fiber communication system and explain each block in detail.

15

Q.3 a) Derive an expression showing the relationship between numerical aperture and acceptance angle of an optical fiber.

b) What do you understand by the term dispersion? Calculate the pulse spread for a fiber undergoing intermodal dispersion having a length of ‘L’ meters with velocity of light in glass given by ‘\( v \)’ meters/sec. Assume ‘\( \nu_o \)’ & ‘\( \nu_c \)’ as zero order and critical order modes respectively.

10

Q.4 a) Differentiate between Surface Emitter LED’s and Edge Emitter LED’s on the basis of their construction, spectral width, efficiency, advantages etc.

b) Write short notes on:
   i) Lens coupling to fiber.
   ii) Super luminiscent LEDs.

5x2
PART-B

Q.5  a) Differentiate between LED and LASERs.  
      10  
    b) Explain the principle of laser action in detail with suitable diagrams.  
      10

Q.6  a) Discuss the principle of action of $P-N$ photodiodes.  
      10  
    b) Explain various factors on which noise in photodiode depends in detail.  
      10

Q.7  a) Discuss various modulation methods used in optical communications.  
      10  
    b) What are fiber couplers? Explain its types in detail.  
      10
End Semester Examination, Dec. 2015  
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) Write the difference between bipolar and MOS Ic’s.
b) Define Mealy’s law.
c) What is thermal oxidation?
d) Why polysilicon gate is preferred over metal gate?
e) Define how inversion layer is formed in MOS capacitor?
f) Define body effect and drain punch through.
g) Define transmission gate.
h) Define various methods of latch up.
i) Define stick diagram. Also draw it for NOT gate.
j) Why EPROM is better than PROM?

Q.2 a) Draw VLSI design flow and explain it.

Q.3 a) Explain Chzochralski technique principle and process for formation of single crystal silicon.

Q.4 a) Derive current equation for all the three regions of MOSFET.
b) What is channel length modulation? Explain its impact on different region in MOSFET.
c) What is scaling? Describe constant field effect on constant voltage scaling concept.

Q.5 a) Discuss and explain various forms of pull-ups for the inverter.
b) Explain basic implementation of BiCMOS inverter.
Q.6  a) Implement a half-adder circuit using NMOS technology. Also explain its truth table.  

   10  
   b) Discuss the implementation of MOD-3 counter.  

   10  

Q.7  a) Implement a 6 transistor static RAM cell.  

   10  
   b) Implement a BCD to excess-3 code converter using PAL.  

   10
End Semester Examination, Dec. 2015  
B. Tech. – Seventh / Eighth Semester  
ADVANCED TELEVISION ENGINEERING (EC-801A)

Time: 3 hrs  
100  
Max Marks:  

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 Flicker.  
b) What is vertical resolution?  
c) Calculate % interlace error if 2nd field starts with a delay of 16 µS.  
d) What is DC component of a video signal?  
e) Define pre equalizing pulses.  
f) Calculate the transmitted power for a system working with a modulation index of 50% having a carrier power of 2 watts.  
g) What do you understand by EHT?  
h) What is leaky capacitor concept?  
i) Define compatibility.  
j) What is NTSC television standard?

2x10

PART-A

Q.2  
a) Draw the block diagram of TV transmitter system and explain each block in brief.

10

b) Explain horizontal sync details. Also mention the respective location of picture signal and sync details.

10

Q.3  
a) Show that a total channel bandwidth of 7 MHz is necessary for successful transmission of both picture and sound signals in the 625 line TV system.

10

b) What is vestigial side band transmission and why is it used for transmission of TV picture signals?

10

Q.4  
a) Explain the construction and working of a monochrome picture tube.

10

b) What is the working principle of image orthicon camera tube? Explain its working in detail.

10

PART-B

Q.5  
a) Explain the following terms:  
   i) Luminance.  
   ii) Hue.  
   iii) Saturation.  
   iv) Additive mixing.
v) Grassman’s law.
   10
b) What is astigmatism? Explain the working of Precision In Line colour picture tube in detail.
   10

Q.6 a) Describe the factors that influence the choice of intermediate frequencies.
   10
b) What are the functions of AFC and AGC circuits?
   10

Q.7 Write short notes on (any four):
   a) LCD TV
   b) Cable TV
   c) HD TV
   d) IP TV
   e) CC TV
   5x4
End Semester Examination, Dec. 2015
B. Tech. –Sixth / Seventh/Eighth 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 Answer the following:
   a) Define DTE and DCE.
   b) Compare serial Vs parallel transmission.
   c) Draw the NRZ-L and NRZ-I for the following data signals:
      i) 110110
      ii) 101101
   d) Define bit rate.
   e) Explain various methods of error correction.
   f) Write the applications of FDM.
   g) Write the applications of codec.
   h) Draw the frame format of control field for a U frame.
   i) Define various types of interleaving.
   j) Explain the following terms:
      i) DSL
      ii) HDTV

2x10

PART-A

Q.2 a) Draw and explain the block diagram including DTE and DCE.  
   b) What are transmission impairments? Explain its various types in detail.

10

Q.3 a) Explain various methods of error correction in detail.
   b) Explain parallel interface in detail.

10

Q.4 Explain various methods of bipolar encoding.

20

PART-B

Q.5 Explain various types of character oriented protocols in detail.

20

Q.6 a) Draw and explain the block diagram of PCM based TDM system.
   b) Explain the formation of super group in FDM hierarchy.

10

10

Q.7 Write short notes on:
   a) SONET
   b) VOD
   c) VOIP
   d) ADSL

5x4
End Semester Examination, Dec. 2015
B. Tech. –Sixth / Seventh Semester
DATA COMMUNICATION (EC-802/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) Discuss various types of series transmission.
b) Define baud rate.
c) Define line configuration.
d) Give examples of types of serial interface.
e) Expand the following terms:
   i) VOD.
   ii) ADSL.
f) Discuss various types of TDM.
g) Explain the need of codec chips.
h) Draw the frame format of control field for an I frame.
i) Define DTE and DCE.
j) Give classification of various types of T-Carriers. 2x10

PART-A

Q.2 a) Define transmission impairments. Explain its various types. 5
b) Draw the block diagram of data communication system using DTE and DCE. 5
c) Discuss various types of data transmission. 10

Q.3 a) Explain various types of bipolar encoding with examples. 10
b) Write note on:
   i) NRZ-L.
   ii) RZ.
   iii) Manchester encoding. 10

Q.4 a) Discuss various methods of error correction in detail. 10
b) Write note on:
   i) Parallel interface.
   ii) Backward error correction. 10

PART-B

Q.5 a) Explain in detail various types of bit oriented protocol. 10
b) Discuss sliding window protocol in detail. 10

Q.6 a) What is multiplexing? Discuss various types of TDM multiplexing. 10
b) Draw and explain AT and T FDM hierarchy? 10

Q.7 a) What is ISDN? Explain its various types and applications. 10
b) Write note on:
   i) Common channel signaling (SST).
   ii) SDH.
   iii) IPTV.
   iv) HDTV 10
End Semester Examination, Dec. 2015  
B. Tech. – Seventh / Eighth Semester  
SATELLITE COMMUNICATION (EC-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  
a) What is the difference between an active and passive satellite system?  
b) Mention the reasons for keeping uplink frequency higher than downlink frequency.  
c) Calculate the radius of a geostationary satellite.  
d) Define the following terms w.r.t. a satellite  
   i) Eccentricity  
   ii) Right ascension  
e) What is an EIRP? A satellite downlink at 12 GHz operates with a transmit power of 6 W and an antenna gain of 48.2 dB. Calculate EIRP in dBW.  
f) The range between a ground station and satellite is 42,000 km. Calculate the free space loss at a frequency of 6 GHz.  
g) Describe SCPC system.  
h) Explain the term multiplexing and distinguish between TDM and FDM.  
i) What is meant by frame efficiency in relation to TDMA operation?  
j) Describe the advantages of laser satellite communication.  

2x10

PART-A

Q.2  
a) What do you mean by geosynchronous/geostationary satellite? What are its advantages?  
b) How is digital satellite communication different from analog satellite communication? List its merits.  
c) What are the different frequencies/bands used for satellite communications? Give the reasons for their selection and different services for which they are used.  

7

Q.3  
a) Define the term-satellite orbit. What are different types of orbit? Discuss their merits and demerits.  
b) Discuss the steps involved in launching a satellite in geostationary orbits.  
c) Explain the following:  
   i) Look angle.  
   ii) Semi major axis  
   iii) Subsatellite point.  

6

d) A satellite is orbiting at 28,300 km apogee with an eccentricity of 0.3. What is the perigee distance and average orbiting period.  

4

Q.4  
a) What is system noise temperature? How does it effect the C/N and G/T ratio?  
b) A satellite at a distance of 40,000 km from a point on the earth’s 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 10 m². If the operating frequency of satellite is 11 GHz and the receiving antenna has a gain of 52.3 dB, find the received power.  

10

PART-B

Q.5  
a) Derive an expression for a digital satellite link and explain as to how it is dependent on the system bandwidth.  

10
b) For a 60 channel FDM system with a maximum baseband frequency of \( f_m = 252 \text{ kHz} \) and a specified top channel S/N=52 dB, find out the bandwidth. The FDM multichannel rms frequency deviation is 546 kHz. Also find out FDM multichannel loading factor, test tone rms frequency deviation and C/N ratio.  

Q.6  
a) Compare TDMA and FDMA.  
b) Explain DAMA in detail.  
c) What is a burst? What are the different types of bursts used in TDMA frame? What is the need for preamble bits.  

Q.7 Write short notes on:  
a) SARSAT  
b) Earth exploration satellite.  
c) VSAT
Q.1 a) Define satellite. What are the advantages of geostationary satellite?
b) Give the reasons for keeping uplink frequency different from downlink frequency in satellite communication.
c) State Kepler’s third law for planetary motion. A satellite is orbiting in a geosynchronous orbit. Find the velocity and time of orbit.
d) Define the term-effective isotropic radiated power (EIRP). A satellite downlink at 12 GHz operates with a transmit power of 6W and an antenna gain of 48.2 dB. Calculate the EIRP in dBW.
e) Define the following terms w.r.t satellite:
   i) Ascending and descending nodes.
   ii) Right ascension.
f) What is loading factor and how does it effect the FM/FDM signal transmission?
g) What is the difference between traffic burst and reference burst in TDMA?
h) What type of modulation techniques may be used for optical satellite communication?
i) The range between a ground station and a satellite is 42,000 km. Calculate the free space loss at a frequency of 6 GHz.
j) What is meant by station keeping of satellite?

PART-A

Q.2 a) Discuss in detail the elements of satellite communication system. What are the advantages and disadvantages of satellite communication?

Q.3 a) A satellite is operating in the equatorial plane with a period from perigee to a perigee of 12 h. Given that the eccentricity is 0.002. Calculate the semimajor axis. The earth’s equatorial radius is 6378.1414 km.

b) Explain the orbital perturbations in detail.

c) Define look angle and explain look angle determination in detail.
Q.4  a) Derive the satellite link design equation. Find out the expressions for C/N and G/T ratios.
   10
   b) Briefly explain the sources of noise in satellite communication. What is the importance of noise temperature in link design?
   6
   c) For a satellite earth station receiver working at 4 GHz, the various gains and noise temperatures are
      \( T_{in} = 50 k \), \( T_{RF} = 100 k \), \( T_{M} = 500 k \), \( T_{IF} = 1000 k \), \( G_{RF} = 30 dB \),
      \( G_{m} = 0 dB \), \( G_{IF} = 50 dB \). Calculate the system noise temperature.
   4

PART-B

Q.5  a) Define symbol rate, \( R_s \) and derive its expression for digital satellite link and explain as to how it is dependent on system bandwidth.
   8
   b) What is meant by threshold in an FM detector? Explain FM improvement and derive the expression for S/N ratio for SCPC signals.
   7
   c) Briefly discuss about analog voice transmission.
   5

Q.6  a) What do you mean by multiple access? Compare the salient features of FDMA, TDMA and CDMA.
   10
   b) What is meant by back off and why is it necessary in multiple access systems?
   5
   c) Briefly describe the ways in which demand assignment may be carried out in TDMA network.
   5

Q.7  a) Explain the operation of VSAT system in detail.
   6
   b) Describe the GPS functioning with a block diagram.
   7
   c) Write a short note on: INTELSAT.
   7
End Semester Examination, Dec. 2015  
B. Tech. – Seventh Semester  
EMBEDDED SYSTEM DESIGN (EC-822A)

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 arithmetic instructions used in PIC 16FXX.  
b) Draw the block diagram of Princeton architecture.  
c) Explain the importance of clock in microcontrollers.  
d) What do you understand by interrupt service routines?  
e) What is the difference between RET and RETI instructions?  
f) Name four different applications where interrupts are used.  
g) What is the need of addressing modes? Explain.  
h) How is PWM used to control the speed of dc motor?  
i) Explain the need of interfacing.  
j) What do you mean by prescaling and postscaling?  

PART-A

Q.2  
a) Differentiate microprocessor and microcontroller on the basis of:  
i) Processing speed  
ii) Software size  
iii) RAM  
iv) ROM  

b) Explain embedded and external memory microcontrollers in detail with the help of examples.  
c) Explain RISC and CISC processors with the help of examples.

Q.3  
a) Explain development tools used to program 8051 microcontroller.  
b) What is the need of random access memory and read only memory in any processor?  
c) Write a program to execute the series:  
2+4+6+8+10+12+14+...+20

Q.4  
a) What is the role of clock in the operation of timer? How the clock speed (crystal frequency) used to get the desired delay?  
b) Write a program to generate 10 KHz square wave using mode 2 on pin P1.3 using  
i) timers  
ii) interrupts  
Assume XTAL=16 MHz.
PART-B

Q.5  a) What does PIC stand for? How it is different from 8051 microcontroller? Explain status and option register used in PIC 16F877A.
  8
  b) Explain any TEN instructions with an example used in PIC 16F877A.
  5
  c) Explain pipelining and addressing modes used in PIC microcontroller.
  7

Q.6  a) Explain timer 2 scalar initialization in detail.
  5
  b) Explain I/P and O/P port expansion.
  5
  c) Explain timer 1 operation in detail with the help of its detailed block diagram.
  10

Q.7  a) How can you interface temperature sensor with 8051? Explain with the help of detailed block diagram.
  10
  b) Show the LCD interfacing with 8051 microcontroller. Also write a program to display "MRIU".
  10
End Semester Examination, Dec. 2015
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 mobility and portability.
b) What is co-channel re-use ratio?
c) Define multiple access techniques. List any three.
d) What is WATM?
e) List various classes of transaction service offered by transaction layer and list characteristics of any one of them.
f) List various techniques of agent discovery.
g) What is slow start mechanism in TCP?
h) What is the role of push access protocol (PAP) in the push architecture?
i) Define reintegration in CODA file system.
j) Define adhoc network. 2x10

PART-A

Q.2 a) How to improve the coverage and capacity in the cellular system? 10
b) What are the various challenges/Issues of mobile computing? 8
c) What is the concept of spread spectrum technique? 2

Q.3 a) Explain various access scenario’s in WATM environment with the help of neat diagram. 10
b) Explain IP packet delivery to and from the mobile node with the help of neat diagram. 10

Q.4 a) Explain the working of indirect TCP under classical TCP improvements stating its advantages and disadvantages. 10
b) Explain the architecture of WAP1.X defining the role of each layer. 10

PART-B

Q.5 a) Define distributed file system. Explain briefly three states of client in CODA. 8
b) What are major transport mechanism used by digital audio broadcasting system. Explain the DAB frame structure. 10
c) Define broadcast disk. 2

Q.6 a) Explain routing in mobile adhoc network based on dynamic source routing protocol. 10
b) Give an overview of adhoc routing protocols. List them all and explain any one. 10

Q.7 Write short notes on (any two):
a) Push architecture in WAP.
b) Kangaroo Joey transaction.
c) Tunneling and encapsulation.
d) Architecture of GSM system.
End Semester Examination, Dec. 2015
B. Tech. – Seventh / Eighth 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) Write names of various segment registers. Explain any one of them.
b) List out the main peripheral units integrated in 80186.
c) List out additional signals of 80286 which are not present in 8086.
d) What is the function of lock signal of 80186?
e) What is address width of 80386?
f) How much physical memory can a 80386 microprocessor address in real mode and in protected mode?
g) Give additional features of 80486 which are not there in 80386.
h) What are various special function registers in 80196?
i) What is the function of PWM unit in an 80196 micro controller?
j) Differentiate mask able and non-mask able interrupts.

PART A

Q.2  a) Write a note on memory paging.
b) Draw and explain programming model of 32-bit processors.

Q.3  a) Explain the function of DEN and NMI signal of 80186.
b) Explain the architecture of 80186 micro processor with the help of suitable diagram.
c) How the master and slave modes of different versions of 80186 are selected?

Q.4  a) Discuss the protected mode model of 80386.
b) Briefly explain the protocol mode addressing.

PART B

Q.5  a) Explain the functions of PWT, BS16 and FERR signals of 80486.
b) Explain the programming model of 80486 microprocessor with the help of suitable diagram.

Q.6  a) Describe reset operation used in 80196.
b) Explain I/O ports in single chip mode and the port multiplexing signals in expanded mode.

Q.7  a) Explain and demonstrate how pulse width modulation (PWM) O/P is obtained using programmable timers.
b) Differentiate pre-auto and post auto indexing.
End Semester Examination, Dec. 2015  
B. Tech. – Eighth 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 function of TRAP and IOPL Flags?  
b) What is relocatable program? 
c) Difference between 80186 and 80286 microprocessor.  
d) Name all the interrupts of 80186 micro processor and explain the following:  
   i) Divide error.  
   ii) Bound Index.  
e) Name and explain the control signals of 80386 microprocessors. 
f) A segment starting address is 2003ACB2 H and limit in 2F003H. Find out the ending address if:  
   i) G=0.  
   ii) G=1. 
g) What are the available versions of 80486 microprocessor? Differentiate them.  
h) Why do we use parity checker and generator?  
i) Why Timer1 is called free running counter?  
j) Give the example of indirect without auto part increment and with part increment addressing mode.  

Q.2  
a) What is the purpose of segmentation? What are segment registers present in 32 bit processor?  
b) Describe the contents of descriptor for designing and readable code segment with the following specification:  
   Starting address=50073000 H.  
   Ending address=805A8FFF H.  
   Privilege level = 10 

Q.3  
a) What are different peripherals connect inside the 80186 microprocessor? Explain the function of each peripheral. 
b) Explain the function of the following pins:  
   i) \( \textit{RES} \)  
   ii) \( \textit{RESET} \)  
   iii) \( \textit{LOCK} \)  
   iv) \( \textit{SRDY} \)  
   v) \( \textit{ARDY} \)  
   vi) \( \textit{LCS} \)  
   vii) \( \textit{UCS} \)  
   viii) \( \textit{DEN} \)
Q.4  a) Explain the Input / Output system of 80386 microprocessor.  
   b) How the memory system of 80486 is different from 80386?  
   c) What do you mean by logical address?

PART-B

Q.5  a) Write a short note on Pentium processor.  
    b) How the memory system of 80486 is different from 80386?  
    c) What do you mean by logical address?

Q.6  a) What are the major building blocks of 80196? Explain in detail.  
    b) Why the ALU of 80196 with 8051?

Q.7  a) Describe the function of HSO and HIS unit in 80196.  
    b) What do you mean by addressing modes? Explain all the addressing modes of 80196 with an example.
End Semester Examination, Dec. 2015
B. Tech. (Integrated) - Third Semester
DIGITAL ELECTRONICS AND CIRCUITS-I (EC-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 are the advantages of digital signal over analog signal?
b) Why NAND and NOR gates are called as universal logic gates?
c) What is base or radix of a number system? Explain with an example.
d) What are error detection and correction codes? Explain with an example.
e) State and prove Demorgan’s theorem.
f) What is gray code? What is its advantage for solving k-Map?
g) What is the difference between half adder and full adder?
h) What is the difference between synchronous and asynchronous counter?
i) What is shift register counter? What are its applications?
j) What is the difference between a latch and a flip-flop? 2x10

PART-A

Q.2 a) Draw and explain all logic gates with their symbols, boolean expressions, logic statements and truth table. 10
b) Draw EXOR and EXNOR gates using only NAND gates. 10

c) Convert:
   i) (ABCDEF, FF)_{16}= (?)_{2}
   ii) (777.67)_{8}=(?)_{2}
   iii) (1234)_{10} = (?)_{16}  9
b) Explain Binary, BCD, Gray and Excess-3 codes with examples. 6
   c) Explain parity method of error detection with an example. 5

Q.4 a) Prove that:
   i) \((X + Y)(X + Z) = X + YZ\)
   ii) \(X + \overline{X}Y = X + Y\)
   iii) \(X + XY = X\)
   iv) \((X + Y)(X + Z)(Y + Z) = XY + YZ + XZ\). 12
b) Minimize the following function using k-Map:
   \(F(A, B, C, D) = \sum m(0, 2, 8, 10, 5, 7, 13, 15)\) and realize the function using NAND gates. 8

PART-B

Q.5 a) Draw and explain with a circuit diagram and truth table, 8:1 multiplexer. 8
b) Draw and explain with a circuit diagram and truth table, decimal to BCD encoder. 7
   c) Draw and explain with a circuit diagram and truth table, 2-bit magnitude comparator. 5

Q.6 a) Draw and explain with truth table:
   i) S—R flip-flop
   ii) J—K flip-flop
iii) D flip-flop

b) Draw and explain with truth table operation of master slave flip-flop.

Q. 7  

a) Draw and explain shift register in following modes:
   i) SISO     ii) SIPO     iii) PISO     iv) PIPO

b) Draw and explain with working and truth table, ring counter.
End Semester Examination, Dec. 2015  
B.Tech. (Integrated) – Fourth Semester  
ELECTRONIC DEVICES AND CIRCUITS-II (EC-I-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) What is 3dB? 
b) Define coupling. Also write its types.  
c) What are the basis of classification of power amplifier? 
d) What is cross over distortion? 
e) What is the need of feedback amplifier?  
f) Draw circuit diagram for emitter follower amplifier.  
g) State Barkhausen criterion for oscillation.  
h) Define CMRR and slew rate.  
i) Define clipping and clamping circuit. 
j) Write features of IC regulator.  
2x10

PART-A  
Q.2  
a) Draw circuit diagram of single stage RC coupled amplifier. Also explain its working.  
6  
b) Derive expression for collector efficiency of class B power amplifier with the help of circuit working.  
8  
c) Define push-pull configuration of power amplifier.  
6

Q.3  
a) Derive expression for closed loop gain of negative feedback amplifier with the help of block diagram.  
10  
b) Explain advantages of negative feedback.  
10

Q.4  
a) Explain hartely oscillator with the help of circuit diagram. Also derive expression for resonance frequency.  
15  
b) Explain working of phase-shift oscillator with the help of circuit diagram.  
5

PART-B  
Q.5  
a) What is the requirement of wave shaping circuit? Explain RC and RL circuit in brief.  
15  
b) Explain clamping circuit with the help of circuit diagram.  
5
Q.6  a) Draw the block diagram of 555 timer and explain its application in astable mode.

   10

   b) Explain operational amplifier as a integrator circuit. Derive expression for it.

   10

Q.7  a) Design a 12 volt fixed power supply.

   10

   b) Explain SMPS with circuit diagram.

   10
End Semester Examination, Dec. 2015
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) Why gray code is used in K-map?
   b) Differentiate between fan in and fan out of a logic gate.
   c) Which logic family consumers the least power?
   d) What is resolution of ADC?
   e) Which is the fastest A/D converter?
   f) Distinguish between combinational circuit and sequential circuit.
   g) How does a PLA differ from PAL?
   h) What do you mean by minterm of a Boolean expression?
   i) Why Quine McCluskey method is preferred over K-map method?
   j) Define FPGA.

Q.2 a) Explain TTL logic family in open collector arrangement with a neat diagram. 15
   b) Why totem pole outputs cannot be wired ANDed? 5

Q.3 a) Describe the successive approximation A/D conversion principle. 5
   b) Describe the operation of dual slope A/D converter with necessary diagram. 15

Q.4 a) What is the difference between PLA, PAL, PROM, EPROM and EEPROM? 10
   b) Design binary to gray code converter using PLA. 10

Q.5 a) Minimize the following Boolean expression using K-map and realize it using basic gates: \[ Y = \sum m(1,3,5,9,11,13) \]. 10
   b) Simplify the following Boolean expression using Quine McCluskey method: \[ Y(A,B,C,D) = \sum m(0,1,3,7,8,9,11,15) \]. 10

Q.6 a) Implement 3-bits asynchronous counter using J-S flip-flop. 10
   b) Differentiate between asynchronous and synchronous counters. 10

Q.7 a) Implement binary addition and subtraction using ALU. 10
   b) Write a note on arithmetic logic unit w.r.t. IC 74181 and its applications. 10
Q.1  a) Differentiate between low level and high level modulation.
    b) Define intermediate frequency.
    c) Give classification of transmitters on the basis of power.
    d) Define selectivity and sensitivity.
    e) What is fidelity and S/N ratio of AM radio receivers?
    f) What is polarization of EM waves?
    g) Define gain and directivity of an antenna.
    h) What is maximum usable frequency and give relation with skip distance?
    i) Give advantages of DCMA.
    j) Add a new question in Q.1

   2x10

PART-A

Q.2  a) What is modulation? Explain the need of modulation in detail.
    10
    b) Draw and explain the block diagram of AM transmitter.
    10

Q.3  a) With block diagram explain the working of super heterodyne receiver.
    10
    b) What is simple and delayed AGC?
    10

Q.4  a) What is the need for limiting and de-emphasis in FM receiver?
    10
    b) What is image rejection ratio and explain their measurement procedure.
    10

PART-B

Q.5  a) Draw and explain the block diagram of FM receiver.
    10
    b) Write the feature of communication receiver.
    10

Q.6  a) Give the brief description of broadside and end five array and their radiation pattern.
    10
    b) Briefly describe disc antenna.
    5
c) With diagram explain different modes of wave propagation.  

5

Q.7  

a) Explain the concept of direct sequence spread spectrum.  

10

b) What is CDMA and explain the generation of spreading sequences?  

10
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Fifth Semester
CONSUMER ELECTRONICS (EC-I-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) Define the term loudspeaker and its working principle.
     b) What is stereo system?
     c) Explain hue and saturation.
     d) What are blanking pulses?
     e) What is Hi-Fi system?
     f) What do VCD and DVD stand for?
     g) Define compatibility of TV systems.
     h) Describe the working of horn loaded woofer.
     i) Define the term scanning.
     j) Differentiate between PAL and NTSC TV standards.

   2x10

PART-A

Q.2  a) What is the working principle of microphones? Explain any two types of
     microphones in detail.
     10
     b) Write short notes on:
        i) CD system
        4
        ii) Stereo amplifiers
        3
        iii) Horn loaded woofer.
        3

Q.3  a) What do you understand by the term scanning? What are its types? Explain
     progressive scanning in detail.
     10
     b) Draw the block diagram of TV receiver. Describe the function of each block and
     draw the waveforms at input and output of each block.
     10

Q.4  Describe the working principle of PIL colour picture tubes. Explain its construction and
     working in detail. Mention its advantages and disadvantages.

   20

PART-B
Q.5  
   a) Draw the block diagram of cable TV systems. Also explain its working in detail.  
      10  
   b) Explain the DTH standards for Television systems.  
      10  

Q.6  
   With the help of neat diagram explain the construction and working of VCR and VCD systems.  
      20  

Q.7  
   a) Draw the block diagram of VCR system. Explain each block in detail.  
      10  
   b) Write a short note on DVD systems.  
      10
End Semester Examination, Dec. 2015
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) Define biomedical instrumentation.
b) Explain body temperature.
c) Name the various organs involve in respiratory system.
d) Define bioelectric signals.
e) Explain transducer and its type.
f) Define prosthetic device. Given an example.
g) Draw ECG waveform.
h) Explain term “Cardiac Arrest”.
i) Name various electrodes used for ECG.
j) Give brief idea about human heart.

Q.2  What is EEG? Draw a neat diagram of EEG explaining about all blocks. Give various applications and electrodes used for EEG.

Q.3  a) Define the procedure of muscle action in human body.
b) Explain respiratory system in detail.

Q.4  a) Name various medical devices. Explain any two.
b) Explain PACEMAKER in detail.

Q.5  a) Write about LVDT?
b) Define respiratory sensor in detail.

Q.6  a) Explain the use of microprocessor in medical electronics.
b) Explain pulse rate measurement system.

Q.7  a) Write the various safety considerations of medical devices.
b) Explain terms:
   i) Gross current shock.
   ii) Skin contact impedance.
End Semester Examination, Dec. 2015
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) What is the difference between analog and digital communication system?
   b) Name transmission impairments.
   c) What is the need of data encoding?
   d) Explain unipolar, polar and bipolar data encoding.
   e) Define RS-232 with an example.
   f) Explain data link protocols.
   g) What do you understand by a mobile telephone system?
   h) Define the term handover in mobile communication.
   i) Explain the need of FAX.
   j) Explain quantization in detail.

2x10

PART-A

Q.2 a) Explain in detail block diagram of digital and data communication system.
   10
   b) Explain in detail data transmission. Also explain various transmission media.
   10

Q.3 a) Explain block diagram of TDM-PCM communication system in detail. Also differentiate between PCM and DPCM system.
   10
   b) Explain differential encoding schemes. Also explain bipolar AMI, B8ZS and HDB3 codes.
   10

Q.4 a) What is the need of UART and USART in communication? Also explain the need and function of MODEM.
   10
   b) Explain the following in detail:
      i) MODEM modulation methods.
      ii) MODEM interconnection.
      5x2

PART-B

Q.5 a) What do you mean by protocols and their functions? Also explain basic concept of integrated services in brief.
   10
   b) Explain following in detail:
      i) ADSL
Q.6  a) What do you understand by cell in mobile communication and explain the concept of frequency reuse?  

b) Explain the following:
   i) GSM
   ii) CDMA
   iii) WLL

Q.7  a) Explain basic idea of FAX system and its application in brief.

b) Explain any two:
   i) Generations of mobile communication.
   ii) Video on demand.
   iii) Features of modern FAX machines.
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Sixth Semester
MICROCONTROLLER AND PLCs (EC-I-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) Show the status of CY, AC and P flags after the addition of 9 CH and 64 H in the following instructions:
    MOV A, # 9 CH
    ADD A, # 64 H
    b) What is the difference between RET and RETI instructions?
    c) List any two applications of PLCs.
    d) Write any three features of 8051.
    e) What is the advantage in using EQU directive to define a constant value?
    f) Write instructions to use the registers of bank 3 and load the same value 05H in the register RO to R3.
    g) What does CPU of PLC consists of?
    h) What is the programmable language used in PLC?
    i) On power-up, what is the location of first stack?
    j) Crystal frequency of 8051 based systems is 16 MHz. Find the period of machine cycle.

Q.2  a) Explain the block diagram of 8051 microcontroller.
    b) Write PUSH instructions to PUSH the contents of registers on stack after the execution of following set of instructions.
       MOV SP, # 4FH
       SET B PSW.3
       MOV RO, # 25H
       MOV R1, # 0CH
       MOV R2, # 05 H
       MOV A, # OCEH
       5
    c) Write a program to load the accumulator with the value 55H and complement the ACC 700 times.

Q.3  a) Explain the 6 interrupts of 8051 and then explain the purpose of interrupt vector table.
    b) Write the instructions to enable serial interrupt, timer O interrupt and external hardware interrupt 1.
    c) Explain various addressing modes of 8051 with examples.

Q.4  a) Explain assembler operation in detail with the help of a suitable diagram.
    b) Write a program to receive the data which has been sent in serial form and send it out to port O in parallel form. Also save the data at RAM location 60H.

PART-A

PART-B
Q.5  
   a) State the difference between PLCs and computers.  
   b) Explain the memory structure of PLCs.  
   c) State the advantages of PLCs on hard wired relay.  
   d) With XTAL=11.0592 MHz, find THI value needed to have the 9600 band rate. 5x4

Q.6  
Explain (any two):  
   a) Ladder diagram programming.  
   b) What is SCAN in PLC?  
   c) Shift registers. 5x2

Q.7  
   a) Explain assembler operation in detail with the help of suitable diagram. 10  
   b) Explain the detail interfacing of 8K ROM with 8051 microcontroller. 10
Q.1 a) A DMS $X$ has four symbols $x_1, x_2, x_3, x_4$ with probabilities $p(x_1) = 0.4, p(x_2) = 0.3, p(x_3) = 0.2$ and $p(x_4) = 0.1$. It generates one of the four messages every microsecond.
   i) Calculate $H(X)$.
   ii) Information rate of the source.
   iii) Find the amount of information contained in the messages $x_1 x_2 x_3 x_4$ and $x_3 x_2 x_1 x_4$ and compare it with $H(X)$.

Q.2 a) Briefly discuss about the channel capacity of a discrete memoryless channel. For a BSC shown below find the channel capacity for $p = 0.9$. Derive the formula that you have used.

b) A discrete memoryless source has five symbols with probabilities of occurrences 0.4, 0.19, 0.16, 0.15 and 0.1. Construct both the Shannon Fano code and Huffman code and compare their code efficiency.

c) Consider a rectangular distribution.
   \[ p(x) = \frac{1}{4}, \quad 0 < x < 4 \]
   \[ 0, \quad \text{otherwise} \]

Find $H(x)$.

Q.3 a) State and prove the Shannon-hartley law of channel capacity.

b) A communication channel has $S/N$ ratio of 31 and bandwidth of $3KHz$. Find the allowable percentage reduction in signal power if the bandwidth is increased to $4KHz$.

Q.4 a) Define the following terms:
   i) Systematic code.
   ii) Code rate.
iii) Hamming distance.

b) Show that $c = \{0000, 1100, 0011, 1111\}$ is a linear code. What is its minimum distance?

c) What is block code? The generator matrix for a (7,4) block code is given:

$$G = \begin{bmatrix}
1 & 0 & 0 & 0 & 1 & 0 & 1 \\
0 & 1 & 0 & 0 & 1 & 1 & 1 \\
0 & 0 & 1 & 0 & 1 & 1 & 0 \\
0 & 0 & 0 & 1 & 0 & 1 & 1
\end{bmatrix}$$

i) Find the parity check matrix of this code.

ii) If the received code word is (0001110), then find the transmitted codeword.

Q.5 a) Consider a (7,4) cyclic code with $g(x) = 1 + x + x^3$

i) Let data word $d = (1010)$, find the corresponding codeword in systematic form.

ii) The sequence (1110011) is received. Find the data word sent.

b) Explain the following:

i) Golay codes.

ii) Rate distortion function.

Q.6 a) What do you mean by minimal polynomial? Explain how it is used to generate BCH code?

b) Write short notes on any two:

i) Optimal linear codes.

ii) Reed Solomon code.

iii) Burst error.

Q.7 a) Explain the Viterbi algorithm and sequential decoding method of convolution codes.

b) Consider the convolutional encoder shown below:

Sketch the state diagram for the convolutional encoder.
End Semester Examination, Dec. 2015  
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) What do you understand by mandatory access controls, levels of security and malicious software? 9
b) Explain orange book in detail. 6

Q.2 a) How do you break an encryption scheme? 5
b) Explain data encryption standard (DES) in detail. 10

Q.3 a) Compare MD4 and MD5. Explain MD5 algorithm in detail. 10
b) Draw the architecture of transport layer security (TLS) with explanation. 5

Q.4 a) Discuss various forms of authentication in detail. 9
b) What is Kerberos protocol? 6

Q.5 a) Describe the various models of public key infrastructure (PKI). 10
b) State the services provided by secure IP protocol (IPSEC). 5

Q.6 a) List some security issues encountered with the web and state how to build and maintain secure web sites? 8
b) What are the risks and issues associated with use of an electronic mail? 7

Q.7 a) List and explain some management issues that security systems in the real would face. 5
b) List the main features of privacy enhanced mail and pretty good privacy (PGP and PEM). 10

Q.8 Write short notes on any three of the following:
a) International data encryption algorithm (IDEA).
b) Advanced encryption standard (AES).
c) Types of cryptographic functions and covert channel.
d) Secure socket layer, its architecture and functions.
e) Security systems and their weaknesses. 5x3
Q.1  

a) Define random variables. Explain Bernoulli and geometric distribution in detail. 

b) If a random variable $X$ has a probability density function:

$$f(x) = \begin{cases} 
\frac{1}{2}(x+1) & \text{for } -1 < x < 1 \\
0 & \text{elsewhere}
\end{cases}$$

Find mean and variance.

Q.2  

a) Find the moment generating function of exponential distribution and hence find its mean and variance. 

b) The time in hours required to repair a machine is exponentially distributed with parameter $\lambda = \frac{1}{2}$. What is the probability that the required time exceeds?

i) 2 hours. 

ii) 5 hours.

Q.3  

a) The total weight of 8 people chosen at random follows a normal distribution with a mean of 550 kg and standard deviation of 150 kg. What is the probability that total weight of 8 people exceeds 600 kg? 

b) Define stochastic convergence in brief. 

c) Explain law of large numbers in brief.

Q.4  

a) State and explain central limit theorem. 

b) Explain Schmidt orthogonalization. For the given signals use Gram Schmidt orthogonalization to find an orthonormal basis for the set of following signals:

Q.5  

a) Prove that exponential distribution follows memory less property. 

b) Explain the process of whitening of Gaussian random vector.

Q.6  

a) Explain transmission of a random process through a linear filter. 

b) Find the auto correlation function whose spectral density is given by:
\[ s(w) = \begin{cases} 
\pi & , \quad |w| \leq 1 \\
0 & , \quad \text{otherwise} 
\end{cases} \]

Q.7  
(a) If the probability that a certain measuring device will show excessive drift is 0.05, then what is the probability that sixth of these measuring devices tested will be the first to show excessive drift? 
(b) Write PDF for Chi-squared random vector and Rayleigh random vector.

Q.8  
Write short notes on:
(a) Covariance function.
(b) Power spectral density.
(c) Auto correlation and cross correlation function.
End Semester Examination, Dec. 2015
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.  10
   b) Find the minimum sampling frequency required for the following signal:
      \[ v(t) = 10 \cos^2 100\pi t + 6 \sin 200\pi t \]  5

Q.2  
   a) Discuss the following practical aspects of sampling and signal recovery:
      i) Flat too sampling  ii) Switching and hold circuit  10
   b) Consider three stage feedback shift register. It is assumed that initial stage of shift
      register is 010. Find out PN sequence.  5

Q.3  
   a) Differentiate between coherent and non coherent detection.  5
   b) Explain QPSK and obtain an expression for its probability of error.  10

Q.4  
   a) Explain layered architecture of data network in detail.  10
   b) Explain circuit switching in brief.  5

Q.5  
   a) Explain baseband shaping for a data transmission.  5
   b) What is ISI? How can it be removed?  5
   c) Explain store and forward switching.  5

Q.6  
   a) Explain frequency hop spread spectrum in detail with necessary diagrams.  10
   b) Discuss TDM in brief.  5

Q.7  
   Write short notes on:
   a) Equalization.  5
   b) Multiple access communication.  5
   c) DSSS.  5x3
End Semester Examination, Dec. 2015
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 With a neat block diagram, discuss working of an optical fiber communication system. Enlist the advantages of optical communication and compare it with microwave and satellite communication.

Q. 2 a) Derive expression for numerical aperture (NA) of an optical fiber assuming \( n_1 \) and \( n_2 \) as refractive index of core and cladding.
   b) Calculate the refractive index of the core and cladding of an optical fiber whose NA is 0.35 and specific refractive index parameter \( \Delta \) as 0.01.

Q. 3 a) Starting from Maxwell’s equation for isotropic dielectric material having no current or free charges, derive wave equations of \( \vec{E} \) and \( \vec{H} \).
   b) Compare step index and graded index fibers with index profiles.

Q. 4 a) Explain the working principle and characteristics of LED.
   b) List various structures of LED. Explain working of surface emitting LED.

Q. 5 a) Compare laser and LED.
   b) With the help of a diagram, discuss the principle of operation of Fabry-Perot and a quantum well laser.

Q. 6 a) Explain various characteristics of photo detectors.
   b) With the help of a diagram, explain the working of PIN-Photodiodes.

Q. 7 a) Compare intensity modulation/direct detection type (IM/DD) and coherent optical Communication System.
   b) Give block diagram of an optical receiver and explain its working.

Q. 8 Write short notes on any three:
   a) Mode field diameter (MFD).
   b) Heterofunctions in opto electronic devices.
   c) Direct band gap and indirect band gap semi conductors.
   d) Optical time domain reflectometry.
   e) Optical power budgeting.
End Semester Examination, Dec. 2015
M. Tech. (Comm. Sys.) - Second Semester
ADVANCED DIGITAL SIGNAL PROCESSING (EC-M-C-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) A discrete time signal is given as \( x(n) = a^{|n|} \) for \(-1 < a < 1\). Find its DTFT. 6
b) State and prove convolution property of DTFT. 6
c) Prove any two properties of twiddle factor. 3

Q.2  a) Obtain circular convolution of \( x_1(n) = [1,2,1,-1] \) and \( x_2(n) = [2,3,-1,1] \) using graphical method. 10
b) Calculate IDFT of \( x(k) = [10,-2+2j,-2,-2-2j] \). 5

Q.3  a) Draw the structures of cascade and parallel realizations of
\[
H(z) = \frac{1-z^{-1}}{(1-z^{-1})(1-\frac{1}{2}z^{-1})}. 
\]
12
b) Write down advantages and disadvantages of direct form structures. 3

Q.4  a) Derive expression for IIR filter design by bilinear transformation and explain the concept of frequency warping. 10
b) Write a short note on Gibbs phenomenon. 5

Q.5  a) Draw structures for multistage decimators and interpolators. 9
b) Discuss type-I and type-II polyphase decomposition and obtain polyphase decomposition of the system with transfer function \( H(z) = \frac{1-4z^{-1}}{1+5z^{-1}} \). 6

Q.6  a) Analyse the filter structure and determine input-output relationship:

\[
\begin{align*}
x_1(n) & \xrightarrow{\uparrow 2} \quad \text{\(x_1(n)\)} \\
x_2(n) & \xrightarrow{\uparrow 2} \quad \text{\(y_2(n)\)} \\
\end{align*}
\]
10
b) State preliminary conditions for the design of digital filters. 5

Q.7  a) The desired response of a low pass filter is \( H_d(e^{j\omega}) = \begin{cases} 0, & -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\ e^{-j2\omega}, & \frac{\pi}{4} < |\omega| \leq \pi \end{cases} \)

Determine the filter coefficients \( h_d(n) \) if the window function is defined as:
\[
\omega(n) = \begin{cases} 1, & 0 \leq n \leq 4 \\ 0, & \text{otherwise} \end{cases}
\]
Also determine the frequency response $H(e^{j\omega})$ of the designed filter.

b) Write a short note on filter banks.

Q.8 Explain the architecture and block diagram of TMS3206713 digital signal processor.
End Semester Examination, Dec. 2015
M. Tech. (Comm. Sys.) - Third Semester
ADAPTIVE SIGNAL PROCESSING (EC-M-C-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 term adaptation and its importance in reference to any machine. 15

Q.2 a) Explain state space model and its advantages for representation of any system. 5
b) Derive state space model equation for a system described by:
\[
\frac{d^3 y(t)}{dt^3} + 3\frac{d^2 y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 4y(t) = x_1(t) + 3x_2(t) + 4x_3(t)
\]
and outputs are given by:
\[
y_1(t) = \frac{4dy(t)}{dt} + 3x_1(t)
\]
\[
y_2(t) = \frac{d^2 y(t)}{dt^2} + 4x_2(t) + x_3(t)
\]
10

Q.3 a) Derive equations for Kalman filter. 8
b) Express relation between RCS and Kalman filter. 7

Q.4 a) Explain the process of adaptive echo cancellation in telephone systems. 8
b) What do you mean by adaptive noise cancellation? Explain. 7

Q.5 a) Explain basic concept of filtering, prediction and smoothing in reference to adaptive systems. 10
b) Explain the effect of eigen value spread on stability and rate of convergence. 5

Q.6 a) What is the job of Weiner filter? Derive expression for MMSE using unit impulse response of Weiner filter. 9
b) What do you mean by optimal signal processing? 6

Q.7 List the methods used for searching the performance of a surface and derive an expression for any one method. 15

Q.8 Write short notes on:
a) Innovation process. 7½x2
b) Adaptive linear combiner.
End Semester Examination, Dec. 2015  
M. Tech. (Comm. Sys.) - Third Semester  
IMAGE PROCESSING (EC-M-C-322 / EC-M-C-322A)

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 the steps required in digital image processing with examples.  
b) Explain 2-Dimensional sampling and quantization in digital image processing.

Q.2  
a) Derive expression of 2-D DFT and discuss any two properties of 2-D discrete Fourier transform (DFT).  
b) Explain a simple image formation model in detail.

Q.3  
a) Discuss various NOISE models with their mean and variance.  
b) Describe image enhancement by point processing of following:  
   i) Identity transformation.  
   ii) Contrast stretching.  
   iii) Gray level slicing.

Q.4  
a) Explain frequency domain Ideal Low Pass filter. Also describe ringing effect and explain how can it be avoided.  
b) The following matrix defines a 5x5 image f(x,y). Suppose smoothing is done to the image using 3x3 neighborhood in spatial domain. Then what will be the new value of f(2,2) using the:  
   i) Mean filter  
   ii) Median filter  
   iii) Min and Max filter  
   iv) Geometric mean filter.

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Q.5  
a) Derive the mean square error (wiener) filter method for an image restoration.  
b) Draw the block diagram of the model of the image degradation/restoration process and explain its various blocks.

Q.6  
a) Explain Lossy and Lossless predictive coding in detail.  
b) What do you understand by image compression? Draw the image compression model and describe the working of each block.

Q.7  
a) What are the basic types of discontinuities in grey level detected?  
b) Explain the following edge extraction operators.  
   i) Sobel  
   ii) Robert
c) Consider two image subsets $S_1$ and $S_2$. For $\nu=2$, determine whether $S_1$ and $S_2$ are:
i) 4-connected
ii) 8-connected
iii) m-connected

\[
\begin{array}{cc|ccc|cc}
S_1 & & & & & S_2 \\
0 & 0 & 0 & 0 & 0 & 0 & 2 & 2 \\
2 & 0 & 0 & 2 & 0 & 0 & 0 & 2 \\
2 & 0 & 0 & 2 & 0 & 0 & 0 & 0 \\
0 & 0 & 2 & 2 & 2 & 0 & 0 & 0 \\
0 & 2 & 2 & 2 & 0 & 0 & 0 & 0 \\
\end{array}
\]
End Semester Examination, Dec. 2015
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) Explain depletion capacitance and diffusion capacitance of Pn junction in detail. 8
     b) Consider a Pn junction in silicon with $N_A = 10^{16} \text{ cm}^{-3}$, $N_D = 10^{15} \text{ cm}^{-3}$ and
        $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$. Determine the total depletion width W assuming temperature
        $T = 300 K$. 7

Q.2  a) Explain the following SPICE commands with examples:
     · TRAN, · PRINT, · OP, · POWER 6
     b) Draw the small signal equivalent circuit of a $P^n$ junction diode. 4
     c) A silicon diode has a reverse saturation current of $2.5 \mu A$ at 300 K. Find the
        forward voltage for a forward current of 10 mA. 5

Q.3  a) What is noise? Explain noise model of a BJT in detail. 7
     b) What is early effect in a BJT? 3
     c) Determine the voltage at all nodes and the current in all branches of the circuit
        shown below. Assume $\beta$ value of transistor as 100. 5

Q.4  a) What is body effect in MOSFET? 5
     b) Explain the high frequency MOSFET model in detail. 10

Q.5  a) Briefly explain the MOSFET channel mobility model. 5
     b) What is short channel MOSFET? 3
     c) Explain level 1 model equations for MOSFET in detail. 7

Q.6  a) Explain the construction and working principle of a JFET. 7
     b) Draw the ac small signal equivalent circuit for JFET. 3
     c) Why is MESFET a fast transistor? What could be done to increase the speed of a
        MESFET? 5
Q.7 Write short notes on the following:
   a) HEMT
   b) MOS capacitor.
   c) Ebers-moll model for a BJT

5x3
End Semester Examination, Dec. 2015
M. Tech. (VLSI & ES) - First Semester
MICRO CONTROLLER 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 architecture of 8051 microcontroller with help of a diagram. 10
b) Differentiate microprocessor and microcontroller. 5

Q.2 a) Explain following instructions with examples:
   i) SJMP
   ii) MUL
   iii) SETB
   iv) RRC
   v) CALL 2x5
b) Explain following registers in detail:
   i) PSW
   ii) DPTR 5

Q.3 a) Write a program to add first 10 natural number. 8
b) What are various addressing modes of 8051 microcontroller? 7

Q.4 a) Explain mode-1 operation of timer of 8051 microcontroller. 5
b) Write a program to generate 10KHz square wave on pin P1.0 assuming crystal frequency of 12MHz. 10

Q.5 a) Explain various modes of operation of serial port of 8051 microcontroller. 12
b) Explain the function of SCON register in detail. 3

Q.6 a) Using 8051 interrupts, design a furnace controller that keeps a building at temperature 25°±1°. 10
b) Explain various interrupts of 8051 microcontroller. 5

Q.7 a) Interface ADC with 8051 microcontroller. 7
b) Interface 8255 PPI chip with 8051 microcontroller. 8

Q.8 Write short notes on (any two):
a) Serial port baud rates.
b) Design tools for development.
c) Development of microcontroller based products. 7½x2
Q.1 a) What are the applications of a differential amplifier circuit?  
   b) Analyze the differential pair circuit to find an expression for small signal voltage gain.

Q.2 Design a basic cascade current mirror circuit. Discuss its disadvantages and the scope of modification to improve its performance.

Q.3 Derive an expression for small-signal differential gain of a differential amplifier with: 
   a) Diode connected load.
   b) Current source load.

Q.4 a) Design a two stage operational amplifier circuit. 
   b) Discuss the performance parameters of an operational amplifier.

Q.5 a) Derive an expression for the gain of a source follower circuit. 
   b) Explain the folded cascode OP-AMP structure.

Q.6 a) Explain and analyze the circuit of transconductance multiplier. 
   b) Explain the working of SAR D/A converter.

Q.7 a) Describe the response of a MOSFET used as a switch to different input levels and initial conditions. Also derive an expression for the variation of $V_{out}$ with time when $V_{in} = V_{DD}$. 
   b) Draw and explain a simple PLL circuit.

Q.8 Write short notes on: 
   a) Widlar current mirror. 
   b) Voltage controlled oscillator.
End Semester Examination, Dec. 2015  
M. Tech. (VLSI & ES) - First Semester  
EMBEDDED SYSTEM 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 do you understand by embedded system? Explain in detail the minimum hardware requirement for embedded systems.  
8  
b) Explain the direct memory access and the control signal used in DMA process.  
7  

Q.2  
a) What are the various architectures for embedded software? Explain with an example.  
8  
b) Explain the concept of semaphore and shared data in detail.  
7  

Q.3  
a) What is a single purpose processor? What are the benefits of choosing a single purpose processor over a general purpose processor?  
8  
b) Explain the general software design tools that are used by embedded system designers.  
7  

Q.4  
a) Explain memory write ability and storage performance in detail.  
8  
b) Explain multilevel bus architectures in detail.  
7  

Q.5  
a) Explain finite state machine model in detail. Also explain concurrent process model in brief.  
7  
b) Explain the following:  
   i) Communication among process.  
   ii) Synchronization among process.  
   4x2  

Q.6  
a) Explain how operations are implemented and terminated using single or general purpose processor?  
8  
b) Discuss intellectual property cores in detail.  
7  

Q.7  
Write short notes on **(any three):**  
a) **I²C**  
b) UART  
c) Timers/counters  
d) Interrupts  
e) Wireless protocol  
5x3
End Semester Examination, Dec. 2015
B. Tech. – First / 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) Define work. Also write down the formula and unit.
     b) Differentiate between spur gear and helical gear.
     c) How many strokes are required to complete one revolution of wheel in a 4-stroke petrol engine?
     d) Define mechanical advantage and velocity ratio.
     e) Define zeroth law of thermodynamics.
     f) What is Hook's law?
     g) Write down the units for shear force and bending moment.
     h) Write down the classification of plain carbon steel.
     i) Define modulus of rigidity.
     j) Define strength and hardness.

2x10

PART A

Q.2  a) Explain the Carnot cycle in detail.
     10
     b) A heat engine working on a Carnot cycle converts one-fifth of the heat output into work. When the temperature of the sink is reduced by 80º C, the efficiency gets doubled? Calculate the temperature of the source and sink.
     10

Q.3  a) Explain the 4-stroke diesel engine in detail with the help of a neat sketch.
     10
     b) Write down the various applications of refrigeration.
     10

Q.4  a) Derive an expression for length of belt for cross-belt system.
     10
     b) Explain compound and reverted type gear trains with diagrams.
     10

PART B

Q.5  a) Derive the relations between elastic constants E, K and C.
     12
     b) The wire working on a railway road signal is 6 mm in diameter and 250 m long. If the movement at the signal end is to be 15 cm, make calculations for the movements which must be given to the wire end at the signal box. Assume a pull of 1500 N on the wire. Value of young's modulus of wire material is 2x10^5 N/mm^2.  

8
Q.6 Draw the shear force and bending moment diagram for the following beam:

![Beam Diagram](image)

Q.7 a) Define the following mechanical properties of engineering materials:
   i) Toughness ii) Ductility iii) Elasticity iv) Brittleness v) Plasticity

   2x5

b) Explain Arc welding process in detail with the help of a neat sketch.

   10
End Semester Examination, Dec. 2015  
B. Tech. – Second Semester  
APPLIED MECHANICS (M-201)

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  
1. Explain the principle of superposition and transmissibility.  
2. Derive $I_{xx}$ of a right-angled triangular area with breadth ‘b’ and height ‘h’.  
3. Write down the steps being followed for solving a truss using method of joints.  
4. Explain Lami’s theorem.  
5. Explain parallel axis theorem with an example.  
6. Derive the third equation of motion.  
7. What is fixed axis rotation?  
8. Explain the procedure of virtual work as a mean of solving problems in statics.  
9. Differentiate between translation and rotation.  
10. Explain work and work done.

2x10

PART-A

Q.2  
1. State and prove parallelogram law of forces.  

8

2. Two spherical balls each of radius $20 \text{ cm}$ and of weight $200 \text{ N}$ are kept between two vertical walls $60 \text{ cm}$ apart. The first ball is resting on the ground and touching one of the vertical wall. The second ball is touching the first ball and the other vertical wall. Calculate the reactions at the contact surfaces and the reciprocal pressure between the balls.

12

Q.3  
1. Find the moment of inertia of the following figure about $I_{xx}$ and $I_{yy}$.
b) Explain radius of gyration with a suitable example.

Q.4  a) Differentiate between method of joints and method of sections.

b) i) Conduct the stability check of the given figure.
    ii) Find out the forces in the members of a pin jointed truss.

PART-B

Q.5  a) X and Y are sitting in cars A and B respectively, 300 m apart and are at rest. X starts his car and moves towards B with an acceleration of 0.5 m/sec². After 3 seconds, Y starts his car towards A with an acceleration of 1 m/sec². Calculate the time and point at which two cars meet with respect to A.
    b) A stone is projected from point A with a velocity of 50 m/s at an angle 30° from the horizontal. At the same time another stone is projected in opposite direction with 40 m/s from a point 120 m from A on the same level. Calculate angle of projection of second stone if the two stones collide.

Q.6  a) A train is moving along a track whose gradient is 1 in 100. The weight of the train is 6000 kN. To avoid an accident, the train is brought to rest applying brakes in 250 m length along the track. The resistance due to friction and air motion is 15 N per kN weight of the train. Find the work done in bringing the train to rest.
b) Explain general plane motion with suitable diagrams.

Q.7  

a) A simply supported beam $AB$ of span $10 \text{ m}$ is loaded as shown in the figure. Calculate the reactions $R_A$ and $R_B$ by the method of virtual work.

![Diagram of a simply supported beam with loads](image)

b) A ball of mass $250 \text{ g}$ is moving with a velocity of $15 \text{ m/sec}$ and is hit by a bat so that the ball is turned back with a velocity of $25 \text{ m/sec}$. The duration of contact between the ball and bat is $0.02 \text{ sec}$. Find the impulse and the average force exerted on the ball by the bat.
Q.1  a) What is sub-zero treatment?
b) Write down the carbon composition and temperature for eutectoid reaction occurs in $Fe-C$ diagram.
c) Where do we need stress relieving annealing process?
d) What do you mean by allotropy? Name an allotropic material.
e) Which heat treatment process is used to improve the decarburization?
f) What do you mean by dead mild steel?
g) Why we add chromium to steel?
h) What is pitting corrosion?
i) What are refractory materials?
j) Define hardness and toughness.

**PART-A**

Q.2  Write short notes on:

a) Stainless steel.
b) Ductile cast iron.
c) Zinc.
d) Brass.

Q.3  a) What are advance ceramic materials? Discuss any three advance ceramic materials briefly.
b) What are ceramic materials? Classify them in details.

Q.4  a) Define fatigue. Also draw and discuss the fatigue strength curve on the basis of fatigue testing.
b) Describe the purpose and procedure for testing of metals for impact strength.

**PART-B**

Q.5  a) Draw a neat sketch of $Fe-C$ equilibrium diagram and mark each line, area and transition point.
b) Briefly discuss the transformation of austenite into bainite.

Q.6  a) What is annealing process? Explain the different types of annealing process.
b) Write short notes on:
   i) Soft spot.
   ii) Overheating and burning of steel.

Q.7  a) What is induction hardening? Explain the procedure with help of a diagram.
b) What is pack carburizing process? Discuss in detail.
End Semester Examination, Dec. 2015  
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 Define any ten terms:  
a) Centre of gravity.  
b) Resolution of force.  
c) Moment of a force.  
d) Couple moment.  
e) Neutral equilibrium.  
f) Determinacy of a beam.  
g) Polar moment of inertia.  
h) Newton’s is third law of motion.  
i) Horizontal range of the projectile.  
j) Curvilinear motion.  
k) Rotational motion.  
l) Principle of work and energy.  
2x10

PART-A

Q.2 a) A block weighing 50 kN is resting on a plane inclined at 30° to horizontal. Determine the component of its weight along the parallel and perpendicular direction to the plane.  
15  
b) Explain rectangular Cartesian co-ordinate system with neat sketches.  
5

Q.3 A truss of span 9 m is loaded as shown in the figure given below. Find the forces in the members of the truss.

20

Q.4 Determine the position of the centroid of shaded area of spandrel OPQ shown in the figure given below, the curve OP being a parabola with axis vertical.
PART-B

Q.5  a) A body of mass 12kg falls from a height of 6m and penetrates into the ground. If the resistance to penetration is constant and equal to 4500N, find the distance through which it penetrates. Assume $g = 9.81 \text{m/s}^2$.

b) Derive expression for range (x) for a body thrown horizontally from a given height (H) in air.

Q.6  A particle is projected downward from a height of 100m with a velocity of 30m/s. Find the velocity with which it strikes the ground.

Q.7  A uniform ladder of 5m long and weighing 200N rests on a smooth floor at A and against a smooth wall at B as shown in the figure given below. A horizontal rope PQ prevents the ladder from slipping. Using the method of virtual work, determine the tension in the rope.
Q.1  a) What do you understand by the “Basic concepts of thermo dynamics” term?
    b) Define the intensive and extensive properties of a system.
    c) Define similarities and dissimilarities of heat work.
    d) Define the homogeneous and heterogeneous system.
    e) Define the quasi-static process and adiabatic process.
    f) What is the phase of a system and pure substance?
    g) Write the expression for the Gibbs functions.
    h) Define the saturation temperature and superheated steam.
    i) Define the proximate analysis and ultimate analysis of fuel.
    j) What is gross calorific value and net calorific value?

Q.2  a) Prove that the entropy of the universe is increasing.
    b) Define the enthalpy, internal energy of a substance and steady how process?
    c) Explain the carnot theorem with the sketch.

Q.3  a) i) What do you mean by clausius inequality?
    ii) Define the concept of continuum in brief.
    iii) How evaporation differs from boiling?
    iv) Draw the T-s and P-v diagram of carnot cycle.
    v) What is the relation between the gauge pressure and absolute pressure?
    b) A gas (volume=0.014 m$^3$) expands polytropically from a pressure of 2.07 MPa to
       207 MPa. The polytropic exponent n=1.35. Determine the work done by the gas
       during the expansion.

Q.4  a) Determine the enthalpy, volume, internal energy and entropy of superheated
    steam at 15 bar pressure and 220 °C. The volume of water many be neglected and
    take specific heat of superheated steam equal to 2.2 kJ/KgK. (Data from steam
    tables corresponding to 15 bar pressure, $v_g=0.132$ m$^3$/kg, $h_f=844.7$ kJ/kg,
    $h_{fg}=1945.2$ kJ/kg, $s_f=2.314$ kJ/kgk $s_{fg}=4.126$ kJ/kgk and $t_{sat}=198.3$ C°).
    b) Derive an expression for the steady flow energy equation. State the assumption
       made before the derivation.

Q.5  a) Describe the constructional and operational aspects of orsat apparatus used for
    analyzing the flue gases from a boiler trial.
    b) Describe the classification of primary and secondary fuels. Why the excess air is
       required for combustion in a fuel fired thermal system?

OR
Determine the stoichiometric air fuel ratio and the products of combustion of $C_8H_{18}$.

Q.6  a) Air at a pressure of 2.75 MPa expands isothermally in a piston cylinder set up from an initial volume of 0.15 m$^3$ to a final volume of 0.45 m$^3$. If the air and the surrounding are both at a temperature of 40ºC. Determine
     i) The work done. ii) The heat transferred during the process.  
     b) Prove that the entropy is constant. Derive an expression for the entropy change in an irreversible process.

Q.7   a) Write down the expression for the available energy for an infinite energy source at a temperature $T$ when the ambient temperature is $T_0$. State and explain the Avogadro’s law. 
     b) State the Kelvin-planck and Claussius statements of second law of thermodynamics and establish the equivalence between them. When does the system become dead? 
     c) How does an ideal gas differ from a perfect gas?
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
MANUFACTURING TECHNOLOGY-I (M-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
a) What is brazing?
b) State the principle of rolling.
c) What do you mean by dry sand and green sand?
d) What are the functions of riser?
e) Differentiate between carburizing flame and oxidizing flame.
f) What is hot working and cold working?
g) What is meant by term forging?
h) What are the main constituents of moulding sand?
i) What is wire drawing?
j) Why is the coating of electrode done? 2x10

PART-A

Q.2
a) What is a core? What are its uses? 5
b) What are the common allowances provided to the pattern? 5
c) Explain the procedure of making a mould using a split 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) Hot tears.  ii) Blow holes. 5
c) Explain in brief the cleaning of casting. 5

Q.4
a) What are different types of forging? Explain drop forging and press forging in detail. 10
b) Sketch and explain tube drawing. 5
c) Explain direct extrusion with the help of a neat sketch. 5

PART-B

Q.5
a) Sketch and explain the following press tools:
   i) Compound die. ii) Progressive die. 5x2
b) Sketch and explain stretch forming in brief. 5
c) Explain bending and coining in brief. 5

Q.6
a) Explain the construction and operation of oxy-acetylene welding. 10
b) What do you understand by term edge preparation in welding? Sketch different types of edges prepared for welding. 10

Q.7
a) Explain submerged arc welding with its application. 10
b) Explain TIG welding with its application. 10
Q.1 a) Define the term specific gravity of a fluid.
b) State Pascal’s law.
c) What do you understand by centre of pressure?
d) Define the term stream line.
e) Distinguish between rotational and irrotational flow.
f) Name the different forces present in a fluid flow.
g) What do you mean by pressure gradient?
h) What is a velocity defect?
i) What do you mean by equivalent pipe?
j) State Rayleigh’s method.

PART-A

Q.2 a) A cubical tank has sides of 1.5\text{m}. It contains water for the lower 0.6\text{m} depth. The upper remaining part is filled with oil of specific gravity 0.9. Calculate for one vertical side of the tank:
i) Total pressure and
ii) Position of centre of pressure.

b) What is the difference between \textit{U\textendash}tube differential manometers and inverted \textit{U\textendash}tube differential manometers? Where are they used?

Q.3 a) Explain uniform flow with source and sink. Obtain expressions for stream and velocity potential functions.

b) Water flows through a pipe AB of 1.2\text{m} diameter at 3 \text{m/s} and then passes through a pipe BC of 1.5\text{m} diameter. At C, the pipe branches. Branch CD is 0.8\text{m} in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5\text{m/s}. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.

Q.4 a) State Bernoulli’s theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli’s theorem from first principle and state the assumptions made for such a derivation.
b) In a 100 mm diameter horizontal pipe, a venturimeter of 0.5 contraction ratio has been fixed. The head of water on the metre when there is no flow is 3 m (gauge). Find the rate of flow for which the throat pressure will be 2 meters of water absolute. The co-efficient of meter is 0.97. Take atmospheric pressure head \( = 10.3 \text{m} \) of water.

**PART-B**

Q.5  
**a)** What is Hagen Poiseuill’s formula? Derive an expression for Hagen Poiseuille’s formula.  
**b)** A fluid of viscosity 0.7 \( \text{Ns/m}^2 \) 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 \( \text{N/m}^2 \), find (i) the pressure gradient (ii) the average velocity and (iii) reynold number of the flow.

Q.6  
**a)** Obtain an expression for the coefficient of friction in the terms of shear stress.  
**b)** A plate of 600 mm length and 400 mm width is immersed in a fluid of specific gravity 0.9 and kinematic viscosity \( 10^{-4} \text{m}^2/\text{s} \). 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.  
   iii) Drag force on one side of the plate.

Q.7  
**a)** The rate of flow of water through a horizontal pipe is 0.25 m\(^3\)/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm\(^2\). Determine:  
   i) Loss of head due to sudden enlargement.  
   ii) Pressure intensity in the large pipe.  
   iii) Power lost due to enlargement.  
**b)** What do you mean by dimensionless numbers? Name any four dimensionless numbers.
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
MATERIAL SCIENCE (M-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) Define atomic packing factor.  
b) What are different types of solid solutions?  
c) Write the purpose of heat treatment.  
d) What is plastic deformation?  
e) What do you understand by creep?  
f) Name any two composite materials.  
g) What are the factors affecting fatigue?  
h) What is cooling curve?  
i) Name the imperfections in metal crystals.  
j) How polymer is formed?  

2x10

PART-A

Q.2  
a) Describe the crystal structure of metallic elements.  
b) What are the defects and imperfections in a crystal? Describe them with neat sketches.  

8 12

Q.3  
a) Explain the working of TTT diagrams and what information is supplied by them?  
b) Explain the terms: eutectoid, hyper eutectoid and hypoeutectoid.  

12 8

Q.4  
a) What are the objectives of annealing and how is it done? Explain.  
b) Explain the methods of hardening.  

10 10

PART-B

Q.5  
a) Explain deformation of metals. How does it take place? State its effect.  
b) How does twinning occur in metals? Name any two types of twins.  

10 10

Q.6  
a) Describe the various means for prevention and control of corrosion.  
b) Name three stages of creep. Sketch creep curve and explain briefly.  

10 10

Q.7  
a) Explain how the degree of crystallinity is controlled by rate of cooling in plastic materials?  
b) What is laminated glass? Give its uses.  
c) How the raw materials are selected for the preparation of ceramic products?  

7 6 7
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
MATERIALS AND HEAT TREATMENT (M-307)

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 any two non-ferrous materials.
b) Classify ceramic materials.
c) Write names of different mechanical failures.
d) What are the objectives of heat treatment?
e) What is stress relieving?
f) What do you mean by post heat treatment?
g) State the property and application of cast Iron.
h) What are limitations of composite materials?
i) What are advantages of salt bath nitro-carburizing?
j) Name two bearing materials.

2x10

PART-A

Q.2  a) Write composition, properties and applications of HSS, tool steels and free cutting steels.
b) What are the alloying elements of ferrous materials? Name the effect of any two alloying elements.

12

Q.3  a) What are fiber-reinforcement composites? Explain the characteristics of materials essential for designing FRC.
b) Explain optical fibre and chemical bonded ceramic.

10

Q.4  a) Explain the tensile testing process and its importance in deciding mechanical properties.
b) Why the study of corrosion is important for an engineer?

10

PART-B

Q.5  a) Explain the construction of CCT diagram. In what way it differs from TTT diagram.
b) What is meant by phase transformation? Explain it in terms of the nucleation and growth of crystals.

10

Q.6  a) What is need of hardening? Explain the methods of hardening.
b) Explain the process of aus-tempering and mar tempering.

10

Q.7  Write short note on any four:
a) Carburizing.
b) Carbonitriding.
c) Flame hardening.
d) Nitriding.
e) Cyaniding.

5x4

371/3
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
METROLOGY (M-308)

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 the Taylor’s principle of limit gauging.
     b) Differentiate between line standard and end standard.
     c) What is unilateral and bilateral tolerance?
     d) What is snap gauge?
     e) What is selective assembly?
     f) What information is needed for designating the surface finish in drawing?
     g) What is the “best size” wire?
     h) What are the different types of irregularities found in circular parts?
     i) Name commonly used methods of measuring straightness.
     j) Define circular pitch, diametral pitch and module of a gear.

   2x10

Q.2  a) Define the following:
     i) Tolerance.
     ii) Basic size.
     iii) Fundamental deviation.
     iv) Upper deviation.
     v) Allowance.

   b) Determine the dimensions, tolerances and allowances for a 28 mm hole and shaft pair designated as H₈d₉.
     Given:
     i) Upper deviation of ‘d’ shaft = -16 D₀.₄₄.
     ii) 28 mm lies in the diameter steps of 18 mm to 30 mm.
     iii) IT₈ = 25 i.
     iv) IT₉ = 40 i.

   1x5

Q.3  a) State the difference between a measuring instrument and comparator.
     b) Describe the working principle of an electrical comparator with a neat sketch.

   15

Q.4  a) Define the following terms with reference to surface roughness.
     i) Ra-value.
     ii) RMS(Rq) value.
     iii) Rz value.
     iv) Lay.
     v) Sampling length.

   b) Describe the principle and operation of a Taylor-Hobson-Taly surf roughness instrument for the measurement of surface roughness.

   1x5  15

Q.5  a) What are the various types of pitch errors found in a screw thread?
     b) Describe with a neat sketch, two wire method of measuring the effective diameter of an external screw thread.

   15

Q.6  a) Define straightness error and circulating error.

   5

372/3
b) Describe the auto collimator method of measuring straightness of a surface. 15

Q.7  
a) Name various methods of checking gear tooth thickness. 5  
b) Explain the checking of involutes shape of a spur gear by straight edge method. 15
Q.1 a) Differentiate between the internal and external combustion engines.  
b) Define the compression ratio.  
c) What are the different parts of an IC engine?  
d) What methods are used in reducing the speed of turbine rotor?  
e) What do you mean by COP of condenser?  
f) Define the rich mixture, stochiometric mixture and lean mixture.  
g) Define the relative efficiency.  
h) Explain common rail injection system.  
i) Define carburetion.  
j) Differentiate between the refrigeration and air-conditioning.

**PART-A**

Q.2 a) Explain the phenomenon of knock in CI engine and compare it with SI engine knock.  

7 

b) How does a 2-strok engine differ from a 4-stroke engine?  

6 

c) Compare between battery ignition with magneto ignition system.  

7 

Q.3 a) i) Define the function of a nozzle.  

ii) Name some applications where the nozzle is used.  

iii) Define refrigeration and its application.  

iv) Define degree of reaction.  

v) What are the different losses occur in a steam turbine?  

2x5 

b) A simple Rankine cycle steam engine has the working range of operation from 10 bar dry saturated steam supply to 0.5 bar exhaust. Determine:  

i) Condition of steam after adiabatic expansion.  

ii) Ranking efficiency.  

iii) Efficiency ratio.  

iv) Specific steam consumption.  

Take the following data:  

Indicated thermal efficiency as 20%, enthalpy \( (H_1) \) of wet steam at 10 bar as 2776.2 kJ/kg, sensible heat at 0.5 bar as 340.6 kJ/kg, and latent heat as 2305.4 kJ/kg.  

10
Q.4  
a) Describe briefly with the neat sketches of the P.V. and T- diagram, the operational aspects of a Rankine cycle. Derive an expression for the efficiency of the Rankine cycle.

10  
b) A CI engine working on diesel cycle has the following particulars: stroke=0.25 m, cylinder bore=150 mm, and clearance volume=400 cm³. The fuel injection takes place at constant pressure for the 5% of the stroke. Find the cycle efficiency. Now the fuel cut off is delayed from 5% to 8% of the stroke. What will be the percentage loss in efficiency if the compression ratio remains the same?

10

PART-B

Q.5  
a) What are the principal requirements of a steam condensing plant? What is the classification of surface condenser? Describe the advantages of surface condenser.

8  
b) Moist air enters a refrigeration coil at 35 ºC dry bulb temperature and 55% relative humidity at the rate of 100 m³/min. The barometric pressure is 1.013 bar. The air leaves at 27 ºC. Calculate the tonnes of refrigeration and final relative humidity. If the surface temperature of cooling coil is 10 ºC and by one word factor is 0.1, calculate the tonnes of refrigeration required and the condenser flow.

12

Q.6  
a) The outlet and inlet temperature of cooling water to a condenser are 37.5 ºC and 30 ºC respectively. If the vacuum in the barometer is 766 mm of mercury with barometer reading 760 mm of mercury. Determine the condenser efficiency. Take the saturation temperature at 0.072 bar pressure as 40 ºC (from steam table).

10  
b) Sketch the schematics of refrigeration system operating on ball- Coleman cycle and explain its working. What are the desirable properties of an ideal refrigerant?

10

Q.7  
a air refrigeration open system operating between 1MPa and 100 KPa is required to produce a cooling effect of 2000 kJ/min. The temperature of air leaving the cold chamber is -5 ºC and leaving the cooler is 30 ºC. Neglecting losses and clearance in the compressor and expander, determine:

a) Mass of air circulated pr hour.

b) Compressor work, expander work and cycle work.

c) COP and power required to run the machine.

20
End Semester Examination, Dec. 2015  
B. Tech. – Fourth / Fifth Semester  
FLUID MACHINES AND TURBOMACHINERY (M-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) What do you mean by impulse momentum principle?  
b) Differentiate between the turbines and pumps.  
c) What is scale effect?  
d) State the purpose of draft tube in a reaction turbine.  
e) What do you mean by gross head and net head?  
f) How is a Kaplan turbine different from a propeller turbine?  
g) What is the hydraulic ram?  
h) Enumerate the salient points of difference between the centrifugal and reciprocating pumps.  
i) How does a centrifugal pump impart pressure energy to the flowing fluid?  
j) Why a reciprocating pump is called a positive displacement pump?

2x10

PART-A

Q.2  
a) Find an expression for the angle of swing of a vertical hinged plate.

8  
b) A small ship is fitted with jets of total area 0.65 m². The velocity through the jet is 9 m/s and speed of the ship is 18 km/hour in seawater. The efficiencies of the engine and pump are 85% and 65% respectively. If the water is taken amid ships, determine the propelling force and the overall efficiency, assuming the pipe losses to be 10% of the kinetic energy of the jets.

12

Q.3  
a) Define the following terms:  
i) Jet ratio.  
ii) Flow ratio.  
iii) Working proportions.  
iv) Number of jets.  
v) Speed ratio.

2x5  
b) A Delton wheel is supplied with water under a head of 35 m at the rate of 40.5 kilo litre/min. The bucket deflects the jet through an angle of 160º and the mean bucket speed is 13 m/s. Calculate the power and hydraulic efficiency of the turbine. Take coefficient of the velocity is equal to 1.0.

10

Q.4  
a) A Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity is
and the radial velocity of flow at inlet is \(0.96\sqrt{2gH}\). The wheel runs at 150 r.p.m and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge determine:

i) The guide blade angle.

ii) The wheel vane angle at inlet.

iii) Diameter of the wheel at inlet.

iv) Width of the wheel at inlet.

b) Define cavitation. Why does it occur and what are its effects?

**PART-B**

Q.5

a) With a neat sketch, explain the principle and working of a centrifugal pump.

b) A three stage centrifugal pump has impellers 40 cm in diameter and 2 cm wide at outlet. The vanes are curved back at the outlet at 45º and reduce the circumferential area by 10%. The manometric efficiency is 90% and the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 r.p.m. delivering 50 litres per second. What should be the shaft horse power?

Q.6

a) The length and diameter of a suction pipe of a single acting reciprocating pump are 5 m and 10 cm respectively. The pump has a plunger of diameter 15 cm and a stroke length of 35 cm. The centre of the pump is 3 m above the water surface in the pump. The atmospheric pressure head is 10.3 m of water and pump is running at 35 r.p.m. Determine:

i) Pressure head due to acceleration at the beginning of the suction stroke.

ii) Maximum pressure head due to acceleration.

iii) Pressure head in the cylinder at the beginning and at the end of the stroke.

b) What is an air vessel? Describe the function of the air vessel for reciprocating pumps.

Q.7

a) Draw a neat sketch and explain the principle and working of a hydraulic lift.

b) The water is supplied at the rate of 3000 litres per minute from a height of 4 m to a hydraulic ram, which raises 300 litres/minute to a height of 30 m from the ram. The length and diameter of the delivery pipe is 100 m and 70 mm respectively. Calculate the efficiency of the hydraulic ram if the co-efficient of friction \((f) = 0.009\).
End Semester Examination, Dec. 2015
B. Tech. – Fourth / 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) Explain the term: Impact of jets
b) Explain function of nozzle.
c) Explain the governing of impulse turbine.
d) Explain unit quantities and specific quantities.
e) What is the function of draft tube?
f) What is pump and classify the pump?
g) What is negative slip in a reciprocating pump?
h) What is cavitation?
i) What is a reciprocating pump?
j) Define the term hydraulic accumulator.

\[2 \times 10\]

**PART-A**

Q.2 a) Obtain an expression for the force exerted by a jet of water on flat vertical plate moving in the direction of the jet.

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) Derive the expression for work done and efficiency of pelton wheel.

b) A double jet pelton wheel has specific speed of 16 and is required to deliver 1200 kW. The turbine is supplied through a pipe line from a reservoir whose level is 380 m above the nozzle. Allowing 8% for friction loss in the pipe, calculate the following:
   i) Speed in rpm
   ii) Diameter of the jet
   iii) Mean diameter of bucket circle.

\[10\]

Q.4 a) Explain the causes of cavitation, its harmful effects and prevention.

b) With the help of a neat sketch, explain the constructional detail of Kaplan turbine.

\[10\]

**PART-B**

Q.5 a) Draw and discuss the operating characteristic curves of a centrifugal pump.

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 1.5 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.

Q.6  a) What is a reciprocating pump? Describe the principle and working of a reciprocating pump with a neat sketch.

b) Find the maximum speed of a single acting reciprocating pump to avoid separation which occurs at 3.0 m of water (abs). The pump has a cylinder of diameter 10 cm and a stroke length of 20 cm. The pump draws water from a sump and delivers to a tank. The water level in the sump is 3.5 m below the pump axis and in the tank the water level is 13 m above the pump axis. The diameter and length of the suction pipe are 4 cm and 5 cm while of delivery pipe the diameter and length are 3 cm and 20 cm, respectively. Take atmospheric pressure head=10.3 m of water.

Q.7  a) Describe working of a hydraulic lift.

b) Find the efficiency of a hydraulic crane, which is supplied with 20 litre of water under a pressure of 8000 N/m² for lifting a weight of 100 kN through a height of 10 m.
End Semester Examination, Dec. 2015
B. Tech. – Third / 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 Briefly explain (any ten):
   a) Temperature stress.
   b) Flitched beam.
   c) Rankine theory of failure.
   d) Strain energy.
   e) Stress-strain diagram of brittle material.
   f) Lateral strain.
   g) Hoop stress.
   h) Pure bending and simple bending.
   i) Slenderness ratio and type of column.
   j) Closed coil spring.
   k) Centrifugal stress.

   \[ 2\times10 \]

PART-A

Q.2 A shaft is 2 m long and tapers uniformly from 10 cm diameter at one end to 5 cm diameter at other end. The longer end is firmly fixed and a twisting moment of \( 5 \, kN \cdot m \) is applied to the smaller end. Find the total angle of twist and the maximum shear strain induced. Assume \( G = 84 \, GPa \).

   \[ 20 \]

Q.3 Figure shows the state of stress at a point. Find the location of principal planes, principal stresses and maximum shear stress graphically.

   \[ 20 \]

Q.4 Explain in detail the theory of simple bending.

   \[ 20 \]
**PART-B**

Q.5 A beam 4\textit{m} in length is simply supported at the ends and carries a UDL of 5\textit{kN/m} length. Determine the strain energy stored in the beam. $E = 200\text{GPa}$, $I = 1200\text{cm}^4$. 

20

Q.6 A copper tube of 10\textit{cm} external diameter and 9.5\textit{cm} internal diameter is closely wound with a steel wire of 1\textit{mm} diameter under a tensile stress of 20\textit{MPa}. Find circumferential stress in the tube under an internal pressure of 2\textit{MPa}.

$E_s = 1.6E_c$, $\gamma_c = 0.3$.

20

Q.7 A tubular steel sturt is 6.5\textit{cm} external diameter. It is 2.5\textit{m} long and has hinged ends. The load is parallel to the axis but eccentric. Find the maximum eccentricity for crippling load of 0.75 of the Euler value, the yield stress being 320\textit{MPa}.

$E = 210\text{GPa}$

20
Q.1 Define following terms any ten:
   a) Poisson’s ratio
   b) Hook’s law
   c) Elasticity
   d) Temperature stresses
   e) Flitchel beam
   f) Torsional rigidity
   g) Proof resilience
   h) Hoop stress
   i) Slenderness ratio
   j) Helix angle of spring
   k) Difference between thick and thin cylinder.

Q.2 a) Calculate the stresses in the bar shown in figure. Take $E_{cu} = 105 \text{ GPa}$, $E_s = 200 \text{ GPa}$.

b) Draw and define Mohr’s Circle for biaxial like stress and condition $6_y < 6_x$.

Q.3 a) Two wooden planks $5\text{cm} \times 15\text{cm}$ each are connected together to form a cross-section of beam as shown in figure. If a bending moment of 3400 N-m is applied around the horizontal neutral axis, find the stresses at extreme fibers of the cross-section. Also calculate the total tensile force on the cross-section.
b) Explain bending of a beam with uniform curvature.

Q.4  a) What diameter of shaft will be required to transmit $80 \, kW$ at $80 \, r.p.m.$, if the maximum torque is 30% greater than the mean and the limit of torsional stresses is to be 56 MPa? Take $G = 84 \, GPa$.

b) Derive torsion formula for shaft of circular cross-section.

PART-B

Q.5  a) A steel specimen $1.5 \, cm^2$ in cross-section, stretches $0.005 \, cm$ over a $5 \, cm$ gauge length under an axial load of $30 \, kN$. Calculate strain energy stored in the specimen at this point.

b) Proof that load applied in case of sudden loading is half of load applied in case of gradual loading for the same elongation and strain energy.

Q.6  a) The shell of a boiler is $2 \, m$ in diameter and the plates are $2 \, cm$ thick. Calculate the safe working pressure in the boiler, assuming that the safe working stress for the shell plates is $70 \, MPa$. By how much percentage the working pressure will be reduced if the efficiency of the joints is 80%?

b) Derive the change in volume of the thin cylinder.

Q.7  a) A straight length of steel bar, $1.5 \, m$ long and $2 \, cm \times 0.5 \, cm$ section is compressed longitudinally until it buckles. Assuming Euler’s formulas to apply to this case, estimate the maximum central deflection before the steel passes the yield point of $320 \, MPa$. Take $E = 210 \, GPa$.

b) Explain Euler’s theory of buckling of columns.
Q.1 a) Explain the difference between continuous chip and continuous with built-up edge chip.
b) What are the desirable characteristics of cutting tool materials?
c) What are the various types of lathe accessories?
d) How will you classify machine tools? Explain.
e) Explain up-milling and down-milling.

PART-A

Q.2 a) Derive the expression for chip thickness ratio, rake angle and shear angle.

10

b) In an orthogonal cutting, if the uncut chip thickness is 1.25 mm and chip thickness after cutting is 2 mm, the tool bit has rake angle 10º, shear strength = 6000 kg/cm², width of cut = 10 mm, cutting speed = 30 m/min, and coefficient of friction = 0.9. Calculate the following:

i) Shear angle.
ii) Shear force.
iii) Friction angle.
iv) Cutting force.
v) Power of cutting.

2x5

Q.3 a) Explain various wear mechanism with reference to tool wear. Explain crater wear and flank wear in brief.

10

b) How do you define a tool life? Explain Taylor’s tool life equation in detail.

10

Q.4 a) Explain the term: “Total cost of machining”.

5

b) Derive an expression for optimum cutting speed in turning for maximum production rate.

15

PART-B

Q.5 a) Make a neat sketch of a milling machine and describe its constructional features.

12
b) Explain briefly the working principle of a shaper.

8

Q.6  a) What machining operations can be performed on a centre lathe? Explain plain turning, eccentric turning, form turning and drilling operation.
    15
    b) Derive an expression to determine the machining time on lathe.
    5

Q.7  a) What is twist drill? Make a neat sketch of a twist drill and explain its different parts.
    10
    b) Draw a neat sketch of a broach tool and explain its parts.
    10
Q.1 Explain the following:
   a) Kinematic chain.
   b) Mechanism.
   c) Circular pitch of a gear.
   d) Length of path of contact.
   e) Epicyclic gear train.
   f) Reverted gear train.
   g) Radial and offset follower.
   h) Classification of synthesis problem.
   i) Precision points in synthesis of mechanism.
   j) Kennedy’s theorem.

2x10

PART-A

Q.2 a) Differentiate between machine and structure.

6

b) Describe with the help of a neat sketch, one inversion of a single slider chain.

7

c) Find the degrees of freedom of the mechanism shown in the figure given below:

7

Q.3 a) Define the following gear terms:
   i) Tooth thickness  
   ii) Face of tooth  
   iii) Diametral pitch

2x3
b) Two involute gears in mesh have a module of \( 8\, mm \) and a pressure angle of 20°. The larger gear has 57 teeth and pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find the:

i) Contact ratio (the number of pairs of teeth in contact).
ii) Angle of action of the pinion and the gear wheel.
iii) Ratio of sliding to rolling velocity at the:
   i) Beginning of contact.
   ii) Pitch point.
   iii) End of contact.

Q.4  

a) An epicyclic gear train, as shown in the figure has a sun wheel S of 30 teeth and two planet wheels P-P of 50 teeth each. The planet wheels mesh with the internal teeth of a fixed annulus A. The driving shaft carrying the sun wheel transmits 4 \( KW \) at 300 \( rpm \). The driven shaft is connected to an arm which carries the planet wheels. Determine the speed of the driven shaft and the torque transmitted, neglecting any losses.

b) Derive an expression for speed ratio of a compound gear train having 6 gears with teeth \( T_1, T_2, \ldots, T_6 \). Gears 2x3 and gears 4x5 are compound gears. Gear 1 meshes with gear 2, 3 with 4 and 5 with 6.

**PART-B**

Q.5  

A cam is to be designed for an offset knife edge follower with constant velocity motion both in upward and return strokes. The details are: Base circle diameter of cam: 50 \( mm \), stroke of the follower: 45 \( mm \), outstroke in 60° cam rotation, dwell for next 60° and return in next 75° cam rotation. Design cam profile if offset of the follower is 10 \( mm \).

Q.6  

a) Explain the three parts of a synthesis problem.

b) Design a four bar mechanism to coordinate the input and output angles as follows:

Input angles: 15°, 30° and 45°.

Output angles: 30°, 45° and 60°.
Q.7  

a) Explain the instantaneous centre method of determining velocity of a point C on a link when velocities of two points A and B on the link are given.

b) The mechanism shown in the figure has following dimensions: \( OA = 300 \text{mm} \), \( AB = 600 \text{mm} \), \( AC = BD = 1.2 \text{m} \), \( OD \) is horizontal for the given configuration. If \( OA \) rotates at 200 \( \text{rpm} \) in clockwise direction, find:

i) Linear velocities of C and D.

ii) Angular velocities of links AC and BD.
End Semester Examination, Dec. 2015
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) Differentiate between fixed cost and variable cost.
   c) Explain the term ‘inventory’ and its types.
   d) What do you understand by term dispatching used in PPC?
   e) What are various types of variations in any process?

   4x5

PART-A

Q.2 a) Explain the procedure of ‘method study’ and also explain the various recording techniques.

   10

   b) How do you arrive at ‘standard time’ of any process? Explain various types of allowances used.

   10

Q.3 a) Explain economic order quantity (EOQ) graphically and algebraically.

   10

   b) Bajaj Scooters require 50000 units of clutch plates per year. Ordering cost is Rs.3/- per order. Inspection cost is Rs.12/- per order. Interest cost is Rs.0.06/- per unit per year. Obsolescence cost is Rs. 0.004/- per unit per year. Storage cost is Rs. 1000/- per year for 50000 units. Calculate.

      i) EOQ.
      ii) Number of orders per year.
      iii) Reorder period.

   10

Q.4 a) How do you arrive at per unit selling price of a manufactured item in terms of various costs associated in a manufacturing company?

   10

   b) ABC company plans to sell an article at a local market. The articles are purchased at Rs.5/-. The rent of factory is Rs.2000/-. The article selling price is Rs.9/-. Determine quantity required to break even. Also quantity required to earn profit of Rs.400/-.

   10

PART-B
Q.5  a) Explain the process of production planning and control (PPC). What are its main objectives?
   10  
b) Five jobs are to be processed on two machines M1 and M2 in the order M1-M2. Processing times are given as under.

<table>
<thead>
<tr>
<th>JOB</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</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 total elapsed time. Find total elapsed time and also idle time on M2. 10

Q.6  a) Explain the concept of quality control with its functions and objectives. 10
b) What are control charts? Distinguish between control charts for attributes and variables. 10

Q.7  Write short notes on any four:
   a) Principles of 5’s’.
   b) Kaizen.
   c) Taguchi techniques.
   d) Total quantity management (TQM).
   e) Just in time (JIT). 4x5
Q.1 Briefly explain the following:
   a) Transference of one force from one plane to another.
   b) Variation of tractive force.
   c) Secondary force and secondary balancing.
   d) Planes in gyroscopic study.
   e) Condition of stability of four wheeler.
   f) Centrifugal governor.
   g) Sensitiveness of a governor.
   h) Dynamic equilibrium.
   i) Principle of virtual work.
   j) Swaying couple.

2x10

PART-A

Q.2 a) Discuss balancing of several masses in different planes.
5
   b) A rotor has the following properties.
      \[ m_1 = 3 \text{kg}, \quad r_1 = 30 \text{mm}, \quad \theta_1 = 30^\circ \]
      \[ m_2 = 4 \text{kg}, \quad r_2 = 20 \text{mm}, \quad \theta_2 = 120^\circ \]
      \[ m_3 = 2 \text{kg}, \quad r_3 = 25 \text{mm}, \quad \theta_3 = 270^\circ \]
      Find the amount of counter mass at a radial distance of 35mm for static balance.
15

Q.3 a) Explain balancing of inline engines.
5
   b) A single cylinder reciprocating engine has a reciprocating mass of 60kg; the crank
      rotates at 60rpm and the stroke is 320mm; revolving mass 40kg at 160mm
      radius. If \(2/3\) of reciprocating parts and whole of the revolving parts are to be
      balanced, determine.
      i) Balance mass required at a radius of 350mm.
      ii) Total unbalanced force when \(\theta = 50^\circ\), where \(\theta\) is crank angle.
15

Q.4 a) Explain Gyroscopic effect in pitching of a Naval Ship.
5
b) The rotor of a marine turbine of moment inertia of $750 \text{ kg} \cdot \text{m}^2$ rotates at $3000 \text{ rpm}$ clockwise viewed from stern. If the ship pitches with angular simple harmonic motion having a periodic time of 16 second and amplitude of 0.1 radian. Find:
   i) Maximum angular velocity of rotor axis.
   ii) Maximum value of gyroscopic couple.

PART-B

Q.5 a) Derive the relation between height (h) of proell Governor and $(N^2)$ i.e. RPM$^2$.
   
   b) Each arm of a Proell governor is 240 mm long and each rotating ball has a mass of 3 kg. The central load acting on the sleeve is 30 kg. The pivots of the arms are 30 mm from axis of rotation. The vertical height is 190 mm. The extension links of lower arms are vertical and governor speed is 180 rpm. When sleeve is in mid position, determine tension in upper arms.

Q.6 a) Explain principle of super-position.
   
   b) $AD = 50 \text{ mm}$
   $AB = 40 \text{ mm}$
   $BC = 100 \text{ mm}$
   $DC = 75 \text{ mm}$
   $DE = 35 \text{ mm}$

   Determine the input torque on link AB for static equilibrium by any method.

Q.7 The turning moment diagram for a petrol engine is drawn to a vertical scale of $1 \text{ mm} = 500 \text{ N.m.}$ and horizontal scale of $1 \text{ mm} = 3^\circ$. The turning moment diagram repeats itself after every half revolution of crankshaft. The areas above and below the mean torque line are 260, -580, 80, -380, 870, and -250 mm$^2$. The rotating part has a mass of 55 kg and radius of gyration of 2.1 m. If the engine speed is 1600 rpm, determine the co-efficient of fluctuation of speed.
End Semester Examination, Dec. 2015
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 causes of stress concentration?
     b) What is Goodman line?
     c) What types of stresses are induced in shafts?
     d) How are commercial shafts made?
     e) What are functions of springs?
     f) Define spring index.
     g) Why are ball and roller bearing called antifriction bearings?
     h) What is hydrodynamic lubrication?
     i) What are advantages of helical gear over spur gear?
     j) What do you mean by ergonomic consideration in design?

PART-A

Q.2  a) A rotating bar made of 45C8 (Sut=630 N/mm²) is subjected to a completely reversed bonding stress. The corrected endurance limit of the bar is 315 N/mm². Calculate the fatigue strength of the bar for a life of 90,000 cycles.

b) What is difference between Gerber curve and Soderberg and Goodman lines?

Q.3  a) Describe the permissible shear stress as per the ASME code.
     b) A rotating shaft, 40 mm in diameter is made of steel FeE 580 (Syt=580 N/mm²). It is subjected to a steady torsional moment of 250 N-m and bending moment of 1250 N-m. Calculate the factor of safety based on:
        i) Max_m principal stress theory.
        ii) Max_m shear stress theory.

Q.4  a) Discuss the ripping phenomenon of leaf spring.
     b) It is required to design a helical compressor spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. Spring index is 6. Ultimate tensile strength and modulus of rigidity of spring material are 1090 and 81370 N/mm² respectively. Design the spring and calculate.
        i) Wire diameter.
        ii) Mean coil diameter.
        iii) Number of active coils.
        iv) Total number of coils.
        v) Force length of coil spring.
        vi) Pitch of the coil.

PART-B

Q.5  a) A ball bearing is subjected to a radial force of 2500 N and axial force of 1000 N. The dynamic load carrying capacity of bearing is 7350 N. The value of X and Y are 0.56 and 1.6 respectively. The Shaft is rotating at 720 rpm. Calculate the life of bearing.

b) Why is hydrostatic bearing called ‘externally pressurized’ bearing?
Q.6  a) In a pair of spur gears, the number of teeth on pinion and gear are 20 and 100 respectively. The module is 06 mm. Calculate:
   i) Centre distance.
   ii) Pitch circle diameter of pinion and gear.
   iii) Addendum and dedendum.
   iv) Tooth thickness.
   v) Gear ratio.

b) Why is the efficiency of worm gear drive low?

Q.7  a) Define ergonomics. Explain ergonomics and value engineering in design.

b) What is standardization? Explain various design considerations in casting.
End Semester Examination, Dec. 2015  
B. Tech. – Fifth Semester  
PRODUCTION ENGINEERING (M-504B)  

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) Explain part print analysis.
   b) Differentiate between jig and fixture.
   c) Enlist the various method for a manufacturing a gear.
   d) Explain the term friability and attrition for grinding process.
   e) Explain the function of stripper in sheet metal processes.
   f) Name the cutting and non-cutting press tool operations.
   g) Describe the degrees of freedom of a work piece located in space.
   h) Explain significance of tolerance stacking.
   i) State advantages of thread rolling over thread cutting.
   j) What is meant by clearance in sheet metal operations?  
   2x10

PART-A

Q.2  A batch of 1000 components of mild steel is to be produced from a blank of \(\phi 38 \times 128 \text{mm}\). Generate a process sheet for the components.

20

Q.3  a) Explain various types of locating devices used in jigs and fixtures.  
   12  
   b) What are different types of jig bushes used?  
   8

Q.4  a) Find the total force and dimensions of die and punch to produce a washer of 5 cm outside diameter with a 2.4 cm diameter hole from a material 4 cm thick and
having shear strength of $360 N/mm^2$.

b) Explain that various types of dies used in press working.

**PART-B**

Q.5  
a) How would you classify various grinding machines? Give applications of each type of grinding machine.  
10

b) Explain the each term in detail for following specification of grinding wheel- 51 A 36 L 5 V 23.  
10

Q.6 Write short notes on:

a) Gear manufacturing methods.  
10

b) Thread manufacturing methods.  
10

Q.7  
a) Explain various constituents of cost estimation.  
5

b) What is the machining time to turn the dimensions given in figure? The material is brass with high speed steel tool. Cutting speed is $100 m/minute$ and feed is $0.75 mm/revolution$.

15
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
METROLOGY MEASUREMENT AND CONTROL (M-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 a) Name any two angle measuring instruments.
b) What is tachometer?
c) What is function of transducer in metrology?
d) State the static characteristics of instruments.
e) Write the elements of control system.
f) What is bridge circuit?
g) How is flow measured?
h) What do you mean by second order system of instrument?
i) What is ADC converter?
j) Write Hurwitz criteria of stability.

PART-A

Q.2 a) Differentiate using sketches the measurements of inside and outside dimensions using a vernier calliper.
b) How is a sine bar specified?

Q.3 a) Explain with a neat sketch determination of force using a load cell.
b) Describe the working of a dynamometer.

Q.4 a) Describe piezoelectric transducers for measurement and give its application.
b) Define resistance, inductance and capacitance.

PART-B

Q.5 a) What do you understand by zeroth, first and second order measuring systems, explain with suitable examples?
b) What is meant by dynamic response of a measuring system?

Q.6 a) What do you mean by control system? Explain transfer function in brief.
b) Discuss the stability of close loop transfer function \( \frac{S + 3}{S^3 + 3S^2 - 4} \).

Q.7 Write short notes on any four:
a) Noise problem.
b) Shielding and grounding.
c) Signal and system analyzer.
d) Interfacing.
e) Data acquisition.
End Semester Examination, Dec. 2015  
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 feasibility study in design philosophy?  
b) What are the advantages of threaded joints?  
c) Define caulking and fullering.  
d) What are advantage and limitation of power screw?  
e) What are various mode of failure in case of riveted joints?  
f) Why are belt drive called flexible drives?  
g) Name the friction material used in clutch and brakes.  
h) What is self energizing brakes?  
i) What are various factor responsible for temperature rise in brakes?  
j) Write uses of clutch assembly.  
2x10

PART A

Q.2  
a) Explain the concept of brain storming.  
10  
b) Describe the following:  
i) Factor of safety  
ii) Detailed design  
10

Q.3 Determine the size of the bolts and the thickness of the arm for the bracket as shown in figure if it carries a load of 40 KN at an angle of 60° to the vertical. The material of the bracket and the bolt is same for which the safe stress can be assumed as 70, 50 and 105 MPa in tension, shear and compression respectively.

All Dimensions in mm
Q.4  a) Write short notes on:
   i) What is an eccentric riveted joint?
   ii) Explain different types of fastenings.
8
b) Two plates of 10 mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter; rivet pitch, strap thickness and efficiency of the joint. Take the working stresses in the tension and shearing as 80 MPa and 60 MPa respectively.
12

**PART-B**

Q.5  a) Derive the condition for transmission of maximum power in belt drive.
10
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.
10

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) Differentiate between brake and clutch.
5

Q.7  a) What is self energizing brake and when does brake becomes self locking?
6
b) A four wheeled automobile car has a total mass of 1000 kg. MI of each wheel about a transverse axis through CG is 0.5 kgM². Rolling radius of the wheel is 0.3 m. Rotating and reciprocating parts of engine and transmission system are equivalent to MI of 2.5 kgM², which rotates at five times the road-wheal speed. Car is travelling at a speed of 100 km/hr on the plane road. When the brakes are applied car deaccelerates at 4.9 m/s². There are brakes on all four wheels. Calculate:
   i) Energy absorbed by each brake.
   ii) Torque capacity of each brake.
14
Q.1
a) What is tolerance?
b) Define factor of safety.
c) Write the conditions for self-locking of power screw.
d) How will you designate ISO metric coarse threads?
e) What are advantages of welded joints compared with riveted joints?
f) What types of failures are in riveted joints?
g) Why are belt drives called flexible drives?
h) What are two theories applied to friction plates?
i) What is the function of clutch?
j) What is self energizing block brake?

PART-A
Q.2
a) Explain the concept of ‘problem identification’ in machine design.
b) Describe the shaft basic system for giving tolerances?

Q.3
a) What is threaded joint? What do you mean by bolt of uniform strength? Explain.
b) A double threaded power screw is used to raise a load of 5 kN. The nominal diameter is 60 mm and pitch is 9 mm. The threads are acme type (\( \theta = 29^\circ \)) and co-efficient of friction at the screw threads is 0.15. Neglecting collar friction. Calculate:
i) Torque required to raise the load.
ii) Torque required to lower the load.
iii) the efficiency of the screw for lifting load.

Q.4
a) Explain caulking and fullering process in riveted joint.
b) A welded connection as shown in figure is subjected to an eccentric force of 60 kN in the plane of welds. Determine the size of welds, if permissible shear stress for the weld is 100 N/mm². Assume static condition.

PART-B
Q.5  
a) Write advantages, disadvantages and applications of chain drives.  

b) It is required to select a V-belt drive to connect a 20 kW, 1440 rpm motor to a compressor running at 480 rpm for 15 hours per day. Space is available for a centre distance of approximately 1.2 m. Determine:  
i) Specification of belt.  
ii) Diameter of motor and compressor pulley.  
iii) Correct centre distance.  
iv) The number of belts.  

Q.6  
a) Why is heat dissipation necessary in clutches?  
b) A multi disk clutch consists of two steel disks with one bronze disk. The inner and outer diameters of the contacting surfaces are 200 and 250 mm respectively. The co-efficient of friction is 0.1 and maximum pressure between contacting surfaces is limited to 0.4 N/mm$^2$. Assuming uniform wear theory, calculate the required force to engage the clutch and the power transmitting capacity at 720 rpm.  

Q.7  
a) What is function of brake? State different types of brakes and give at least one practical example of each.  
b) An automobile vehicle weighing 13.5 kN is moving on a level road at a speed of 95 km/hr. When the brakes are applied, it is subjected to uniform deceleration of 6 m/sec$^2$. There are brakes on all four wheels. The tyre diameter is 750 mm. the kinetic energy of rotating part is 10 % of kinetic energy of moving vehicle. The mass of each brake drum assembly is 10 kg and specific heat capacity is 460 J/kg °C. Calculate:  
i) The braking time.  
ii) The braking distance.  
iii) Total energy absorbed by each brake.  
iv) Torque capacity of each brake.  
v) Temperature rise of brake drum.
End Semester Examination, Dec. 2015
B. Tech. – Sixth Semester
OPERATIONS RESEARCH (M-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) Name different mathematical techniques used in solving OR problems and discuss any one in brief.
b) Define slack variable, surplus variable and artificial variable.
c) What do you understand by queuing theory? What purpose can be achieved from the use of the concept?
d) How does PERT differ from CPM?
e) What is simulation? What are the reasons for using simulation?

Q.2 a) Explain the SIMON model types of decision making environment.

b) Define operations research. Discuss in detail the applications of OR in industry.

Q.3 a) Use M-method to solve the LLP:

\[ Z_{\text{min}} = 4x_1 + x_2 \]

Subject to:

\[ 3x_1 + x_2 = 3 \]
\[ 4x_1 + 3x_2 \geq 6 \]
\[ x_1 + 2x_2 \leq 4 \]
\[ x_1, x_2 \geq 0 \]

b) Explain the economic interpretation of dual variables.

Q.4 a) Determine the optimal assignment for the following problem:

<table>
<thead>
<tr>
<th>Jobs</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>26</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>13</td>
<td>28</td>
<td>4</td>
<td>26</td>
</tr>
<tr>
<td>C</td>
<td>38</td>
<td>19</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>D</td>
<td>19</td>
<td>26</td>
<td>24</td>
<td>10</td>
</tr>
</tbody>
</table>

b) Find the optimal transportation cost for the following:

<table>
<thead>
<tr>
<th>Supply</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>7</td>
<td>9</td>
<td>20</td>
</tr>
</tbody>
</table>

402/3
Q.5 a) The inter-arrival times at a tool crib is exponential with an average time of 12 minutes. The length of service is assumed to be exponentially distributed with the mean of 10 minutes. Determine:

i) Probability that arriving customer has to wait.

ii) Average queue length.

iii) Average time spent in the queue.

iv) The fraction of day, an operator is idle.

v) Probability that six or more customers will be waiting for service.

10

PART-B

b) What are the elements of queuing system? What do they signify?

5

Q.6 A project has the various activities and corresponding duration as follows:

<table>
<thead>
<tr>
<th>Activities (1-2)</th>
<th>1-3</th>
<th>1-4</th>
<th>2-4</th>
<th>2-5</th>
<th>3-4</th>
<th>3-6</th>
<th>4-7</th>
<th>5-7</th>
<th>6-7</th>
<th>6-8</th>
<th>7-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>13</td>
<td>15</td>
<td>09</td>
<td>10</td>
<td>27</td>
<td>07</td>
<td>18</td>
<td>30</td>
<td>12</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Draw the network of the project and find its duration.

20

Q.7 a) What are random numbers? Why are random numbers useful in simulation studies?

10

b) The sale of items/units depends on demand (daily basis) which has the following distribution:

<table>
<thead>
<tr>
<th>Sales (items/units)</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.10</td>
<td>0.15</td>
<td>0.20</td>
<td>0.35</td>
<td>0.15</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Using the sequence, simulate the sales for the next 10 days.

Random no. 10, 99, 65, 99, 95, 01, 79, 11, 16, 20

10
End Semester Examination, Dec. 2015
B. Tech. – Fifth / Sixth 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) Engineering design is iterative process. Comment.
b) Give the benefits of integrated CAD/CAM system.
c) Define synthetic curves.
d) Define approximation splines.
e) Define the term fixed zero and floating zero.
f) What are canned cycles?
g) What is CNC?
h) Define adaptive control.
i) Name different types of CAPP systems.
j) What is transfer line?

2x10

PART-A

Q.2 a) List the various factor which one must consider before implementing CAD/CAM in a medium scale industry. Also explain the domain where it is going to have direct impact.
10
b) Explain different types of transformations and derive their mathematical matrix notations.
10

Q.3 a) What are the important properties for curves designing?
10
b) Four vertices of Bezier polygon are \( P_0 (1,1), P_1 (2,3), P_2 (4,3) \) and \( P_3 (3,1) \). Determine seven points on the Bezier curve.
10

Q.4 a) Explain in detail the CSG approach for the creation of solid models.
10
b) Make a comparative analysis of the wire frame, surface and solid modeling.
10

PART-B

Q.5 a) What is DNC system? Explain its types in detail with the help of suitable diagrams.
10
b) Explain the function of MCU in NC machine tools. What is the role of PLC in CNC systems?
10
Q.6  
a) With the aid of neatly labelled diagrams, explain drive surface, check surface and part surface.  
10  
b) From a shaft 25\,mm diameter, make a stepped shaft with dimensions as shown in the figure below. Take speed = 3000 rpm and feed = 30\,mm/min.

Q.7  
a) Describe the purpose of process planning. How are computers used in such planning?  
10  
b) What is meant by concept of group technology? Explain the OPITZ coding scheme with the help of an example.  
10
End Semester Examination, Dec. 2015
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 meant by overall heat transfer coefficient?
     b) Explain the Fourier rate equation for heat transfer by conduction.
     c) Define thermal capacity of a material.
     d) Define efficiency of fin.
     e) What is an error function?
     f) What is lumped system analysis?
     g) Define Rayleigh number.
     h) Define shape factor.
     i) Define radiation heat transfer.
     j) What is a heat exchanger?

   2x10

   PART-A

Q.2  a) Derive an expression for temperature distribution under one dimensional steady state heat conduction through a long hollow cylinder.
     b) A mild steel tank of wall thickness 12 mm contains water at 95 °C. The thermal conductivity of mild steel is 50 W/m °C, and the heat transfer coefficients for the inside and outside the tank are 2850 and 10 W/m² °C, respectively. If the atmospheric temperature is 15 °C, calculate:
        i) The rate of heat loss per m² of the tank surface area.
        ii) The temperature of the outside surface of the tank.

   10

Q.3  a) Derive an expression for temperature distribution and heat dissipation in a straight fin of rectangular profile for fin losing heat at the tip.
     b) Which of the following arrangement of pin fins will give higher heat transfer rate from a hot surface?
        i) 6 fins of 10 cm length.   ii) 12 fins of 5 cm length.
        The base temperature of the fin is maintained at 200 °C and the fin is exposed to a convection environment at 15 °C with convective coefficient 25 W/m² °C. Each fin has cross-sectional area 2.5 cm², perimeter 5 cm and is made of a material having thermal conductivity 250 W/m °C. Neglect the heat loss from the tip of fin.

   10

Q.4  a) Explain the significance of error function in a semi-infinite body in a transient state.
     b) What are the assumptions for lumped capacity analysis.
     c) The initial uniform temperature of a large mass of material (α = 0.42 m²/h) is 120 °C. The surface is suddenly exposed to and held permanently at 6 °C.
Calculate the time required or the temperature gradient at the surface to reach 400°C/m.

**PART-B**

Q.5  a) Derive energy equation for thermal boundary layer over a flat plate.  
     b) A heat-treat steel plate measures 3m×1m and is initially at 30°C. It is cooled by blowing air parallel to 1m edge at 9 km/hr. If the air is at 10°C, calculate the convective heat transfer from both sides of the plate.

Q.6  a) Derive a general relation for the radiation shape factor in case of radiation between two surfaces. 
     b) A black body of 0.2 m² area has an effective temperature of 800 K. Calculate:
       i) The total rate of energy emission. 
       ii) The intensity of normal radiation. 
       iii) The intensity of radiation along a direction 60° to the normal. 
       iv) The wavelength of maximum monochromatic emissive power.

Q.7  a) Differentiate between the mechanism of filmwise and dropwise condensation. 
     b) Define heat exchanger effectiveness. 
     c) A counter-flow concentric tube heat exchanger is used to cool the lubricating oil of a large industrial gas turbine engine. The oil flows through the tube at 0.19 kg/s \( (C_p = 2.18 \text{ kJ/kg} \text{ K}) \), and the coolant water flows in the annulus in the opposite direction at a rate of 0.15 kg/s \( (C_p = 4.18 \text{ kJ/kg} \text{ K}) \). The oil enters the coolant at 425 K and leaves at 345 K, while the coolant enters at 285 K. How long must the tube be made to perform this duty if the heat transfer coefficient from oil to tube surface is 2250 W/m² K and from tube surface to water is 5650 W/m² K? The tube has a mean diameter of 12.5 mm and its wall presents negligible resistance to heat transfer.
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 different types of variable stresses? Define mean and amplitude stress.
b) Explain Gerber criteria for fatigue design.
c) What are the functions of key?
d) What types of stresses are induced in shafts?
e) Write the applications of spring.
f) What are nipping and surging in spring?
g) What is partial journal bearing?
h) Define dynamic load carrying capacity of ball bearing.
i) State law of gearing.
j) What are design considerations for machining?

Q.2 a) Explain fatigue loading. What is notch sensitivity?
b) A machined component is subjected to a fluctuating stress that varies from 40 to 100 \text{ N/mm}^2. The corrected endurance limit stress for the machined component is 270 \text{ N/mm}^2. The ultimate tensile strength and yield strength of the material are 600 \text{ N/mm}^2 and 450 \text{ N/mm}^2 respectively. Find the factor of safety using:
   i) Gerber theory
   ii) Soderberg line
   iii) Goodman line.
   Also, find the factor of safety against static failure.

Q.3 a) The standard X-section for a flat key which is fitted on a 50 mm diameter shaft is 16 \times 10 \text{ mm}. The key is transmitting 475 Nm torque from the shaft to hub. The key is made of commercial steel \( S_{yc} = S_{yc} = 230 \text{ N/mm}^2 \). Determine the length of key if factor of safety is 3.
b) A hollow transmission shaft is having inside diameter 0.6 times the outside diameter. It is made up of plain carbon steel 40C8 \( (S_{yt} = 380 \text{ N/mm}^2) \) and the factor of safety is 3. A belt pulley, 1000 mm in diameter is mounted on the shaft, which overhangs the left hand bearing by 250 mm. The belts are vertical and transmit power to the machine shaft below the pulley. The tensions on the tight side and slack sides of belt are 3 kN and 1 kN respectively while the weight of the pulley is 500 N. The angle of wrap of the belt on the pulley is 180 degree. Calculate the inside and outside diameters of the shaft.

Q.4 a) A safety valve, 40 mm in diameter, is to blow off at a pressure of 1.2 MPa. It is held on its seat by means of a helical compression spring, with initial compression of 20 mm. The maximum lift of the value is 12 mm. The spring index is 6. The spring is made of cold drawn steel wire with ultimate tensile strength of
The permissible shear stress can be taken 50\% of strength, \( G = 81370 \, N/mm^2 \). Calculate:
i) Wire diameter      ii) Mean coil diameter      iii) No. of active coils  15
b) What is leaf spring? Define the terms associated with it.  5

**PART-B**

Q.5  a) A deep groove ball bearing subjected to radial load of 6 \( kN \) is expected to have a life of 10,000 \( hrs \) at 1500 \( rpm \) with a reliability 99\%. Calculate the dynamic load capacity of the bearing so that it can be selected from the manufacturer’s catalogue based on reliability 90\%.  12
b) Briefly describe reasons of failure of sliding contact bearings.  8

Q.6  a) What are the advantages of helical gear over spur gear? Compare the contact between their mating teeth.  6
b) A pair of spur gears with 20\(^\circ\) full depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 \( mm \) while the face width is 40 \( mm \). Pinion rotates at 1450 \( rpm \) and the service factor for the application is 1.75. Assume that velocity factor accounts for dynamic load and factor of safety is 1.5. Design spur gear. \( S_{ut} = 600 \, MPa \)  14

Q.7  a) What is standardization? Write the principles of design for manufacture and assemblies.  10
b) Write a short note on design considerations for forging.  10
End Semester Examination, Dec. 2015
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) Define indicated thermal efficiency and brake thermal efficiency.
     b) Mention the various assumptions made in air-standard cycle analysis.
     c) What is carburetion? What are the factors that affect the process of carburetion?
     d) Define stoichiometric mixture, rich mixture and lean mixture.
     e) What are the factors that affect delay period?
     f) What are the functions of lubrication?
     g) Why a cooling system is required?
     h) List various methods available for finding friction power of an engine.
     i) Define brake mean effective pressure.
     j) What are pumping losses?  

**PART-A**

Q.2  a) Explain stirling cycle with the help of P-V and T-S diagrams.  
     b) A 4-strok, 4 cylinder diesel engine running at 2000 rpm develops 60 kW. Brake thermal efficiency is 30 % and calorific value of fuel is 42 MJ/kg. Engine has a bore of 120 mm and stroke of 100 mm. Take $\rho_a = 1.15$ kg/m$^3$; air-fuel ratio=15:1 and $\eta_{th} = 0.8$. Calculate:
       i) Fuel consumption (kg/s).
       ii) Air consumption (m$^3$/s).
       iii) Indicated thermal efficiency.
       iv) Volumetric efficiency.  

Q.3  a) What is the main function of a spark plug? Draw a neat sketch of a spark plug and explain its various parts.
     b) What are the requirements of an injection system?

Q.4  a) Compare knocking in C. I. engine with the phenomenon of detonation in S.I. engine.
     b) Explain flame propagation in S. I. engine.  

**PART-B**

Q.5  a) What are the various desired properties of lubricating oil?
     b) How the lubricating oils are graded as per SAE rule?

Q.6  a) What factors are required to evaluate performance of an engine?
     b) Find the brake specific fuel consumption in kg/kWh of a diesel engine whose fuel consumption is 5 grams per second when the power output is 80 kW. If the mechanical efficiency is 75 %, calculate the indicated specific fuel consumption.
Q.7  a) Describe with a neat sketch the working of a simple constant pressure open cycle gas turbine.

b) Describe briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine.
End Semester Examination, Dec. 2015  
B. Tech. – Sixth Semester  
POWER PLANT ENGINEERING (M-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) What are primary and secondary sources of energy?  
b) What is meant by working fluid in power plants?  
c) What is reheat-regenerative cycle?  
d) What are prime mover selection factors for a hydro electric power plant?  
e) What is pressurized water reactor?  
f) What is flat demand rate type of tariff system?  
g) What is load curve?  
h) What are combination cycle?  
i) What are the main fuels which are used for gas turbine plants?  
j) Classify hydro electric plants.  

PART-A

Q.2  
a) Describe the Rankine cycle as applied to a system using super-heated steam. What is the utility of this cycle in the study of steam power plants?  
b) Give flow-sheet or layout of 100 MW steam power station indicating major components. What are the main steps involved in the design of a steam power station?  

Q.3  
a) Name the various methods of ash handling. Describe the pneumatic system of ash handling.  
b) What are the essential elements of hydroelectric plant? Describe the different types of dams used for such plants and discuss the conditions under which each type can be used.  

Q.4  
Explain in detail the setup, site location requirement, working and principle of operation with a neat diagram of modern thermal power plants.  

PART-B

Q.5  
a) Compare the gas turbine plants with steam turbine plants and diesel power plants.  
b) In a gas turbine plant, working on Brayton cycle with regenerator of 75 % efficiency the air at the inlet to the compressor is at 0.1 MPa, 30º C the pressure ratio is 6 and the maximum cycle temperature is 900º C. If the turbine and compressor have each an efficiency of 80 %, find the percentage increase in the cycle efficiency due to regeneration.  

Q.6  
a) How CANDU type reactor differs from PWR? Draw a neat diagram of CANDU type reactor and give its advantages and disadvantages over other types.  
b) Discuss the advantages and disadvantages of nuclear power plants as compared with conventional power stations.
Q.7  a) A thermal power plant supplies the following loads 500 kW, 540 kW, 250 kW and 170 kW, and has a maximum demand of 750 kW. The energy supplied per annum is $1.64 \times 10^5$ KW-hr.

Calculate:

i) Annual load factor.
ii) Diversity factor.
iii) Demand factor.

b) Explain in detail about performance and operating characteristics of power plants.
End Semester Examination, Dec. 2015
B. Tech. – Sixth Semester
AUTOMOBILE ENGINEERING (M-624)

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 answer of the following:
   a) Name four ways of classification of automobiles.
   b) What is preventive safety design of automobile body?
   c) Where are electromagnetic clutch used and why?
   d) What is the function of torsional spring in friction plate?
   e) What are the advantages of synchromesh gearbox?
   f) What is brake dip?
   g) What is the function of steering gear?
   h) What are the primary and secondary brakes?
   i) What is tyre carcass?
   j) What chemical reaction takes place in lead acid battery? 2x10

PART A

Q.2 a) Draw a schematic diagram showing the layout of the transmission system of a rear wheel driven car and explain the importance of each component. 10
b) Discuss various styles of car bodies giving examples. 10

Q.3 a) Explain the construction, working and operation of a diaphragm clutch. Draw the diaphragm clutch in disengaged position. 10
b) Where and why do we use multiple clutches? Explain its working with the help of a neat sketch. 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) Sketch general arrangement of a live rear axle and identify various loads that it has to withstand. 10

PART B

Q.5 a) Explain the terms: comber, castor, steering axis inclination and toe in. What are the effects of each on the steering characteristics of a vehicle? 10
b) With the help of a neat sketch explain the working and functioning of rack and pinion type of steering gear. 10

Q.6 a) Describe the construction and working of drum brakes. Compare the same in details with the disc brakes. 10
b) Draw a neat sketch of tyre section and then explain the importance of each part. 10

Q.7 a) Discuss the different sources of atmospheric pollution from the automobile. Also explain how pollution can be reduced from these source. 10
b) Explain the exhaust gas recirculation system with the help of a neat sketch.
End Semester Examination, Dec. 2015
B. Tech. – Seventh / Eighth Semester
SOLAR ENERGY AND ITS APPLICATIONS (M-626)

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 air-mass ratio.
       b) Describe Reynolds number and its usefulness.
       c) Define convection.
       d) Give applications of flat plate collector.
       e) Why solar radiations is treated as mono directional radiation.
       f) Give the names of different types of solar collectors.
       g) Define altitude angle.
       h) List the material used in construction of flat plat collector.
       i) State why the solar constant is not a constant.
       j) Explain scattered radiation.

2x10

PART-A

Q.2 a) What is spectrum? Explain the difference between terrestrial and extraterrestrial spectrums.
     10
     b) Calculate the declination angle (S) for March 31 in a leap year.
     10

Q.3 a) Explain working principle of pyranometer with a neat diagram. Also explain its limitations.
     15
     b) Explain in detail solar constant.
     5

Q.4 a) Describe in brief:
     i) Difference between direct and scattered radiation.
     5
     ii) Define and explain convection.
     5
     b) Describe in brief the community heating and cooling system.
     10

PART-B

Q.5 a) Describe in detail the latent heat storage with a neat sketch.
     12
     b) Mention the materials used and its applications.
     8

Q.6 a) Describe in detail the solar gas absorption refrigeration scheme with heat layout and also give its applications.
     20

Q.7 a) Discuss in detail the process of sensible heat storage with water.
     10
     b) Mention the characteristics of thermal energy storage.
     10

416/3
End Semester Examination, Dec. 2015  
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 briefly:
   a) If the refrigerant is designated as R-11, R-22, R-718 and R-729, find the chemical formula.
   b) Define specific humidity and relative humidity.
   c) What do you understand by ‘cryogenics’?
   d) Sketch ‘comfort chart’ and show on it the ‘comfort zone’.
   e) Define the following:
      i) Refrigeration.
      ii) Unit of refrigeration.
      iii) Refrigerated system.
      iv) Sensible heating.

5x4

PART-A

Q.2 a) Derive an expression for C.O.P. for reversed Brayton cycle or Bell-Coleman cycle.  
10
b) State and briefly explain the various methods of refrigeration.  
10

Q.3 A simple air cooled system is used for an aeroplane having a load of 9 tonnes. The atmospheric pressure and temperature are 0.9 bar and 10°C respectively. During ramming pressure increases to 1.013 bar. In the heat exchanger, the temperature of air is reduced by 55°C. The pressure in the cabin is 1.01 bar and the temperature of the air leaving the cabin is 25°C. Determine:
   i) Power required to take the load of cooling in the cabin.
   ii) C.O.P. of the system.  
20

Q.4 a) Draw a neat diagram of ‘Electrolux refrigerator’ and explain its working principle. What is the important role of hydrogen in this refrigeration system?  
15
b) What are the advantages of dry compression over wet compression?  
5

PART-B

Q.5 a) Atmospheric air at 1.013 bar and 35°C has a relative humidity of 60%. The saturation pressure of water vapour at 35°C is 5.628 kPa then find specific
humidity of moist air.

10

b) Explain the difference between summer air-conditioning and winter air conditioning.

10

Q.6 Describe briefly the following:
i) Water cooled condensers.
ii) Automatic expansion valve.

10x2

Q.7 The following data is available for designing on air conditioning system for a hall.
Inside conditions — 23°C DBT, 65% RH
Outdoor conditions — 37°C DBT, 28°C WBT
Sensible heat load in room — 45.5 kW
Latent heat load in room — 11.5 kW
Total infiltration air — 1150 m³/h
Apparatus dew point — 9°C
Quantity of recirculated air from hall — 60%

If the quantity of recirculated air is mixed with the conditioned air after cooling coil, determine:
a) The condition of air before entering the hall.
b) The bypass factor of cooling coil.
c) The refrigeration load on the cooling coil in tones of refrigeration.

20
Q.1  
a) Write the chemical formula for the following refrigerants:  
R – 11, R – 12, R – 21, R – 717
b) Define wet bulb temperature, Dry bulb temperature and Dew point temperature.
c) State and explain the factors which affect the comfort.
d) What do you mean by Cascade refrigeration system?
e) Define the following:
   i) Humidification.
   ii) Refrigeration effect.
   iii) By pass factor.
   iv) Relative humidity.

PART-A

Q.2  Describe with a schematic diagram and T-S representation of the processes of boot-strap evaporation type aircraft refrigeration system.

Q.3  
a) Describe the working of a steam jet refrigeration system with the help of a neat sketch.
b) What is simple vapour absorption system? Write the formula of its C.O.P.

Q.4  
a) Discuss briefly the properties of refrigerants.
b) A refrigerator works between –7ºC and 27ºC. The vapour is dry at the end of adiabatic compression. There is no under-cooling and expansion in by throttle value. Determine:
i) C.O.P.
ii) Power of compressor to remove 180kJ/min.

The properties of refrigerant are as under:

<table>
<thead>
<tr>
<th>Temp. (ºC)</th>
<th>Enthalpy (kJ/kg)</th>
<th>Entropy (kJ/kg-k)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid ($h_l$)</td>
<td>Latent ($h_{fg}$)</td>
</tr>
<tr>
<td>–7</td>
<td>–30</td>
<td>1298</td>
</tr>
<tr>
<td>27</td>
<td>115</td>
<td>1173</td>
</tr>
</tbody>
</table>

PART-B

Q.5  Explain the following with a neat sketch:
a) Flooded type evaporator.
b) Capillary tube.
c) Air cooled condenser.
d) Rotary compressor.

Q.6  a) Derive an expression for specific humidity and show that it is function of vapour pressure and barometric pressure of air.
     b) Explain with a neat diagram the working of central system air-conditioning.

Q.7 The following data relate to a conference room for seating 80 persons:

   Inside design condition  –  22ºC DBT, 55% RH
   Outside design condition –  38ºC DBT, 28ºC WBT
   Sensible and latent heat load per person – 75W and 45W respectively
   Light and fan loads – 12000W

Sensible heat gain through glass:
   Wall, ceiling etc – 12000W
   Air infiltration – 18m³/min
   Fresh air supply – 80m³/min
   By pass factors of coils – 0.1

If two-third of recirculated room air and one third of fresh air are mixed before entering the cooling coils, determine:
   i) Apparatus dew point.
   ii) Grand total heat load.
   iii) Effective room sensible heat factor.
Q.1 Answer the following questions:
   a) Distinguish between traditional and unconventional machining methods.
   b) State the mechanism of material removal of USM.
   c) State the application of AJM.
   d) Comment on “MRR is independent of mechanical or physical properties of the work material during ECM”.
   e) State the principle of chemical machining.
   f) State the characteristics of the EDM tool electrodes.
   g) Name the different types of LASER used in machining.
   h) What are the transferred type and non-transferred type plasma arc systems in PAM?
   i) State the basic principle mechanism of material removal in EBM.
   j) How does spark occur in electro-chemical spark machining?

Q.2 Compare and analyse the unconventional machining processes based on:
   a) Physical parameters.
   b) Capacity to shape.
   c) Machining characteristics.

Q.3 a) Explain with a neat diagram, the working of WJM.
   b) Write short notes on the following:
      i) Function of slurry, transducer and concentrator in USM.
      ii) Principle mechanism of material removal in AJM.

Q.4 Explain the principle of electro-chemical machining. Using suitable notations, establish the relationship of the electrode feed rate theoretically in an ECM.

Q.5 Explain the effect of the following process parameters on MRR of EDM:
   a) Current in each spark.
   b) Frequency of the discharge.
   c) Gap setting.
   d) Dielectric flushing conditions.

Q.6 a) Explain in brief the production of LASER beam along with working principle.
   b) Explain with a neat diagram the electron-gun assembly of EBM.

Q.7 Write short notes on:
   a) Electro-chemical spark machining.
b) Electro-stream drilling.
End Semester Examination, Dec. 2015  
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) Form the differential equation by:  
\[ y = Ax + A^2 \]  
2  
b) Define the different methods of measuring dispersion.  
3  
c) Two coins are tossed together. Describe the sample space.  
3  
d) Write down the definition of vector and scalar quantities.  
2  
e) State the fundamental theorem of calculus.  
2  
f) Find: \( \int x^2 \cdot e^x \, dx \).  
4  
g) Find the area included between the parabola \( y^2 = 4ax \) and its latus rectum.  
2  
h) Write down the equation of first order and first degree.  
2

PART-A

Q.2  
a) Evaluate: \( \int \sin^{-1} \frac{x^2}{a^2} \).  
6  
b) Evaluate: \( \int_1^2 (x + x^2) \, dx \) as a limit of sum.  
6  
c) Prove that \( \int_0^\pi \frac{x \tan x}{\sec x + \cos x} \, dx \) is a finite integral.  
8

Q.3  
a) Find the area bound by \( y^2 = 9x \) and \( x^2 = 9y \).  
10  
b) Find the area of region bounded by:
Q.4  
   a) Solve: \((x+1) \frac{dy}{dx} + x(y^2 + 1)\).

   b) Solve the Homogeneous equation:
   \[
   \frac{dy}{dx} = \frac{y}{x} + x \sin \frac{y}{x}
   \]

**PART-B**

Q.5  
   a) Find the variance and standard deviation for the following set of numbers 25, 30, 45, 30, 70, 42, 36, 48, 34, 60.

   b) The mean and variance of 7 observations are 8 and 16 respectively. It five of the observations are 2, 4, 10, 12 and 14 find the remaining two observations.

Q.6  
   a) A card is drawn at random from an ordinary deck of 52 playing cards. Find the probability that its is i) an ace, ii) a jack of hearts iii) a six of diamonds iv) a heart.

   b) A ball is drawn from a bag containing 5 white and 7 black balls.
   i) What is the probability of drawing a white ball?
   ii) What are the odds against drawing a white ball?
   iii) If two balls are drawn simultaneously what is the probability that both balls are white.

Q.7  
   a) Find the angle between two vectors \( \vec{a} \) and \( \vec{b} \) with magnitude 1 and 2 respectively and such that \( \vec{a} \cdot \vec{b} = 1 \).

   b) Find \( \vec{a} \times (\vec{b} \times \vec{c}) \). If \( \vec{a} = \hat{i} + \hat{j} + \hat{k} \), \( \vec{b} = \hat{i} + 2\hat{j} + 3\hat{k} \) and \( \vec{c} = 2\hat{i} + \hat{j} + 4\hat{k} \)
End Semester Examination, Dec. 2015  
B. Tech. – First Semester  
APPLIED MATHEMATICS-I (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 the convergence of the following series:  
\[ 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} \ldots \ldots \ldots \ldots \infty \]

b) State the necessary condition for a series to be convergent.

c) If \( y = (ax + b)^{n-2} \), find \( y_{n+1} \).

d) Expand \( f(x) = \log(1 - x) \) in the powers of \( x \).

e) If \( z = \log(y), \tan^{-1}(x^2 - y^2) \), find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \).

f) If \( u = \cos ec^{-1} \left[ \frac{1}{x^2 + y^2} \right]^\frac{1}{2} \), find \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \)

g) Using double integral, find the area of the curve \( x + y \leq a \).

h) If \( \vec{F} = xz \hat{i} + 3x^2 \hat{j} + (xz^2 + y^2 z) \hat{k} \), find \( \nabla \times \vec{F} \).

i) If \( \phi = (x^2 + y^2 + z^2 - 3xyz) \) find grad \( \phi \).

j) Solve: \( x^2 dy + y^2 dx = 0 \).

PART-A

Q.2  
Discuss the convergence of the series:

a) \[ 1 + \frac{1}{2} + \frac{1.3}{2.4} + \frac{1.3.5}{2.4.6} + \ldots \ldots \ldots \ldots \infty \]

b) \[ \sum_{n=1}^{\infty} 3\sqrt{n^3 + 1} - n \] or \[ \sum_{n=1}^{\infty} (n^3 + 1)^\frac{1}{n} - n \]

c) \[ \sum_{n=1}^{\infty} \frac{(n+1)^n}{n^{n+1}} x^n \]

Q.3  
a) By forming a differential eq., prove that \( \cos(m \sin^{-1} x) = 1 - \frac{m^2}{2!} x^2 - \frac{m^2(2^2 - m^2)}{4!} \ldots \ldots \ldots \infty \)

b) Expand \( f(x) = \cos x \) in the powers of \( \left( x - \frac{\pi}{6} \right) \). Hence find \( \cos 32^\circ \) correct to three decimal places.
Q.4  a) If \( u = \tan^{-1}\left[ \frac{x^2 - y^2}{x - y} \right] \), prove that \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \sin 2x \)  

b) If \( x = r \sin \theta \cos \phi; y = r \sin \theta \sin \phi; z = r \cos \theta \), then find \( \frac{\partial (x, y, z)}{\partial (r, \theta, \phi)} \)  
c) Find the extreme value of the function: \( x^3 + y^3 - 3axy \).

PART-B

Q.5  a) Evaluate: \( \int_{x=0}^{x=a} \int_{y=0}^{2y-x} x y dy dx \) by changing the order of integration.  
b) Prove that \( \Gamma\left( \frac{1}{2} \right) = \sqrt{\pi} \)  
c) Find the volume of sphere \( x^2 + y^2 + z^2 = a^2 \) by using triple integral.

Q.6  a) If \( \vec{r} = x\hat{i} + y\hat{j} + z\hat{k} \), show that  
i) \( \nabla r^n = nr^{n-2}\vec{r} \)  
ii) \( \nabla \left( \frac{1}{r^2} \right) = \frac{-2\vec{r}}{r^4} \) where \( |\vec{r}| = r \)  
b) If \( \vec{F} = (2x^2 - 3z)\hat{i} - 2xy\hat{j} - 4x\hat{k} \); evaluate \( \iiint_v (\nabla \cdot \vec{F}) dv \), where \( v \) is bounded by the planes \( x = 0; y = 0; z = 0 \) and \( 2x + 2y + z = 4 \)

Q.7  a) Solve: \( \frac{d^2 y}{dx^2} + 4y = e^x + \sin 2x \)  
b) Solve: \( \frac{dx}{dt} + y = \sin t \); \( \frac{dy}{dt} + x = \cos t \), given that, when \( t = 0; x = 2 \) and \( y = 0 \).
Q.1  a) Discuss the convergence of sequence \( u_n \) where 
\[ u_n = 1 + \frac{1}{3} + \frac{1}{3^2} + \ldots + \frac{1}{3^n} \]

b) Define Leibnitz test.

c) Expand \( a^{x+y} \) up to \( h^2 \).

d) Find degree of \( f(x, y) = (x^{1/2} + y^{1/2})(x^n + y^n) \).

e) If \( u = xe^y z \) where \( y = \sqrt{a^2 - x^2}, z = \sin^2 z \) find \( \frac{dy}{dx} \).

f) Find grad \( \phi \) when \( \phi \) is given by \( \phi = 3x^2 y - y^3 z^2 \).

g) Solve: \( ye^x dx + (xe^y + 2y) dy = 0 \)

h) Solve: \( \frac{d^2 x}{dt^2} + 6 \frac{dx}{dt} + 9x = 0 \)

i) Change the order of integration.
\[ \int_{0}^{2} \int_{x}^{y} \frac{x}{y} dy dx \]

j) Find \( \frac{\sqrt{5}}{6} \)

PART-A

Q.2  a) Discuss the convergence of the following series.
\[ \left( \frac{1}{3} \right)^2 + \left( \frac{1.2}{3.5} \right)^2 + \left( \frac{1.2.3}{3.5.7} \right)^2 + \ldots + \left( \frac{1.2.3.4}{3.5.7.9} \right)^2 + \ldots \]

b) Find the interval of convergence of the series:
\[ x - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} + \ldots \]

Q.3  a) Expand \( \log \left[ x + \sqrt{1 + x^2} \right] \) by forming a differential equation.

b) Compute value of \( \sin 31^\circ \) upto 3 decimal places.

c) Prove \( \log \left( \frac{\tan x}{x} \right) = \frac{x^2}{3} + \frac{7}{90} x^4 + \ldots \)

Q.4  a) If \( u = f(y - z, z - x, x - y) \) prove \( \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0 \).
b) Find shortest and the largest distance from the point $(1,2,-1)$ to the sphere $x^2 + y^2 + z^2 = 24$. 

$$
c) 
\text{If } u = \cos^{-1}\left(\frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}\right)^{1/2} \text{. Prove that } x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial y^2} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{144}{\tan u} \left(13 + \tan^2 u\right) \text{.}
$$

\text{PART-B}

Q.5  
\begin{align*}
a) & \text{Evaluate } \iint r dr d\theta \text{ over one loop of the lemniscates } r^2 = a^2 \cos 2\theta. \\
b) & \text{Change the order of integration in the following integral and evaluate. } \\
& \int_{0}^{\pi/2} \int_{r^2=a^2}^{4a^2 \cos^2 \theta} r dr dx \\
c) & \text{Evaluate } \int_{0}^{\pi/2} \sqrt{\tan \theta} d\theta
\end{align*}

Q.6  
\begin{align*}
a) & \text{Evaluate } \int_{S} \vec{F} \cdot d\vec{s} \text{ where } \vec{F} = 2x^2 y \hat{i} - y^2 \hat{j} + 4xz^2 \hat{k} \text{ and } S \text{ in the closed surface of the region in the first octant bounded by the cylinder } y^2 + z^2 = 9 \text{ and the planes } x = 0, y = 2, x = 2, y = 0 \text{ and } z = 0. \\
b) & \text{If } \vec{R} = x \hat{i} + y \hat{j} + z \hat{k}, \ r^2 = x^2 + y^2 + z^2 \text{ prove that:} \\
& \text{i) } \nabla \left(\frac{1}{r^2}\right) = -\frac{2 \vec{R}}{r^4}. \\
& \text{ii) } \nabla \left(\frac{\vec{R}}{r}\right) = -\frac{3}{r^3} \vec{R}.
\end{align*}

Q.7  
\begin{align*}
a) & \text{Solve } \frac{d^2 y}{dx^2} - 4y = x \sinh x. \\
b) & \text{Solve } (2xy + 1) dy + x(1 + 2xy - x^3 y^3) dx = 0. \\
c) & \text{Apply the method of variation of parameter to solve: } \frac{d^2 y}{dx^2} + 4y = 4 \sec^2 2x.
\end{align*}
Q.1 a) If \( A = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix} \) is an orthogonal matrix, then find \( A^{-1} \).

b) Find the sum and product of the eigen values of the matrix \( \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix} \).

c) Write the period of \( f(x) = \cos x + \sin 2x \).

d) Explain why constant function is periodic.

e) Solve the differential equation \( z = px + qy + \frac{p}{q} \).

f) Solve the differential equation \( p^3 - q^3 = 0 \).

g) Find the Laplace transform of \( 3^t \).

h) Find \( L^{-1}\left[ \frac{e^{-2t}}{s^2} \right] \).

i) Find the Fourier transform of \( f(t) = 1 \).

j) \( \omega = \log z \) is analytic everywhere except at \( z = \ldots \ldots \).

Q.2 a) If \( x_1 = (3,1,-4), x_2 = (2,2,-3), x_3 = (0,-4,1) \), then show that the vectors \( x_1, x_2 \) and \( x_3 \) are linearly dependent over the field of rational numbers. Also find the relation between them.

b) Reduce the following matrix into normal form and hence find its rank:
\[
A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}.
\]

c) Find the eigen values and eigen vectors of the matrix:
\[
A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.
\]

Q.3 a) Expand \( f(x) = x \sin x \), \( 0 < x < 2\pi \) as a Fourier series.

b) Find the Fourier series of the function \( f(x) = x + x^2 \) in the internal \( (-\pi, \pi) \).

Q.4 a) Solve \( p - 5q = \tan(y + 5x) \).
b) Solve \[ z^2 (x^2 p^2 + q^2) = 1. \]
c) A rod of length \( \ell \) with insulated sides is initially at a uniform temperature \( \mu_0 \). Its ends suddenly cooled to 0º C and are kept at that temperature. Find the temperature function \( \mu(x,t) \).

**PART-B**

Q.5  

a) Determine the analytic function \( f(z) = u + iv \) where \( v = \log \sqrt{x^2 + y^2} \).  
b) Evaluate \( \int \frac{\sin^2 z}{z} dz \); \( C : |z| = 1 \).  
c) Expand in series the function \( f(z) = \frac{1}{z^2 - 3z + 2} \) in the regions:
   i) \( 0 < |z| < 1 \)  
   ii) \( 0 < |z - 1| < 1 \)

Q.6  

a) Verify convolution theorem for \( f(x) = g(x) = e^{-x^2} \).  
b) Using Parseval’s identity, evaluate \( \int_0^\infty \frac{x^2 dx}{(a^2 + x^2)(b^2 + x^2)} \).  
c) Find the Fourier transform of \( f(x) = \begin{cases} 1 - x^2 & ; \quad |x| < 1 \\ 0 & ; \quad |x| > 1 \end{cases} \)

Q.7  

a) With the help of Laplace transforms, evaluate \( \int_0^\infty e^{-t} \frac{\sin^2 t}{t} dt \).  
b) Find the inverse Laplace transform for \( F(s) = \frac{5s}{s^2 + 4s + 4} \).  
c) Solve the simultaneous differential equations: \( \frac{dx}{dt} + 3x + y = 0 \), \( \frac{dy}{dt} - x + y = 0 \) subject to the conditions \( x(0) = y(0) = 1 \).
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
QUANTITATIVE APTITUDE (MA-301)

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 (V) the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.
### Question 1
Which of the following is a prime number?
- a) 9
- b) 2
- c) 4
- d) 8

### Question 2
Simplify 586645 * 9999
- a) 5865863355
- b) 5665863355
- c) 4865863355
- d) 4665863355

### Question 3
Find the HCF of 54, 288, 360
- a) 18
- b) 36
- c) 54
- d) 108

### Question 4
Raju age after 15 years will be 5 times his age 5 years back, what is the present age of Raju?
- a) 15
- b) 14
- c) 10
- d) 8

### Question 5
Reeya obtained 65, 67, 76, 82 and 85 out of 100 in different subjects, what will be the average?
- a) 70
- b) 75
- c) 80
- d) 85

### Question 6
Find the number if difference between number and its $\frac{3}{5}$th is 50.
- a) 120
- b) 123
- c) 124
- d) 125

### Question 7
Worker A takes 8 hours to do a job. Worker B takes 10 hours to do a job. How long should it take both A and B, working together to do same job?
- a) $\frac{4}{9}$
- b) $\frac{22}{9}$
- c) $\frac{31}{9}$
- d) $\frac{40}{9}$

### Question 8
A train is 100 meter long and is running at the speed of 30 km per hour. Find the time it will take to pass a man standing at a crossing.
- a) 10 S
- b) 12 S
- c) 14 S
- d) 16 S

### Question 9
Find the average of first 10 multiples of 7
- a) 35.5
- b) 37.5
- c) 38.5
- d) 40.5

### Question 10
A and B can together complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete that work?
- a) 4
- b) 5
- c) 6
- d) 7

### Question 11
What will be the fraction of 20%?
- a) $\frac{1}{4}$
- b) $\frac{1}{5}$
- c) $\frac{1}{10}$
- d) None of these

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### Question 12
36 men can complete a piece of work in 18 days. In how many days will 27 men complete the same work?
- a) 24
- b) 28
- c) 32
- d) 36

### Question 13
If Rahul rows 15 km upstream in 3 hours and 21 km downstream in 3 hours, then the speed of the stream is
- a) 5 km/hr
- b) 4 km/hr
- c) 2 km/hr
- d) 1 km/hr

### Question 14
Find the rate at Simple interest, at which a sum becomes four times of itself in 15 years
- a) 10
- b) 20
- c) 30
- d) 40

### Question 15
What will be the compound interest on Rs. 25000 after 3 years at the rate of 12 % per annum
- a) 10123.20
- b) 10123.30
- c) 10123.40
- d) 10123.50

### Question 16
One side of rectangular field is 15 meter and one of its diagonals is 17 meter. Then find the area of the field.
- a) 120
- b) 130
- c) 140
- d) 150

### Question 17
In a throw of dice what is the probability of getting number greater than 5
- a) $\frac{1}{2}$
- b) $\frac{1}{3}$
- c) $\frac{1}{5}$
- d) $\frac{1}{6}$

### Question 18
Find the number which when multiplied by 15 is increased by 196
- a) 10
- b) 12
- c) 14
- d) 16

### Question 19
A man can do a piece of work in 5 days, but with the help of his son he can do it in 3 days. In what time can the son do it alone?
- a) 7.5
- b) 6.5
- c) 5.5
- d) 4.5

### Question 20
If 15% of 40 is greater than 25% of a number by 2, the number is
- a) 14
- b) 16
- c) 18
- d) 20

### Question 21
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

### Question 22
A cistern can be filled by a tap in 4 hours while it can be emptied by another tap in 9 hours. If both the taps are opened
simultaneously, then after how much time cistern will get filled?

Q.23 A person travels from P to Q at a speed of 40 km/hr and returns by increasing his speed by 50%. What is his average speed for both the trips?
a) 44  b) 46  c) 48  d) 50

Q.24 If 16 toys cost 240, then what does 40 toys cost?
a) 600  b) 620  c) 640  d) 680

Q.25 In one hour, a boat goes 11km along the stream and 5 km against it. Find the speed of the boat in still water
a) 6  b) 7  c) 8  d) 9

Q.26 There was simple interest of Rs. 4016.25 on a principal amount at the rate of 9%p.a. in 5 years. Find the principal amount
a) 8925  b) 7625  c) 7675  d) None of these

Q.27 Find the surface area of a 10cm*4cm*3cm brick.
a) 154  b) 158  c) 162  d) 164

Q.28 Evaluate 30! / 28!
a) 970  b) 870  c) 770  d) 670

Q.29 Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is
a) 4:5  b) 3:4  c) 1:2  d) None of these

Q.30 Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?
a) 3/4  b) 1/2  c) 3/5  d) 2/3

Q.31 Find the HCF of 2/3, 4/6, 8/27
a) 2/27  b) 8/3  c) 2/3  d) 8/27

Q.32 Y is in the East of X which is in the North of Z. If P is in the South of Z, then in which direction of Y, is P?
a) North  b) South  c) South-East  d) None of these

Q.33 If log 27 = 1.431, then the value of log 9 is:
a) 0.934  b) 0.944  c) 0.954  d) 0.964

Q.34 36, 34, 30, 28, 24, ... What number should come next?
a) 20  b) 22  c) 18  d) 24

Q.35 A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is
a) 1/13  b) 2/13  c) 1/26  d) 1/52

Q.36 Evaluate 100C100
a) 10000  b) 1000  c) 100  d) 1

Q.37 Sumit and Ravi started a business by investing Rs 85000 and 15000 respectively. In what ratio the profit earned after 2 years be divided between Sumit and Ravi respectively.
a) 17:1  b) 17:2  c) 17:3  d) 17:4

Q.38 if x:y = 1:3, then find the value of (7x+3y):(2x+y)
a) 14:5  b) 15:5  c) 16:5  d) 17:5

Q.39 In college, the ratio of the number of boys to girls is 8 : 5. If there are 200 girls, the total number of students in the college is
a) 420  b) 520  c) 620  d) 720

Q.40 In how many words can be formed by using all letters of the word BHOPAL
a) 120  b) 36  c) 720  d) None of these

Q.41 Today is Monday. After 61 days, it will be:
a) Friday  b) Saturday  c) Sunday  d) Wednesday

Q.42 Introducing a boy, a girl said, "He is the son of the daughter of the father of my uncle." How is the boy related to the girl?
a) Brother  b) Nephew  c) Uncle  d) Son-in-law

Q.43 53, 53, 40, 40, 27, 27, ... What number should come next?
a) 12  b) 14  c) 27  d) 53

Q.44 A, P, R, X, S and Z are sitting in a row. S and Z are in the centre. A and P are at the ends. R is sitting to the left of A. Who is to the right of P?
Q.45 If one-third of one-fourth of a number is 15, then three-tenth of that number is:
   a) 35  b) 36  c) 48  d) 54

Q.46 A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6500?
   a) 4991  b) 5991  c) 6991  d) 6001

Q.47 A and B together have Rs. 1210. If $\frac{4}{15}$ of A's amount is equal to $\frac{2}{5}$ of B's amount, how much amount does B have?
   a) 460  b) 484  c) 510  d) None of these

Q.48 The sum of the digits of a two-digit number is 15 and the difference between the digits is 3. What is the two-digit number?
   a) 78  b) 96  c) 69  d) Cannot be determined

Q.49 Statements: Some actors are singers. All the singers are dancers.
Conclusions: 1. Some actors are dancers 2. No singer is actor
   a) Only (1) conclusion follows  b) Only (2) conclusion follows  c) Either (1) or (2) follows  d) Neither (1) nor (2) follows

Q.50 Which of the following diagrams indicates the best relation between Profit, Dividend and Bonus?

   a)  b)  
   c)  d)
End Semester Examination, Dec. 2015  
B. Tech. – Third Semester  
APPLIED MATHEMATICS (MA-341A)  

Time: 3 hrs  
Max Marks:  
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.

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**Q.1**

a) Find derivative of $e^{x^2}$

b) Find derivative of $f(x) = xe^x$

c) Solve $\int x^2 dx$

d) Solve $\int \cos^{-1} x dx$

e) Expand $f(x) = x^2$ in terms of $(x - 2)$.

f) If $u = x^2$, find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.

g) Evaluate $\int_0^\infty \int_0^\infty x^2 dxdy$

h) Show that $\int_0^\infty e^{-x^4} dx = \frac{1}{4} \sqrt[4]{\frac{1}{4}}$

i) Find $\nabla \phi$ or grad $\phi$, where $\phi = \log(x^2 + y^2 + z^2)$.

j) Define scalar and vector function with an example.

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**PART-A**

**Q.2**

a) Differentiate the following functions w.r.t. $x$.

i) $f(x) = [\log x]^3$  

ii) $f(x) = \sin x \sin 2x$

b) Find $\frac{dy}{dx}$, where $y = \frac{e^{ax}}{\sin(bx + c)}$

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**Q.3**

a) Solve the following integrals:

i) $\int_1^3 |x + 1| dx$

ii) $\int \frac{2x + 5}{x^2 - x - 2} dx$

b) Solve $\int_0^{\pi/2} x^2 \sin x \, dx$

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**Q.4**

a) If $u = \sin^{-1} \left( \frac{x + y}{\sqrt{x} + \sqrt{y}} \right)$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$

b) If $u_1 = x_2x_3/x_1$, $u_2 = x_3x_1/x_2$, $u_3 = x_1x_2/x_3$, prove that $\frac{\partial (u_1, u_2, u_3)}{\partial (x_1, x_2, x_3)} = 4$. 

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2x10

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**PART-B**

Q.5  
a) Use Maclaurin’s series to show that 
\[ e^x \sec x = 1 + x + \frac{2x^2}{2!} + \frac{4x^3}{3!} + \ldots \]  
10
b) Discuss the maximum or minimum value of \( u = x^2 - 3xy + y^2 + 2x \)  
10

Q.6  
a) Show that \( \int_0^2 \int_0^2 \int_0^2 x^2yz \, dz \, dy \, dx = 1 \).  
10
b) Evaluate \( \int \int xy(x + y) \, dx \, dy \) over the area between \( y = x^2 \) and \( y = x \).  
10

Q.7  
a) If \( \mathbf{r} = |\mathbf{r}| = x\mathbf{i} + y\mathbf{j} + z\mathbf{k} \). Prove that \( \nabla \mathbf{r} = \frac{\mathbf{r}}{r} \).  
5
b) Find the directional derivative of \( \phi = xyz \) at (1, 2, 3) in the direction of the vector.  
7
c) Given \( f(t) = (5t^2 - 3t)\mathbf{i} + 6t^3\mathbf{j} - 7tk \), evaluate \( \int_{t=2}^{t=4} f(t) \, dt \).  
8
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
BIOSTATISTICS (MA-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) What is frequency polygon?
b) Define primary data.
c) Define coefficient of skewness.
d) How many parameters are there in binomial distribution?
e) What is null hypothesis?
f) Write formula of Poisson’s distribution.
g) State whether Normal distribution is discrete or continuous.
h) What are chances of 4 tails in 8 tosses?
i) Define analysis of variance (ANOVA).
j) What is standard error?

PART-A

Q.2 a) In the usual notations, it is given:

\[ N = 15 \quad \bar{X} = 25 \quad \sigma_X = 3.01 \quad \sigma_Y = 3.03 \quad \tau(X - \bar{X})^2 = 132 \]

\[ \sum (Y - \bar{Y})^2 = 138 \quad \text{and} \quad \sum xy = 122 \]

Find the value of \( r \) (correlation coefficient).

b) Explain coefficient of determination and also rank correlation coefficient.

Q.3 a) State and explain the basic laws of probability with an example.

b) A box contains 3 white, 5 red and 6 blue balls. If three balls are drawn at random, find the probability that:

i) Two of the balls drawn are white.

ii) Exactly one ball is white.

iii) Atleast one ball is white.

Q.4 a) State and explain the properties of normal distribution.

b) One fifth percent of the blades produced by a blade manufacturing factory turn out to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing:

i) One defective

ii) Two defectives

iii) No defectives

respectively in a consignment of 100000 packets. Given \( e^{-0.02} = 0.9802 \)

PART-B

Q.5 a) Explain ANOVA in brief and its applications.

b) A random sample of boots worn by 36 soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.6 years. Under the standard condition the boots are known to have an average life of 1.28 years. Is there a reason to assert, at 1% level of significance that use in desert causes the mean life of such boots to decrease. What will be your conclusion if the level of significance is 5%. Assume that the life boots in normally distributed. Values of
standardized normal variate are -2.33 and -1.645 at 1% level and 5% level respectively?

Q.6 a) Explain $\chi^2$ test with respect to $2 \times 2$ contingency table as test of independence.

b) A sample of 20 observations gave a standard deviation 5. Is this compatible with the hypothesis that the sample is from a normal population with variance 64 at 5% level of significance. Tabulated value of $\chi^2$ for 19 degrees of freedom at 5%, level of significance is 30.14.

Q.7 Write short notes on:
   a) Degrees of freedom.
   b) Sign test.
   c) Sampling error.
   d) Binomial and Poisson probability distribution.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
APPLIED MATHEMATICS (MA-441A)

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) Solve: \( 3x(xy - 2)dx + (x^3 + 2y)dy = 0 \). 3
b) State and prove modulation theorem. 3
c) Solve: \( yp + xq + pq = 0 \) 2
d) Write auxiliary equation for Lagrange’s method. 2
e) Check whether the function is odd or even: 
\[ f(x) = \begin{cases} x^2, & 0 \leq x \leq \pi \\ -x^2, & -\pi \leq x \leq 0 \end{cases} \] 4
f) Find the rank of matrix: 
\[ A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix} \] 3
g) Find: 
\[ L \left[ e^t \sin t \right]_0^t dt \] 3

**PART-A**

Q.2 a) Solve: \( y'' + 5y' + 4y = x^2 + 1 \) 10
b) Solve: 
\[ \frac{d^2y}{dt^2} + \frac{dy}{dt} - 2y = \sin t; \quad \frac{dx}{dt} + x - 3y = 0 \] 10

Q.3 a) Find: 
\[ L^{-1} \left[ \frac{5s + 3}{(s-1)(s^2 + 2s + 5)} \right] \] 10
b) State and prove convolution theorem for Laplace transforms. 10

Q.4 a) Find \( A^{-1} \) for 
\[ A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} \] 10
b) Find Eigen values and Eigen vectors of 
\[ A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \] 10

**PART-B**

Q.5 a) Find Fourier series for \( e^{-ax} \) in the interval \((0, 2\pi)\). 10
b) Develop Fourier series in the interval \((-2, 2)\) if: 
\[ f(x) = \begin{cases} 0, & -2 < x < 0 \\ 1, & 0 < x < 2 \end{cases} \] 10

439/4
Q.6  
\(a)\) Solve: \((p - q) = \log (x + y)\)  
\(b)\) Solve: \(z^2 = pq \cdot xy\)  
\(c)\) Solve by method of separation of variables: \(\frac{\partial^3 z}{\partial x^3} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0\)  

Q.7  
\(a)\) Find Fourier sine transform of \(\frac{e^{-ax}}{x}\)  
\(b)\) Express \(f(x) = \begin{cases} 1, & 0 \leq x < \pi \\ 0, & x \geq \pi \end{cases}\) as Fourier sine Integral and hence evaluate:
\[\int_{0}^{\pi} \frac{1 - \cos (x \lambda)}{\lambda} \sin (x \lambda) d\lambda\]
End Semester Examination, Dec. 2015
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) Define extrapolation.
b) Define intermediate mean value theorem.
c) Write forward difference table if:

\[
\begin{array}{c|c c c c}
  x & 10 & 20 & 30 & 40 \\
  y & 1.1 & 2.0 & 4.4 & 7.9 \\
\end{array}
\]
d) What do you mean by algebraic and transcendental equations, give an example of each?
e) Which of the following methods converges faster: Gauss Seidal or Gauss Jocobi method?
f) Write Newton’s cote quadrature formula.
g) The names of two self-starting methods to solve \( y' = f(x,y) \) given \( y(x_0) = y_0 \) are __________.
h) Define feasible region.
i) Write mathematical form of LPP.
j) The number of strips required in Weddle’s rule is __________.

2x10

PART-A

Q.2 a) Determine \( f(x) \) as a polynomial in \( x \) for the following data:

\[
\begin{array}{c|c c c c c}
  x & -4 & -1 & 0 & 2 & 5 \\
  f(x) & 1245 & 33 & 5 & 9 & 1335 \\
\end{array}
\]
b) Fit a straight line to the following, using method of least squares:

\[
\begin{array}{c|c c c c c}
  x & 1 & 2 & 3 & 4 & 5 \\
  f(x) & 14 & 27 & 40 & 55 & 68 \\
\end{array}
\]

10

Q.3 a) Find the root of the equation \( xe^x = \cos x \) using Regula Falsi Method.
b) Using Newton Rephson Method, establish the formula

\[
x_{n+1} = \frac{1}{2} \left[ x_n + \frac{N}{x_n} \right], \text{Where } N \text{ is square root of a +ve number.}
\]

6

Q.4 Solve the following system of equations using Gauss Seidal Method:
\[
\begin{align*}
8x - 3y + 2z &= 20 \\
4x + 11y - z &= 33 \\
6x + 3y + 12z &= 35
\end{align*}
\]

20

PART-B

Q.5 a) From the following table find the maximum value of \( y \):

\[
\begin{array}{c|c|c|c|c|c|c|c|c|c|c|c}
  x & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\
  y & 12 & 23 & 34 & 45 & 56 & 67 & 78 & 89 & 90 & 101 \\
\end{array}
\]
b) Evaluate $\int_{0}^{6} \frac{dx}{1 + x^2}$ by using Trapezoidal Rule.

Q.6  a) Find by Taylor’s series method, the values of $y$ at $x = 0.1$, $x = 0.2$ from 

\[ \frac{dy}{dx} = x^2y - 1; \ y(0) = 1 \]

b) Using R-K method of order 4, find $y(0.2)$ for 

\[ \frac{dy}{dx} = \frac{(y-x)}{(y+x)}, \ y(0) = 1, \text{ Take } h = 0.2. \]

Q.7  Maximize $Z = 107x_1 + x_2 + 2x_3$, 

Subject to 

\[ 14x_1 + x_2 - 6x_3 + 3x_4 = 7 \]

\[ 16x_1 + \frac{1}{2}x_2 - 6x_3 \leq 5 \]

\[ 3x_1 - x_2 - x_3 \leq 0, \]

\[ x_1, x_2, x_3, x_4 \geq 0. \]

Using simplex method.
End Semester Examination, Dec. 2015
B. Tech. – Fifth / Sixth Semester
NUMERICAL METHODS AND OPTIMISATION 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) An approximate value of \( \pi \) is given by \( 3.1428571 \) and its true value is \( \pi \approx 3.1415926 \). Find the absolute and relative error.
b) Prove that \( y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0 \), where \( \Delta \) denotes the forward difference operator.
c) Using Newton-Raphson method, establish the formula:
\[
 x_{n+1} = x_n + \frac{N}{x_n - N}, \quad \text{where } N \text{ is the square-root of any } +ve \text{ number.}
\]
d) State the convergence criteria of Gauss-Jacobi method for the system of simultaneous linear equations.
e) Write down Simpson’s \( 3/8^{th} \) rule to integrate \( y = f(x) \), where \( a < x < b \).
f) Explain why Runge-Kutta method is better than Taylor’s series method for solving ordinary differential equations.
g) Write a formula to find the maximum of any function \( y = f(x) \).
h) State feasible solution and basic feasible solution of a LPP.

Q.2 a) Find \( f(1.5) \) and \( f(7.5) \) from Newton’s forward and backward interpolation method for the given data:

<table>
<thead>
<tr>
<th>( x )</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>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>1</td>
<td>8</td>
<td>27</td>
<td>64</td>
<td>125</td>
<td>216</td>
<td>343</td>
<td>512</td>
</tr>
</tbody>
</table>

b) Fit a straight line for the given data:

<table>
<thead>
<tr>
<th>( x )</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>14</td>
<td>27</td>
<td>40</td>
<td>55</td>
<td>68</td>
</tr>
</tbody>
</table>

Q.3 a) Use the fixed point iteration method to find a root of the following equation correct to 3 decimal places \( x^3 + x^2 - 1 = 0 \).
b) Find the root of the equation: \( xe^x = \cos x \), using secant method correct to 4 decimal places.

Q.4 a) Solve by Gauss-Seidal method, the following equations:
\[
\begin{align*}
8x - 3y + 2z &= 20 \\
4x + 11y - 2z &= 33 \\
6x + 3y + 12z &= 35
\end{align*}
\]
b) Find numerically largest eigen value of:
\[
A = \begin{bmatrix}
25 & 1 & 2 \\
1 & 3 & 0 \\
2 & 0 & -4
\end{bmatrix}
\]

Corresponding eigen vector.

**PART-B**

Q.5  
\text{a)} Find } y'(1) \text{ and } y''(1) \text{ from the given data:}

<table>
<thead>
<tr>
<th>( x )</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>8</td>
<td>27</td>
<td>64</td>
<td>125</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

\text{b)} Evaluate: } \int_{0}^{10} \frac{dx}{1+x^2} \text{ by using: i) Trapezoidal rule \ ii) Simpson’s 3/8-rule}

Q.6  
\text{a)} Compute } y(0.2) \text{ correct to 4 decimal places from the Taylor’s series solution of the equation } \frac{y''}{y'} = y^2 - 2x, \quad y(0) = 1

\text{b)} Using } R-K \text{ method of order 4, find } y \text{ at } x = 0.1, 0.2, 0.3 \text{ given that:}

\[ \frac{dy}{dx} = x - y^2, \quad y(0) = 1 \]

Q.7  
\text{a)} Use graphical method to solve:

\[
\begin{align*}
\text{Max } z &= 3x_1 + 2x_2, \\
\text{subject to } x_1 - x_2 &\geq 1, \quad x_1 - x_2 \geq 3 \text{ and } x_1, x_2 \geq 0
\end{align*}
\]

\text{b)} Solve the following LPP:

\[
\begin{align*}
\text{Max } z &= 2x + 3y, \\
\text{subject to } -2x + 3y &\leq 2, \quad 3x + 2y \leq 5 \text{ and } x, y \geq 0
\end{align*}
\]
End Semester Examination, Dec. 2015
MA (Applied Psychology) – First Semester
PSYCHOLOGY OF COGNITIVE PROCESSES (MA-AP-101)

Time: 3 hrs

Max Marks: 50

No. of pages: 1

Note: Attempt FIVE questions in all; PART-B is compulsory. Attempt any FOUR questions from PART-A.

PART-A

Q.1 List and describe three influences on cognitive psychology. What events contributed to its emergence as a separate discipline?

10

Q.2 What are the early, middle and late models of auditory attention? Describe each with examples.

10

Q.3 How are mental set images like perception? How are they different from perception?

10

Q.4 What are the functions of language? Discuss structure of language.

10

Q.5 Discuss the meaning and aspects of creativity.

10

PART-B

Case study:

Mary-Jo Sapulla was her evening walk as always. Mary decided to take her usual route along the Smoky River trail. Along the way Mary passed a young dark hair man walking rather quickly in the opposite direction. Mary thought it was odd to see someone whom she did not know as most of the people who walk along the trail live in Mary’s neighborhood. About 15 minutes after passing the man on the trail, Mary was startled by a loud gun shot. She looked up and saw a person running up the hillside. Although Mary was far enough away to not be seen, she swears that she’ll never forget what the person looked like. .... (time passes).... Mary id’s a person in the line-up as the person she saw running up the hill away from the crime, a young man with dark hair and a mustache. The defense has called upon you as an expert witness in the case. As an expert witness you are asked to give the facts with respect to eye-witness testimony.

Q.6 Read the case study carefully given above and answers the following question:

a) What do you tell the court (give you testimony)?

10
End Semester Examination, Dec. 2015  
MA (Applied Psychology) – First Semester  
RESEARCH METHODOLOGY-I (MA-AP-102)

Time: 3 hrs  
Max Marks: 50  
No. of pages: 1

Note: Attempt FIVE questions in all; PART-B is compulsory. Attempt any FOUR questions from PART-A.

**PART-A**

Q.1 What is statistics? Describe the descriptive and inferential statistics in detail.  
10

Q.2 Calculate the appropriate statistics from the data given below:

<table>
<thead>
<tr>
<th></th>
<th>x₁</th>
<th>x₂</th>
<th>x₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>5</td>
<td>4</td>
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<tr>
<td>3</td>
<td>6</td>
<td>3</td>
<td>7</td>
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<tr>
<td>4</td>
<td>8</td>
<td>4</td>
<td>1</td>
</tr>
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<td>5</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

(With df = (2, 21) f must be atleast 3.46 to reach p<.05, so f score is statistically significant)  
10

Q.3 What are the major components of experimentation?  
10

Q.4 Describe major experimental designs.  
10

Q.5 Explain the major elements from the qualitative analysis.  
10

Q.6 Write short notes on following topics:  
a) Data.  
b) Measure of central tendency.  
5x2

**PART-B**

Q.7 Calculate product moment correlation from the following:

<p>| Sr. No. | Variable 1 | Variable 2 |</p>
<table>
<thead>
<tr>
<th>1</th>
<th>15</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>
End Semester Examination, Dec. 2015
MA (Applied Psychology) – First Semester
APPLIED SOCIAL PSYCHOLOGY (MA-AP-103)

Time: 3 hrs  
Max Marks: 50  
No. of pages: 2

Note: Attempt FIVE questions in all; PART-B is compulsory. Attempt any FOUR questions from PART-A.

PART-A

Q.1 We construct our social reality! What are the factors that help in framing our social reality?
   10

Q.2 Which according to you is the most comprehensive method of studying social psychology? Prove with the help of any classical experiment.
   10

Q.3 How do the opinion of others impact the way you think, act and respond? Explain with examples from the domain of social psychology.
   10

Q.4 Define your ‘self’ in social context. Which theory do you think best describes your ‘self’?
   10

Q.5 Write short notes on any two:
   a) Schemas.
   b) Group Formation.
   c) Festinger’s Theory.
   5x2

PART-B

Case study:

Part I Tim Hinks
I was an instructor at a suburban community college in a unique program for students who had very poor academic records in high school. As the social science instructor for 120 students, I worked to coordinate my teaching with three other instructors; one each in natural science, the humanities, and composition. Being a “sixties liberal,” I wanted to make a contribution to integration and take a strong stand against racism. Tim Hanks, the only African-American student in my course, wasn’t helping any. He attended class sporadically, turned assignments in late, missed others altogether, and performed poorly on tests. When he did come to class, he was usually late and always left before I had a chance to talk to him. Like the other faculty in the program, I felt it was my responsibility to pull each student, regardless of race, through. I wouldn’t lower standards but was prepared to do everything in my power to help all students meet the requirements. Nothing that worked with other students seemed to work with Tim. He made appointments to meet with me and his other
instructors, only not to show up. Offers of extra time and assistance on assignments didn’t help either. Attempts to call Tim at the phone number listed for him with the college were unsuccessful; the number had been disconnected. Letters to his listed address were returned as undeliverable.

**Part II Turnaround**

Eventually I came to the conclusion that Tim simply lacked the motivation to complete assignments and attend class regularly. He didn’t have the academic skills to do the work nor the drive to correct his deficiencies. As the semester drew to a close, it was clear that Tim would fail the course. It was painful to flunk any student but this was doubly so; something was obviously deficient in me. I didn’t have what it took to succeed with African-American students. Shaking my head, I wrote an F on the grade sheet. When I received my class list for the next semester I saw that Tim Hanks was in my class again. Feeling somewhat uncomfortable I wondered why Tim didn’t try some other instructor. Tim obviously couldn’t get motivated to do the work in my class the previous semester. Was he just a glutton for punishment? Seven or eight weeks later Tim came in to get his midterm test from me. It was an A-. He had earned no lower than a B+ on any of his assignments. As he sat down to talk (a big smile on his face after seeing the grade on his midterm), I asked him, “What makes the difference between someone I had to fail last winter and someone I’ll have to give an A to this fall?” “I have a car,” he said. “How can a car make such a difference?” I asked, puzzled. “Well, I live downtown near the Art Center. In a car it’s a thirty minute trip. On a bus it’s an hour and half both ways on a good day.” Embarrassed, he looked down at the floor as he said, “On a bad day I would be OK till I got out here to Main Road. Then it would be hit or miss whether the bus drivers would pick me up. A couple of them would even swerve to splash slush all over me. If they did, I’d feel so bad I just got on a bus going back home.” When asked why he didn’t come in and tell me about these difficulties he said, “I was so embarrassed about doing so poorly in your class I just couldn’t get myself to come in.”

**Q.6** Read the case study carefully given above and answers the following questions:

a) How is prejudice different from discrimination? For example, would you have considered the instructor racist if he had told the readmission committee about his view of Tim as lacking academic skills and the motivation to improve them? Would you consider the instructor racist if he had confronted Tim on his low motivation?

b) Take some time to think back and see where your attitudes towards people different from you may have come from. How has the culture and society played a role in shaping them?
End Semester Examination, Dec. 2015
MA (Applied Psychology) – First Semester
SYSTEMS AND THEORIES OF PSYCHOLOGY (MA-AP-111)

Time: 3 hrs
Max Marks: 50
No. of pages: 1

Note: Attempt any FOUR questions from PART A. PART B is compulsory. Each question carries equal marks.

**PART-A**

Q.1 Describe the process of transformation of psychology from arts to science. 10
Q.2 Explain the major elements from the first force of psychology. 10
Q.3 What is behaviourism? Describe the effects of scientific development on the development of behaviourism. 10
Q.4 Describe Gestaltism and Perceptual organization in detail. 10
Q.5 Explain the major elements from the Humanistic Existential perspective. 10
Q.6 In your views based on the history what is the future of psychology? 10

**PART-B**

Q.7 Write short notes on the following:
   a) Signal Detection Paradigm
   b) Ego Defence Mechanism
   c) Positive Psychology
   d) B F Skinner 2½x4
End Semester Examination, Dec. 2015  
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 $16 P_3$ and $20 C_5$.  
b) Using Binomial theorem, find the value of $(104)^4$.  
c) If $\tan \theta = \frac{16}{5}$, find the values of $\sin \theta$, $\sec \theta$.  
d) Find the first three terms of the sequence defined by $a_n = 3n^2 + 3$.  
e) Write the section formula in three dimensions.  
f) Find the equation of the line passing through the point $(2, 4)$ having slope $3$.  
g) Find the equation of the line passing through the points $(2, 1)$, $(3, 4)$.  
h) Write the equation of the circle whose centre is $(5, 2)$ and radius is $(4, 5)$.  
i) Find the equation of the parabola with vertex $(0, 0)$ and focus at $(3, 0)$.  
j) Find the distance between the points $(2, 3, 4)$ and $(5, 6, 7)$.  

**PART-A**

Q.2  
a) $A$ is the A.M. between $a$ and $b$. Show that:  
$$\frac{A+2a}{A-b} + \frac{A+2b}{A-a} = 4$$

b) In an increasing G.P. the sum of the first and last term is 66, the product of the second and the last but one term is 128. If the sum of the series is 126, find the number of terms in the series.

Q.3  
a) Find the coefficient of $x^5$ in the expansion of the product $(1+2x)^6(1-x)^7$.  
b) Resolve the partial fractions,  
$$\frac{4x+1}{(x-2)(x+1)^2}$$

Q.4  
a) Find the number of arrangements of the words.  
   i) MRU  
   ii) MRIU  
   iii) MRCE  
b) Find the value of $m$, if  
$$\frac{n}{3m-3} \text{ and } \frac{n}{5m-4}$$  
are in the ratio 3:1

**PART-B**

Q.5  
a) Show that $\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ = \frac{\sqrt{3}}{2}$

b) If $\tan x = 2 \tan y$. Prove that  
$$\frac{\sin (x+y)}{\sin (x-y)} = 3$$
c) If $\sin x = \frac{3}{5}$, $\cos y = -\frac{12}{13}$ and $x$, $y$ both lie in the second quadrant, find the values of:

i) $\sin(x + y)$

ii) $\tan(x + y)$

Q.6  

a) Find the equations of the lines which pass through the point $(4, 5)$ and make equal angles with the lines $5x - 12y + 6 = 0$ and $3x - 4y - 7 = 0$. 

b) If $p$, $q$ are the lengths of perpendicular from the origin to the lines $x \cos \theta - y \sin \theta = k \cos 2\theta$ and $x \sec \theta + y \csc \theta = k$ respectively, prove that:

$p^2 + 4q^2 = k^2$

Q.7  

a) Find the coordinates of foci, the vertices, the length of major axis, minor axis, latus-ractum and the eccentricity of the conic represented by the equation:

$4x^2 + 9y^2 = 36$

b) Find the equation of the circle, whose centre is $(4, -3)$ and which passes through the intersection of the line $3x + 5y = 1$ and $4x - 3y = 3$
End Semester Examination, Dec. 2015
B.Tech. (Integrated) – Second Semester
MATHEMATICS-II (MA-I-201)

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 modulus of complex numbers \( z = -3 + 5i \) and \( z = 4 + 3i \)

b) Find determinant of matrix \( A \) given by 
\[
A = \begin{bmatrix} 2 & -4 & 3 \\ 3 & 1 & 2 \\ 7 & 6 & 1 \end{bmatrix}
\]

c) Find inverse of 
\[
A = \begin{bmatrix} 5 & 4 \\ 9 & 3 \end{bmatrix}
\]

d) Find \( \frac{dy}{dx} \) if \( y = e^{2x} \) and \( y = \log(2x^2 + 7) \)

e) Define a convex region in linear programming problems.

4x5

PART-A

Q.2  a) If 
\[
A = \begin{bmatrix} 1 & -1 & -1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}
\]
then find \( A^{-1} \) and show that \( A^{-1} = A^2 \)

10

b) If 
\[
A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}
\]
then show that \( A^2 - 4A - 5I = 0 \)

10

Q.3  a) Prove that 
\[
\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( 1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)
\]

10

b) If 
\[
A = \begin{vmatrix} a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix}
\]

= \( (a-b)(b-c)(c-a)(ab+bc+ca) \)

10

Q.4  a) Express the following complex number \( Z \) in the form of \( (a + ib) \):
\[
Z = \frac{5 + \sqrt{2}i}{5 - \sqrt{2}i}
\]

10

b) Find the modulus and argument of the following \( Z \) given by:
\[
Z = \frac{1+2i}{1-3i}
\]

10
PART-B

Q.5 Find \( \frac{dy}{dx} \) if,

a) \( y = (\sin x)^2 \)  

b) \( y = 5(2^x) + \log(2x^2 + 7) \)  

c) \( y = e^{x^2} + 2\cos x \)  

d) \( 5e^{2x}(2\tan x + 3\sec x) \)

Q.6 a) A cylindrical tank standing upright (with one circular base on the ground) has radius 20 cm. How fast does the water level in the tank drop when the water is being drained at 25 cm³/sec

b) Let \( f(x) = \begin{cases} 
1 + 4x - x^2 & \text{for } x \leq 3 \\
(x + 5)/2 & \text{for } x > 3 
\end{cases} \)

find the maximum and minimum value of \( f(x) \) for \( x \) in \([0,4]\)

Q.7 a) Solve using graphical method the following problems:

Maximize \( z = 3x + 2y \)

Subject to:
\[
\begin{align*}
2x + y &\leq 18 \\
2x + 3y &\leq 42 \\
3x + y &\leq 24 \\
x &\geq 0, \ y &\geq 0
\end{align*}
\]

b) Minimize \( z = 6x + 7y \)

Subject to:
\[
\begin{align*}
2x + 3y &\leq 12 \\
2x + y &\leq 8 \\
x &\geq 0, \ y &\geq 0
\end{align*}
\]
End Semester Examination, Dec. 2015
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) Give the list of items reserved for exclusive manufacturing in a small scale industry.
b) Discuss the role of NABARD in supporting entrepreneurs.
c) Discuss the importance of communication in business motivation.
d) Discuss the importance of industrial relations.

5x4

PART-A

Q.2 Discuss the following entrepreneurial support systems:
a) Commercial Banks  b) State Financial Corporations

10x2

Q.3 a) Discuss the procedure for registration of a small scale industry.  
b) How would you assess the demand and supply in potential areas of growth?

10

Q.4 How would you make a preliminary project report? Elaborate in detail.

20

PART-B

Q.5 Discuss the basic principles of financial management.

20

Q.6 a) Discuss the factors contributing to air, water and noise pollution.  
b) Discuss the role of PPEs in safety at work places.

10

Q.7 a) How do incentives act as a motivating factor for employees?  
b) What is the concept of workers participation in management? Discuss the objectives of the same in detail.

10
End Semester Examination, Dec. 2015
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 Convert the following sentences in the correct tense as stated against each sentence (any ten of the following):
   a) They (pay) for everything. (Present perfect)
   b) He (run) very fast! (Present Continuous)
   c) Kate (lie) in bed now. (Present Continuous)
   d) You (help) me a lot. (Past Perfect)
   e) Lately, I (exercise) quite frequently. (Present Perfect Continuous)
   f) They (visit) us often. (Simple Present)
   g) Stella (cook) dinner for two hours. (Past Perfect Continuous)
   h) Tom (work) every day. (Simple Present)
   i) You (do) nothing for the last 30 minutes. (Present Perfect Continuous)
   j) Martha (finish) her homework. (Simple Past)
   k) I (have) a snake. (Future)
   l) In this club people usually (dance) a lot. (Simple Present)
   m) Anna (rest) tonight. (Future)

Q.2 a) Use the words in sentences. (Any Five):
   i) Versatile
   ii) Spacious
   iii) Except
   iv) Concern
   v) Amicable
   vi) Clarity

   1x5
   b) Identify the underlined words as Parts of Speech: (Any Five)
   i) I helped him carry it.
   ii) The weather was very cold.
   iii) My friend said, "Oh! What a cold weather!"
   iv) We didn't spend the night there.
   v) We got back home late at night but we didn't go to sleep immediately.
   vi) You are an amazing actor.

   1x5

Q.3 Write a paragraph of approximately 150 words on the topic “How to make India Shine?”

   10

Q.4 “FDI in retail sector is going to benefit Indian economy”. Write a debate in favour or against this statement. (100 words)

   10

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.

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 her/him to allow you to join the Institute 15 days after the Commencement of Formal Academic session. Give suitable reason(s) for your request.

10

Q.7 Write a conversation between two friends expressing their views on “Coming of an unwanted guest” (12 dialogues each).

10
End Semester Examination, Dec. 2015
B. Tech. – First Semester
COMMUNICATION SKILLS (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 Convert the following sentences in the correct tense as stated against each sentence (any ten of the following):
   a) They (pay) for everything. (Present perfect)
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      i) I helped him carry it.
      ii) The weather was very cold.
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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.

Answer the following question based on the above passage:

a) According to the passage, why summer is different for adults?

b) According to the passage, explain briefly narrators view about summer rain?

c) As used in the final paragraph, what does the word reprieve means?

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.

Q.6 Write a letter to the Director of your Institution requesting her/him to allow you to join the Institute 15 days after the Commencement of Formal Academic session. Give suitable reason(s) for your request.

Q.7 Write a conversation between two friends expressing their views on “Coming of an unwanted guest” (12 dialogues each).
Q.1 Attempt (any five):
a) What is feedback in communication process?
b) Write down the difference between verbal and non-verbal communication.
c) Name the different barriers of communication.
d) What is group dynamics?
e) What is interpersonal communication?
f) What is the significance of decoding in the stages of communication? 2x5

Q.2 a) Fill in the blanks with appropriate options of phrasal verbs given below:

| Check out, go on, looking forward to, call back, looking for. |

i) I know things seem bad, but life must _____________.
ii) I’m afraid Mr. Thompson isn’t here. Can you _________ later?
iii) Guests must ___________ by 12:00 P.M.
iv) I’m _________ seeing John and Janet again, aren’t you?
v) Where have you been? We’ve been ___________you everywhere. 1x5

b) Write the meaning and origin of the following words, attempt (any five):

i) Adios –
ii) Bona fide –
iii) Lingua –
iv) Rendezvous –
v) Hasta la vista –
vi) Fiesta –
vii) Amigos – 1x5

Q.3 What are the barriers of communication? 10

Q.4 Write down the suggestions followed in organizing presentation skills. 10

Q.5 Explain your views on the topic “Ban on smoking in public places”. 10

Q.6 What are the 7 'C's of communication? 10

Q.7 Prepare a cover letter for a company where you are applying as a fresher for employment. 10
End Semester Examination, Dec. 2015
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. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.
Q.1 Gaurav walks 20 metres towards North. He then turns left and walks 40 metres. He again turns left and walks 20 metres. Further, he moves 20 metres after turning to the right. How far is he from his original position?
   a) 40 metres  b) 50 metres  c) 60 metres  d) 70 metres

Q.2 Pointing to a gentleman, Deepak said, "His only brother is the father of my daughter's father." How is gentleman related to Deepak?
   a) Brother  b) Father  c) Grand Father  d) Uncle

Q.3 In a certain code, SIKKIM is written as THLJL, how is TRAINING written in that code?
   a) SQBHOHOF  b) UQBHOIOF  c) UQBHOHOL  d) UQBHOHOF

Q.4 Complete the series 20, 19, 17, ...., 10, 5
   a) 15  b) 16  c) 13  d) 14

Q.5 A father is now three times as old as his son. Five years back, he was four times as old as his son. The age of the son is:
   a) 12  b) 15  c) 18  d) 20

Q.6 A shepherd had 27 sheep. All but 10 died. How many he left with?
   a) 10  b) 15  c) 17  d) 27

Q.7 For the integer n, if n*n*n is odd, then what is true
   a) n is odd and n*n is even  b) n*n is odd  c) n is even  d) n*n is even

Q.8 Which greatest possible length can be used to measure exactly 15 meter 75 cm, 11 meter 25 cm and 7 meter 65 cm?
   a) 45cm  b) 255cm  c) 244cm  d) 55cm

Q.9 Find the average of all numbers between 6 and 34 which are divisible by 5
   a) 15  b) 20  c) 25  d) 30

Q.10 Average of five numbers is 27. If one number is excluded the average becomes 25. The excluded number is
   a) 35  b) 45  c) 55  d) 65

Q.11 The total age of A and B is 12 years more than the total age of B and C. C is how many year younger than A
   a) 11  b) 12  c) 13  d) 14

Q.12 If sales tax is reduced from 5% to 4%, then what difference it will make if you purchase an item of Rs. 1000
   a) 10  b) 20  c) 30  d) 40

Q.13 One fourth of one third of two fifth of a number is 15. What will be 40% of that number
   a) 140  b) 150  c) 180  d) 200

Q.14 A man can do a piece of work in 5 days, but with the help of his son he can do it in 3 days. In what time can the son do it alone?
   a) 15/2 days  b) 13/2 days  c) 11/2 days  d) 9/2 days

Q.15 A can do a job in 16 days, B can do same job in 12 days. With the help of C they did the job in 4 days. C alone can do the same job in how many days?
   a) 13/2 days  b) 15/2 days  c) 43/5 days  d) 48/3 days

Q.16 A Man travelled a distance of 61 km in 9 hours. He travelled partly on foot
at 4 km/hr and partly on bicycle at 9 km/hr. What is the distance travelled on foot?

a) 16km  
 b) 14km  
 c) 12km  
 d) 10km

**Q.17** A train is moving at a speed of 132 km/hour. If the length of the train is 110 meters, how long will it take to cross a railway platform 165 meters long?

a) 7 sec.  
 b) 7 sec.  
 c) 8 sec.  
 d) 8 sec.

**Q.18** In one hour, a boat goes 11km along the stream and 5 km against it. Find the speed of the boat in still water?

a) 6  
 b) 7  
 c) 8  
 d) 9

**Q.19** Pipe A can fill a tank in 5 hours, pipe B in 10 hours and pipe C in 30 hours. If all the pipes are open, in how many hours will the tank be filled?

a) 2.5hrs  
 b) 2hrs  
 c) 3.5hrs  
 d) 3hrs

**Q.20** Pipes A and B can fill a tank in 5 hours and 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in.

a) $3(9/5)$  
 b) $3(9/17)$  
 c) $3(7/5)$  
 d) $3(7/17)$

**Q.21** There was simple interest of Rs. 4016.25 on a principal amount at the rate of 9%p.a. in 5 years. Find the principal amount?

a) 7925  
 b) 8925  
 c) 7926  
 d) 8926

**Q.22** Reema took a loan of Rs 1200 with simple interest for as many years as the rate of interest. If she paid Rs. 432 as interest at the end of the loan period, what was the rate of interest?

a) 5 %  
 b) 6 %  
 c) 7 %  
 d) 8 %

**Q.23** What will be the compound interest on Rs. 25000 after 3 years at the rate of 12 % per annum?

a) Rs 10123.20  
 b) Rs 10123.30  
 c) Rs 10123.40  
 d) Rs 10123.50

**Q.24** In what time will Rs.1000 become Rs.1331 at 10% per annum compounded annually?

a) 2yrs.  
 b) 3yrs.  
 c) 4yrs.  
 d) 5yrs.

**Q.25** The area of a rectangle is 460 square metres. If the length is 15% more than the breadth, what is the breadth of the rectangular field?

a) 18m  
 b) 20m  
 c) 22m  
 d) 25m

**Q.26** A courtyard is 25 meter long and 16 meter board is to be paved with bricks of dimensions 20 cm by 10 cm. The total number of bricks required is?

a) 16000  
 b) 18000  
 c) 20000  
 d) 22000

**Q.27** A circular well with a diameter of 2 meters, is dug to a depth of 14 meters. What is the volume of the earth dug out?

a) 40  
 b) 42  
 c) 44  
 d) 46

**Q.28** The curved surface of a right circular cone of height 15 cm and base diameter 16 cm is

a) $116n$  
 b) $122n$  
 c) $124n$  
 d) $136n$

**Q.29** In how many words can be formed by using all letters of the word BHOPAL?

a) 420  
 b) 520  
 c) 620  
 d) 720

**Q.30** A box contains 4 red, 3 white and 2
blue balls. Three balls are drawn at random. Find out the number of ways of selecting the balls of different colours?

Q.31 Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

Q.32 A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is?

Q.33 10 men, working 6 hours a day can complete a work in 18 days. How many hours a day must 15 men work to complete the work in 12 days?

Q.34 4 mat-weavers can weave 4 mats in 4 days. At the same rate, how many mats would be woven by 8 mat weavers in 8 days?

Q.35 A, B and C enter into a partnership investing Rs 35000, Rs 45000 and 55000. Find their respective shares in annual profit of 40,500?

Q.36 Three partners shared the profit in a business in the ratio 5:7:8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?

Q.37 \( \log\sqrt{5}/\log5 = ? \)

Q.38 The last day of a century cannot be?

Q.39 How many days are there in \( x \) weeks \( x \) days?

Q.40 When the hands are in the opposite directions, they are how many minute spaces apart?

Q.41 In every 60 minutes, the minute hand gains how many minutes on the hour hand?

Q.42 In a code, 'lee pee tin' means 'Always keep smiling'. What is the code for?

I. 'tin lut lee' means 'Always keep left'.

II. 'dee pee' means 'Rose smiling'.

Q.43 Select from four alternative diagrams, the one that best illustrates the relationship among the three classes: Pigeons, Birds, Dogs
Q.44 A, P, R, X, S and Z are sitting in a row. S and Z are in the centre. A and P are at the ends. R is sitting to the left of A. Who is to the right of P?
   a) A  b) X  c) S  d) Z

Q.45 A dice is numbered from 1 to 6 in different ways. If 1 is adjacent to 2, 4 and 6, then which of the following statements is necessarily true?
   a) 2 is opposite to 6  b) 1 is adjacent to 3  c) 3 is adjacent to 5  d) 3 is opposite to 5

Q.46 Find the 10th term in the series 2, 4, 8, 16
   a) 1000  b) 1022  c) 1023  d) 1024

Q.47 Which one will replace the question mark?
   a) 18  b) 12  c) 9  d) 6

Q.48 How many educated people are employed?
   a) 9  b) 15  c) 18  d) 20

Q.49 Statements:
   All the harmoniums are instruments.
   All the instruments are flutes

Q.50 Five girls are sitting on a bench to be photographed. Seema is to the left of Rani and to the right of Bindu. Mary is to the right of Rani. Reeta is between Rani and Mary. Who is sitting immediate right to Reeta?
   a) Bindu  b) Rani  c) Mary  d) Seema
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-I
(HM-403)

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. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.
Q.1 A farmer divides his herd of cows among his four sons so that first son gets one-half of the herd, the second son one-fourth, the third son one-fifth and the fourth son 7 cows. The total number of cows in the herd is:
   a) 100   b) 140   c) 180   d) 240

Q.2 \((51 + 52 + 53 + 54 + \ldots 100) = ?\)
   a) 1275   b) 5050   c) 3775   d) 5000

Q.3 How many numbers between 200 and 600 are divisible by 4, 5 and 6 ?
   a) 5   b) 6   c) 7   d) 8

Q.4 A tap can fill a cistern in 8 hours and another tap can empty it in 16 hours. If both the taps are open, the time taken to fill the tank will be:
   a) 8 hours   b) 10 hours   c) 16 hours   d) 24 hour

Directions for Questions 5-9: Refer to the data below and answer the questions that follow.
In a survey among students at all the IIMs, it was found that 48% preferred coffee, 54% liked tea and 64% smoked. Of the total, 28% liked coffee and tea, 32% smoked and drank tea and 30% smoked and drank coffee. Only 6% did none of these. If the total number of students is 2000 then

Q.5 The ratio of the number of students who like only coffee to the number who like only tea is
   a) 5:3   b) 8:9   c) 2:3   d) 3:2

Q.6 The number of students who like coffee and smoking but not tea is
   a) 600   b) 240   c) 280   d) 360

Q.7 The percentage of those who like coffee or tea but not smoking among those who like at least one of these is
   a) More than 30   b) Less than 30   c) Less than 25   d) None of these

Q.8 The percentage of those who like at least one of these is
   a) 100   b) 90   c) Nil   d) 94

Q.9 The two items having the ratio 1:2 are
   a) Tea only and tea and smoking only   b) Coffee and smoking only and tea only   c) Coffee and tea but not smoking and smoking but not coffee and tea   d) None of the above

Q.10 Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:
   a) 5 \(5\frac{5}{11}\)%   b) \(11\frac{60}{100}\)%   c) 6 \(5\frac{11}{11}\)%   d) \(5 \frac{6/11}{11}\)%

Q.11 Three numbers are in the ratio of 3:4:5 and their L.C.M. is 2400. Their H.C.F. is:
   a) 40   b) 80   c) 120   d) 200
Q.12 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) 0  d) 4  
Q.13 When a number is multiplied by 13, it becomes greater to 105 by an amount with which it is lesser to 105 by now. What is the number?
a) 15  b) 13  
c) 17  d) 19  
Q.14 When asked in an exam how much time is left, the teacher answered that the amount of time left is 1/5 of the time already completed. How much time is left?
a) 10  b) 12  
c) 23  d) 5  
Q.15 Look carefully for the pattern, and then choose which pair of numbers comes next.  
36 31 29 24 22 17 15  
a) 13 11  b) 10 5  
c) 13 8  d) 10 8  
Q.16 How many bricks, each measuring 25 cm x 11.25 cm x 6 cm, will be needed to build a wall of 8 m x 6 m x 22.5 cm?
a) 5600  b) 6000  
c) 6400  d) 7200  
Q.17 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.18 Which of the following will replace ‘?’ in the series given below 2, 8, 13, 24, 41, (?)
a) 70  b) 80  
c) 75  d) 85  
Q.19 The sum of third and ninth term of an A.P is 8. Find the sum of the first 11 terms of the progression.
a) 44  b) 22  
c) 19  d) None of these  
Q.20 20 women can complete a work in 7 days and 10 children take 14 days to complete the work. How many days will 5 women and 10 children take to complete the work?
a) 3  b) 5  
c) 7  d) Cannot be determined  
Q.21 42 oranges are distributed among some boys and girls. If each boy gets 3 then each girl gets 6. But if each boy gets 6 and each girl gets 3, it needs 6 more. The number of girls is:
a) 4  b) 6  
c) 8  d) 10  
Q.22 The letters of the word NUMBERS are arranged among themselves. Find the probability of always having NUM in the word.
a) 1/42  b) 1/26  
c) 1/21  d) 1/13  
Q.23 If P(A) = 0.4  P(B)= 0.8  P(B/A) = 0.6. Find P(A/B).
a) 0.4  b) 0.3  
c) 0.6  d) None of these
Q24 A cinema hall has four entry gates and three exit gates. In how many ways can a person enter the cinema hall and comes out?
   a) 7  b) 12  c) 14  d) 24

Q25 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

Q26 If 600 men dig a 55m wide, 4 m deep and 405 m long canal in half an hour, then how long a canal will 2500 men working for 6h, dig if it is 10 m wide and 8 m deep.
   a) 6452 m  b) 5568 3/4 m  c) 26941/3 m  d) 4082 m

Q27 Walking at ¾ of his usual place, a man reaches his office 20 min late. Find his usual time.
   a) 2h  b) 1h  c) 3h  d) 4h

Q28 A passenger train takes two hour less for a journey of 300km if its speed is increased by 5km/h from its normal speed. The normal speed is(in km/h):
   a) 35  b) 50  c) 25  d) 30

Q29 If 5 men take an hour to dig a ditch, then how many minutes should 12 men take to dig a ditch of the same type?
   a) 25  b) 30  c) 28  d) 20

Q30 A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is
   a) 1/13  b) 2/13  c) 1/16  d) 1/15

Q31 Anticipating objections and rehearsing your answers are examples of in a presentation
   a) Introduction  b) Refutation  c) Narrative  d) Argument

Q32 Which of the following is not a characteristic of a good team member?
   a) Encourages feedback on own behavior  b) Understands and is committed to team objectives  c) Engages in win/lose activities with other team members  d) Understands what is going on in the group

Q33 “The choice is ours. We can live with the ever increasing attrition rates, or grasp a culture driven by meritocracy and concern for career progression. “ The above statement is an example of
   a) Antithesis  b) Rhetorical Questions  c) Both  d) None

Q34 Using a comment, a question, a relevant story, a statement, or an example – to get your audience interest/s attention are examples of in a presentation
   a) Opening  b) Closing  c) Audience Analysis  d) Getting Organized

Q35 An effective leader is
   a) An initiator  b) A role-model to others
c) A good coach  
d) All of the above  

Q.36 Passing somebody’s work as your own work is called  
a) Imitation  
b) Copy  
c) Plagiarism  
d) None of the above  

Q.37 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.38 “What to change today so that tomorrow is better than yesterday”- is the definition of  
a) Self awareness  
b) Decision Making  
c) Planning  
d) Goal setting  

Q.39 Choosing an occupation, getting a job, growing in our job, acquiring skills, changing careers and retiring are examples of  
a) Self awareness  
b) Decision Making  
c) Career Planning  
d) Goal setting  

Q.40 The decision making pyramid has  
a) Intuition, occupational awareness and self awareness  
b) Strength, weaknesses, opportunities and threats  
c) Strengths, occupational awareness and opportunities  
d) Intuition, opportunities and threats  

Q.41 The ability to evaluate oneself, observe the behaviors, find the areas of improvement and work on them is an example of Intelligence  
a) Spacial  
b) Intrapersonal  
c) Interpersonal  
d) Rhythmic  

Q.42 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  
d) All of the above  

Q.43 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.44 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.45 Which of the following helps in Reducing Stress
a) Taking up a hobby
b) Doing regular exercises
c) Learning to say "no."
d) All of the above

Q.46 ……… is the other form of stress that is positive and beneficial. We may feel challenged, but the sources of the stress are opportunities that are meaningful to us. It helps provide us with energy and motivation to meet our responsibilities and achieve our goals.
 a) Distress  b) Eustress
c) Pestress  d) Estress

Q.47 During a cross cultural communication it is important that one
a) Speaks fast
b) Asks negative question
c) Uses a slang
d) Summarizes & paraphrases to verify

Q.48 Generating creative ideas and converting them into novel, useful and viable commercial products, services, and business practices is called ………………………
a) Innovation  b) Creativity
c) Bisociation  d) Analysis

Q.49 Visual, Auditory and Kinesthetic are examples of
a) Learning Styles
b) Presentation styles
c) Audience Analysis
d) Effective opening techniques in presentation

Q.50 SWOT and PEST Analysis are examples of
a) Self Assessment
b) Decision making
c) both
d. None of the above
End Semester Examination, Dec. 2015
B. Tech. – Fifth / Sixth Semester
INDUSTRIAL MANAGEMENT (HM-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 Answer the following:
a) Discuss nature of management.
b) Problems of layout.
c) Draw a BIN card.
d) Importance of industrial relations. 5x4

PART-A

Q.2 Define management. Discuss the controlling process with the help of a diagram. 20
Q.3 Define plant layout. Discuss the types of layout with the help of a diagram. 20
Q.4 Discuss various types of associated charts along with method studies. 20

PART-B

Q.5 Discuss EOQ analysis with the associated costs with inventory management. 20
Q.6 Discuss the scope of employee welfare. 20
Q.7 What is TQM? Discuss TQM in detail. 20
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
CAREER SKILLS-III (HM-503A)

Time: 2hrs
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 mark each. There is no negative marking.
Q.1 A car travelling with of its actual speed covers 42 km in 1 hr. 40 min. 48 sec. Find the actual speed of the car is:
   a) 17 ½ 
   b) 20 
   c) 30 
   d) 35

Q.2 A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:
   a) 13 km 
   b) 15 km 
   c) 16 km 
   d) 17 km

Q.3 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.4 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.5 Three unbiased coins are tossed. What is the probability of getting at most two heads?
   a) 3/4 
   b) 1/4 
   c) 3/8 
   d) 7/8

Q.6 Look at this series: 7, 10, 8, 11, 9, 12, ... What number should come next?
   a) 7 
   b) 10 
   c) 12 
   d) 13

Q.7 If the population of a town is decreased by 10% and then increased by 10%, the net effect on the population of the town is:
   a) A decrease of 99% 
   b) No change 
   c) A decrease of 1% 
   d) An decrease of 1%

Q.8 How many times the two hands of a clock meet in a day?
   a) 22 
   b) 11 
   c) 44 
   d) 55

Q.9 What percentage of numbers from 1 to 70 have 1 or 9 in the unit’s digit
   a) 1 
   b) 14 
   c) 20 
   d) 21

Q.10 A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:
   a) 588 
   b) 672 
   c) 600 
   d) 700

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) 1/14 
   b) 1/10 
   c) 7/15 
   d) 8/15

Q.12 The largest 4 digit number exactly divisible by 88 is:
   a) 9944 
   b) 9988 
   c) 8888 
   d) None

Q.13 What is the unit digit in \((6374)^{1793} \times (625)^{317} \times (341491)?\)
   a) 0 
   b) 2 
   c) 3 
   d) 5

Q.14 \(8597 - ? = 7429 - 4358\)
   a) 5430 
   b) 5420 
   c) 5526 
   d) None

Q.15 In how many ways can the letters of the word 'LEADER' be arranged?
   a) 72 
   b) 36 
   c) 360 
   d) None

Q.16 Two discounts of 60% and 20% equal to a single discount of
   a) 70 
   b) 65 
   c) 66 
   d) 68

Q.17 In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is red?
   a) 1/3 
   b) 1/2 
   c) 8/21 
   d) 3/13

Q.18 Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?
   a) 4 
   b) 10 
   c) 13 
   d) 16

Q.19 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.20 The ratio between the speeds of two trains is 7:8. If the second train runs 400 km in 4 hours, then the speed of the first train is:
   a) 67.5 kmph 
   b) 57.5 kmph 
   c) 77.5 kmph 
   d) 87.5 kmph
Q.21 It’s important to understand the difference between effectiveness and efficiency. What does effectiveness mean?
   a) Doing things in the right way to use your time well.
   b) Following the rules processes and systems that are in place.
   c) Inventing new rules, processes and systems.
   d) Only doing what is essential to achieve results.

Q.22 To do list should include the following
   a) Meeting agenda
   b) Milestones and deadlines
   c) Charts
   d) Pictures

Q.23 Which characteristic represents the procrastinator?
   a) Fear of offending
   b) Postponing the tasks
   c) Desire to help others
   d) Can't say no

Q.24 A method of prioritization is
   a) First, second, third & fourth
   b) Short task & long task
   c) Immediate, short term, medium, long term
   d) Immediate task and medium task

Q.25 When asked to estimate how much time a task will take, what should you ideally do?
   a) Underestimate how much time you need.
   b) Attempt to make an accurate estimate.
   c) Overestimate how much time you need.
   d) Refuse to commit to an estimate.

Q.26 You are on an airplane that suddenly hits extremely bad turbulence and begins rocking from side to side. What do you do?
   a) Continue to read your book or magazine, or watch the movie, trying to pay no attention to the turbulence.
   b) Become vigilant for an emergency, carefully monitoring the stewardesses and reading the emergency instructions card.
   c) A little of both a and b.
   d) Start shouting and alerting others.

Q.27 Which is the first step in problem solving?
   a) Identify and analyze the problem
   b) Observe, evaluate, and adjust
   c) Consider possible solutions
   d) Collect and analyze data

Q.28 Problem-solving method in which all members of a group fully accept and support a decision.
   a) Norm
   b) Compromise
   c) Goal
   d) Consensus

Q.29 You are a customer service representative and have just gotten an extremely angry client on the phone. What do you do?
   a) Hang-up. It doesn't pay to take abuse from anyone.
   b) Listen to the client and rephrase what you gather he is feeling.
   c) Explain to the client that he is being unfair, that you are only trying to do your job, and you would appreciate it if he wouldn't get in the way of this.
   d) Tell the client you understand how frustrating this must be for him, and offer a specific thing you can do to help him get his problem resolved.

Q.30 You have been given the task of managing a team that has been unable to come up with a creative solution to a work problem. What is the first thing that you do?
   a) Draw up an agenda, call a meeting and allot a specific period of time to discuss each item.
   b) Organize an off-site meeting aimed specifically at encouraging the team to get to know each other better.
   c) Begin by asking each person individually for ideas about how to solve the problem.
   d) Start out with a brainstorming session, encouraging each person to say whatever comes to mind, no matter how wild.

Q.31 Customers, suppliers, distributors and community groups are:
   a) Stockholders
   b) Stakeholders
   c) Shareholders
   d) None of the above

Q.32 Which of the following does NOT result in quality customer service?
   a) Lowering prices
   b) Defining the types of customer it has
   c) Regular communication with customers to determine their needs and expectations and what they value.
   d) Continual improvement to meet and exceed customer needs and expectations.

Q.33 What is FAB?
   a) Future & benefits
   b) Further & benefits
Q.34 Which skills are assessed by the panel in GD.
   a) Authoritarian skills  b) Leadership skills
c) Team skills   d) Only B & C
Q.35 A statement placed at the beginning of the CV acts as a/an:
   a) Preface  b) Letter of recommendation
c) Synopsis  d) Objective
Q.36 In an interview when you do not know an answer, you should:
   a) Keep guessing  b) Remain quiet
c) Bluff  d) Admit you do not know the answer
Q.37 What are FAQ’s?
   a) Frequently answered questions  b) Frequently asked questions
c) Fairly asked questions  d) Fondly answered questions
Q.38 The best way to apply for a job is to submit a résumé that is:
   a) Full of personal information  b) Self-recommending
c) Specifically written for that particular job  d) Suitable for any job
Q.39 Tease” or “stress” questions are intended to judge:
   a) How the candidate handles them  b) The candidate’s intelligence quotient
c) The candidate’s stress level  d) The candidate’s technical skill
Q.40 The left part of our brain controls:
   a) Logic and reasoning  b) Emotions
c) Creativity  d) Imagination
Q.41 A discussion between you and your friend has escalated into a shouting match. You are both upset and in the heat of the argument, start making personal attacks which neither of you really mean. What is the best thing to do?
   a) Agree to take a 20-minute break before continuing the discussion.
b) Go silent, regardless of what your partner says.
c) Say you are sorry, and ask your partner to apologize too.
d) Stop for a moment, collect your thoughts, then restate your side of the case as precisely as possible.
Q.42 Which of the following is NOT a benefit of excellent customer service?
   a) Work is less fulfilling.
b) Businesses with truly exceptional customer service can achieve a unique competitive edge.
c) Customer service providers feel positive about their roles in creating positive exchanges with customers.
d) Companies earn a more positive reputation.
Q.43 Which of the following things you would like to study before an interview?
   a) Job description  b) Company profile
c) Both  d) None
Q.44 Begin a job search by ________________.
   a) Assessing your skills and aptitudes  b) Searching online for job prospects
c) Networking  d) Registering with an employment agency
Q.45 One should reach the interview venue:
   a) Just on time  b) 15 mins prior
c) Can reach anytime  d) an hour prior
Q.46 The interviewer is asking you to give specific examples of topics you are discussing. This is what type of interviewing technique?
   a) Competency-based interview  b) Informational interview
c) Stress interview  d) Behavioral interview
Q.47 What kind of preparation should you undertake before going to an interview?
   a) About the job you are applying for  b) About the company
c) About the culture  d) All of the above
Q.48 What body language and presentation skills will serve you well in an interview?
   a) Firm handshake  b) Speaking clearly
c) Maintaining eye contact
d) All of the above

Q.49 What strategy is recommended when this is your first job?
   a) Use concrete examples from schoolwork, projects, and internships to show your stuff
   b) Explain why the company’s training program will be important
   c) Say how much you want and need the job
   d) Talk about your uncle, who owns the company

Q.50 When the interview is completed, what should you do?
   a) Go home and party
   b) Go home and write a thank you follow-up
   c) Go home and call the interviewer right away and ask more questions
   d) All of the above
Q1
Answer the following:
   a) What is the importance of directing?
   b) What is product layout? Explain with a diagram.
   c) What is worker participation in management?
   d) Define the role of NABARD.

**PART-A**

Q2 Define management. Discuss the process of controlling with the help of a diagram.
   20

Q3 Discuss the factors influencing a layout and major problems of a layout.
   20

Q4 Discuss the ABC technique of inventory control in detail.
   20

**PART-B**

Q5 What is employee welfare? Discuss the scope of employee welfare in detail.
   20

Q6 Discuss the role of following in supporting entrepreneurs:
   a) Commercial Banks.
   b) District Industry Centres.
   10x2

Q7 Write short notes on:
   a) Objectives of good industrial relations.
   b) Role of SIDBI in supporting entrepreneurs.
   10x2

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**End Semester Examination, Dec. 2015**
B. Tech. – Fifth Semester

**QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-II**
(HM-505)

Time: 2 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 When dealing with a predicament or dilemma, it is advisable to brainstorm possible solutions because this procedure:
   a) Stimulates creative and strategic-solution-oriented thinking.
   b) Prevents you from confusing the symptoms of the problems with the actual problem
   c) Allows you to put off the day of reckoning
   d) Makes you appear smarter than you really are

Q.2 Establishing goals and calculating the odds are examples of:
   a) Verbal/linguistic intelligence.
   b) Strategic thinking.
   c) Intrapersonal intelligence.
   d) Body/kinesthetic intelligence.

Q.3 If faced with a challenge, which of the following strategic thinking questions would you logically ask first?
   a) What possible problems might I encounter?
   b) How can I increase my chances of not making mistakes?
   c) What is my objective (or objectives)?
   d) How can I avoid mistakes?

Q.4 Which of the following describes the process by which individuals come to agreement?
   a) Accommodation.
   b) Avoidance.
   c) Negation
   d) Fighting actively

Q.5 The practice of storing up grievances so they may be unloaded at another time is called:
   a) Brown bagging.
   b) Stonewalling.
   c) gunnysacking.
   d) Harboring.

Q.6 Recognizing that your partner has legitimate feelings demonstrates:
   a) Empathy
   b) Mind reading
   c) Sympathy
   d) Imagining

Q.7 What type of approach to conflict is "avoiding"?
   a) I win -- you win.
   b) I lose - you lose.
   c) I lose -- you lose, and then I win.
   d) I win - you lose.

Q.8 One advantage of conflict is that it:
   a) makes problems go away
   b) makes problem people go away.
   c) forces problems to be addressed.
   d) forces one to choose friends wisely

Q.9 The résumé of a fresh graduate is generally:
   a) half a page
   b) two pages long
   c) three pages long
   d) one page long
Q.10 A summary placed at the beginning of the CV acts as a:
   a) statement of objectives.
   b) synopsis.
   c) letter of recommendation.
   d) preface.

Q.11 The first objective in a group discussion is to:
   a) prove your superiority.
   b) catch the group’s attention.
   c) create sub-groups.
   d) act as a self-appointed leader of the group.

Q.12 Which of the following is NOT a benefit of excellent customer service?
   a) Work is less fulfilling.
   b) Businesses with truly exceptional customer service can achieve a unique competitive edge.
   c) Customer service providers feel positive about their roles in creating positive exchanges with customers.
   d) Companies earn a more positive reputation.

Q.13 What is the main reason that more businesses are not actually providing excellent customer service?
   a) They don't care about serving customers.
   b) They don't know how to get started.
   c) They don't like people.
   d) They see no value in it.

Q.14 A customer service representative strives to be prompt when addressing customer complaints. Which service factor is the representative demonstrating?
   a) Assurance.
   b) Responsiveness.
   c) Empathy.
   d) Reliability.

Q.15 A person approaches you and tells you of many complaints he has about your department. You should first:
   a) Assume that he is just blowing off steam and ignore the criticisms.
   b) Check into the legitimacy of the complaints.
   c) Ask for advice from your supervisor on the best way to handle the person.
   d) Regard the complaints as accurate and take immediate steps to correct them.

Q.16 The purchasing strategy that refers to a buyer's efficiency orientation where the main purchasing goal is to seek the lowest price for the product is known as:
   a) the bargainer.
   b) the price minimize.
   c) the clockwiser.
   d) the adaptator.

Q.17 Organizational buying behaviour is about:
   a) determining the characteristics of the needed product.
   b) the functions and processes, strategy, and the network of relationships.
   c) searching for qualified sources.
Q.18 Organizations that purchase goods and services that are then consumed as part of their production and manufacturing processes are referred to as:
ad) Institutions.
b) Users.
c) Original Equipment Manufacturers.
d) Distributors.

Q.19 A unique purchase situation in the business market that requires considerable effort on the decision maker's part is called:
a) a straight rebuy.
b) a modified rebuy.
c) a new-task buy.
d) a selective rebuy.

Q.20 How can excellent customer service help retain current customers?
a) Productive solutions are developed in response to customer challenges.
b) Customer challenges are recognized.
c) Customer service philosophies focus on satisfying customers.
d) All of the above.

Q.21 Which of the following IS a benefit of excellent customer service?
a) Emphasis is on gaining new customers, not retaining old ones.
b) Customers are not treated as co-producers.
c) Work environments deteriorate because of the added pressure.
d) Profit goals are more likely to be reached.

Q.22 Which of the following is one of the most effective and least expensive ways to market a business?
a) In-theater advertising.
b) Effective customer service.
c) Glossy, colorful, professional brochures.
d) One-on-one sales calls.

Q.23 When participating in a group presentation, it is imperative to:
a) ensure everyone makes equal contributions.
b) solve the problem or issue as quickly as possible.
c) incorporate every suggestion.
d) ensure everyone understands the assignment.

Q.24 A public discussion with a moderator in which a series of short speeches is presented to an audience is:
a) a group discussion.
b) a forum presentation.
c) a symposium presentation.
d) a panel discussion.

Q.25 In which type of group presentation do audience members ask questions and direct comments to the group, and group members respond with brief impromptu speeches?
a) a forum presentation.
b) an office meeting a forum presentation.
c) a symposium presentation.
d) a panel discussion.

Q.26 Which of the following roles is not a responsibility of a member of a group?
a) challenge unfounded conclusions.
b) support other group members.
c) avoid advocating personal beliefs.
d) question other members.

Q.27 Tia is the moderator for a symposium presentation on "Gender Bias in the Workplace." After each member has spoken, the floor is opened for questions. Rex stands up and asks Tia, "How did you decide on such a stupid topic for this presentation?" How should Tia respond?
a) "I believe you'd like to know how we decided on this topic. Well...".
b) "If you can't ask questions in a more respectful way, I can't answer."
c) "I'm sorry. I couldn't hear that question. Does anyone else have a question?"
d) "Because you're a man, you can't possibly understand our problem."

Q.28 During a focus group, the discussion has seriously departed from the discussion guide. The moderator could use which of the following techniques to re-steer the group?
a) speech patterning.
b) reframing.
c) pattern identification.
d) controlling group dynamics.

Q.29 The purpose of the small talk stage of an interview is to:
a) form a first impression in the mind of the interviewer.
b) form a first impression in the mind of the interviewee.
c) help the candidate feel at ease with the interview setting.
d) all three

Q.30 Which of the following is NOT a standard interview question?
a) What are your weaknesses?
b) What are your qualifications?
c) What are your long-term goals?
d) Can you tell me how you work under pressure?

Q.31 If the sum of two natural numbers is multiplied by each number separately, the product so obtained are 2418 and 3666. What is the difference between the numbers?
a) 16  b) 26  c) 22  d) 35

Q.32 Find the greatest number less than 100000 which is divisible by 38, 60, 64?
a) 98000  b) 85000  c) 76000  d) 91200

Q.33 A boat running upstream takes 8 hrs and 48 min to cover a certain distance, while it takes 4 hrs to cover the same distance running downstream. What is the ratio of the speed of the boat to the speed of current?
a) 2:3  b) 3:2  c) 8:3  d) Cannot be determined.
Q.34 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.35 If the letters of the word ATTRACTION are written down at random, find the probability that all the T’s occur together.
   a) 1/15 
   b) 1/12 
   c) 1/20 
   d) 1/25

Q.36 From 4 flags of different colours, how many different signals can be given, by taking any number of flags at a time? (no signal is formed if no flags are used)
   a) 65 
   b) 60 
   c) 64 
   d) 55

Q.37 A scored 30% marks and failed by 15 marks. B scored 40% marks and obtained 35 marks more than those required to pass. The pass percentage is:
   a) 33% 
   b) 38% 
   c) 43% 
   d) 46%

Q.38 An amount of Rs 2430 is divided among A, B and C such that if their shares be reduced by Rs 5, Rs 10 and Rs 15 respectively, the remainders shall be in the ratio of 3 : 4 : 5. Then B’s share was
   a) Rs 605 
   b) Rs 790 
   c) Rs 800 
   d) Rs 810

Q.39 4 men and 6 women can complete a job in 8 days, while 3 men and 7 women can complete it in 10 days. How many days will 10 women working alone take to complete the same work?
   a) 24 days 
   b) 40 days 
   c) 36 days 
   d) 72 days

Q.40 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.41 **Statements:** Some actors are singers.
   All the singers are dancers.
   **Conclusions:**
   1. Some actors are dancers.
   2. No singer is actor.
   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.42 A clock is started at noon. By 10 minutes past 5, the hour hand has turned through?
   a) 145° 
   b) 150°
Q.43 If 16 men working 7 hours day can plough a field in 48 days, in how many days will 14 men working 12 hours a day plough the same field?
   a) 46  b) 32  c) 35  d) 30

Q.44 Which one will replace the question mark?
   ![Diagram](image)
   a) 80  b) 114  c) 108  d) None

Q.45 If each edge of a cube is increased by 50%, find the percentage increase in its surface area?
   a) 125%  b) 150%  c) 175%  d) 110%

Q.46 A rectangular block 6 cm by 12 cm by 15 cm is cut up into an exact number of equal cubes. Find the least possible number of cubes.
   a) 30  b) 40  c) 10  d) 20

Q.47 A began a business with Rs. 85,000. He was joined afterwards by B with Rs. 42,500. For how much period does B join, if the profits at the end of the year are divided in the ratio of 3 : 1?
   a) 4 months  b) 5 months  c) 6 months  d) 8 months

Q.48 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.49 A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?
   a) 26.34ltrs  b) 27.36ltrs  c) 28ltrs  d) 29.16ltrs

Q.50 In a certain code '13' means 'stop smoking', '59' means 'injurious habit', '93' means 'smoking habit'. What is the meaning of '15' in that code?
   a) Stop Habit.
   b) Smoking Habit.
   c) Stop Injurious.
   d) None
End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
QUANTITATIVE APTITUDE AND PERSONALITY DEVELOPMENT-II (HM-505)

Time: 2 hrs
50

Max Marks:

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 mark each. There is no negative marking.
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 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) 6!  b) 4!  c) 6!/2!  d) 6!/2!

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:
   a) 1  b) 2  c) 3  d) 4

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) 263×21  b) 26×25×24×21  c) 25×24×23×21  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 4 km 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) `16  b) `21  c) `25  d) `31

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 II to brandy in vessel I?
   a) 7:8  b) 8:7  c) 1:1  d) None of these
Q.16 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.17 Find the next term in the given series ZA₅, Y₄B, XC₆, W₃D, ____
   a) E₇V  b) V₇E  c) VE₅  d) VE₇

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 If A = x% of y and B = y% of x, then which of the following is true?
   a) A is smaller than B  b) A is greater than B  c) Relationship between A and B cannot be determined  d) None of these

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
   a) Problem Solving  b) Time Management  c) Delegation  d) Stress Management

Q.22 Twitter is
   a) Urgent/ Important  b) Urgent/ Not Important  c) Not Urgent/ Not Important  d) Not Urgent/ Important

Q.23 Which of the following activities deserve most of your time?
   a) Urgent/ Important  b) Urgent/ Not Important  c) Not Urgent/ Not Important

Q.24 Which of the following activities need to be eliminated from your schedule?
   a) Urgent/ Important  b) Not Urgent/ Not Important  c) Both  d) None

Q.25 Adhoc meetings are
   a) Urgent/ Important  b) Urgent/ Not Important  c) Not Urgent/ Not Important  d) Not Urgent/ Important

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
   a) Paraphrasing  b) Problem Solving  c) Stress Management  d) Customer Engagement

Q.29 Which of the following is a not a valid category for Cause and Effect Analysis
   a) People  b) Attitude  c) Machine  d) Material

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
   a) Sales  b) Marketing  c) Product Positioning  d) Media Planning

Q.32 In Transactional selling what is a salesperson chasing
   a) Word of mouth  b) Customer loyalty
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
a) Analytical Skills  b) Decision Making
c) Both  d) None

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. 2015
B. Tech. – Sixth Semester
CAREER SKILLS-IV (HM-602)

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. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.
Q.1  It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?
a) Wednesday  b) Friday
c) Saturday  d) Sunday

Q.2  In a division sum, the remainder is 0. As student mistook the divisor by 12 instead of 21 and obtained 35 as quotient. What is the correct quotient?
a) 0  b) 12  c) 13  d) 20

Q.3  A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?
a) 10/21  b) 11/21
c) 2/7  d) 5/7

Q.4  The curved surface area of a cylindrical pillar is 264 m$^2$ and its volume is 924 m$^3$. Find the ratio of its diameter to its height.
a) 3:7  b) 7:3
c) 6:7  d) 7:6

Q.5  Six bells commence tolling together and toll at intervals of 2, 4, 6, 8 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?
a) 4  b) 10  c) 15  d) 16

Q.6  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 days  b) 6 days
c) 10 days  d) 7 days

Q.7  Find the missing number in the series:
20, 19, 17, x , 10, 5
a) 12  b) 13  c) 14  d) 15

Q.8  In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?
a) 120  b) 720
c) 4320  d) 2160

Q.9  How many terms are there in the G.P. 3, 6, 12, 24, .... , 384 ?
a) 7  b) 8  c) 9  d) 10

Q.10  How many two digit numbers can be formed using 1, 2, 3, 4, 5, 6?
a) 30  b) 36
c) 35  d) None of these

Q.11  Robert is travelling on his cycle and has calculated to reach point A at 2 P.M. if he travels at 10 kmph, he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M.?
a) 8 kmph  b) 11 kmph
c) 12 kmph  d) 14 kmph
Q.12 Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?
   a) 1/2  b) 2/5  c) 8/15  d) 9/20

Q.13 How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?
   a) 5  b) 10  c) 15  d) 20

Q.14 A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?
   a) 1/3  b) ⅓  c) 1/5  d) 1/7

Q.15 What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?
   a) 1  b) 14  c) 20  d) 21

Q.16 A student multiplied a number $\frac{3}{5}$ instead of $\frac{5}{3}$ by $\frac{3}{5}$ instead of $\frac{5}{3}$, what is the percentage error in the calculation?
   a) 34%  b) 44%  c) 54%  d) 64%

Q.17 The price of 2 sarees and 4 shirts is Rs. 1600. With the same money one can buy 1 saree and 6 shirts. If one wants to buy 12 shirts, how much shall he have to pay?
   a) Rs. 1200  b) Rs. 2400  c) 2300  d) None of these

Q.18 Free notebooks were distributed equally among children of a class. The number of notebooks each child got was one-eighth of the number of children. Had the number of children been half, each child would have got 16 notebooks. Total how many notebooks were distributed?
   a) 256  b) 432  c) 512  d) 640

Q.19 There are two examinations rooms A and B. If 10 students are sent from A to B, then the number of students in each room is the same. If 20 candidates are sent from B to A, then the number of students in A is double the number of students in B. The number of students in room A is:
   a) 20  b) 80  c) 100  d) 200

Q.20 In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?
   a) 3:7  b) 5:7  c) 7:3  d) 7:5

Q.21 Communication is:
   a) Getting Understood
b) Understanding others

c) Getting the desired response

d) All

Q.22 I am very good at understanding how something is being told to me in terms of Tone, pitch, rate of speech, volume, intonation etc. I am good at:

a) Chronemics  
b) Haptics  
c) Vocalics  
d) Oculessics

Q.23 I am not punctual and expect others to behave in a similar manner. I am:

a) Monochronic  
b) Polychronic  
c) Both  
d) None

Q.24 I am good at understanding other and find it very easy to build credibility. I possess the following type of intelligence:

a) Spacial  
b) Intrapersonal  
c) Interpersonal  
d) Rhythmic

Q.25 When you have to speak about a topic without preparation, it is called:

a) Extempore  
b) Debate  
c) Declamation  
d) None

Q.26 We should pick up our phone ideally in ____ or less rings

a) 1  
b) 2  
c) 3  
d) 6

Q.27 Passing somebody’s work as your own work is called:

a) Imitation  
b) Copy  
c) Plagiarsim  
d) None of the above

Q.28 The neck scratch is a signal of:

a) Doubt or Uncertainty  
b) Conformism  
c) Under confidence  
d) Feeling powerful

Q.29 Walking with the head up, chin out and one palm gripping the other hand behind the back:

a) Superiority  
b) Inferiority  
c) Agreeableness  
d) Open mindedness

Q.30 A typical “Know it all gesture” of professionals is:

a) Clasping palms  
b) Both hands behind head  
c) Neck scratching  
d) Guarding the mouth
Q.31 Nose touch gesture is a sophisticated, disguised version of the:
   a) Hand Clenching
   b) Neck Scratching
   c) Mouth Guard
   d) Ear Rub

Q.32 Listener when guards his mouth means he thinks:
   a) Speaker is truthful
   b) Speaker is sincere
   c) Speaker is serene
   d) Speaker is lying

Q.33 Fingers in the mouth shows:
   a) Over confidence
   b) Boredom
   c) Under confidence
   d) Creativity

Q.34 What percentage of our daily communication is Non Verbal?
   a) More than 80
   b) 60
   c) 20
   d) 50

Q.35 Ocalics/ Oculesics is a non verbal communication through
   a) Ears
   b) Eyes
   c) Tongue
   d) Uvula

Q.36 “After you”, “May I”, “Please allow me”, “Thank you” are examples of
   a) Punctuality
   b) Morality
   c) Courtesy
   d) Brutality

Q.37 What would be the best medium to communicate if I have to terminate somebody in my team?
   a) Face to face meeting
   b) Email
   c) Telephone
   d) Fax

Q.38 I am the HR manager of an organization and I have to inform all the employees of the organization about the new leave policy. Which medium will be ideal?
   a) Face to face meeting
   b) Email
   c) Telephone
   d) Fax

Q.39 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.40 The various qualities and skills that get tested in a GD are:
   a) Group behavior
   b) Communication skills
   c) Leadership Skills
   d) All of the above.

Q.41 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) Both b) and c)

Q.42 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 abbreviations

Q.43 I am a participant in a GD. I am not familiar with the topic. However I listen to other participants in the first few minutes and create my content by changing the language. This makes me:
   a) Initiator    b) Moderator
   c) Loan Taker   d) Concluder

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 Group discussions are conducted to test the following:
   a) Knowledge.
   b) Communication
   c) Leadership
   d) All of the above.

Q.46 I want to make an effective CV. My CV must have:
   a) Project Details
   b) Scholastics
   c) Achievements and Awards.
   d) None of the above.

Q.47 You’re asked what your biggest weakness is. How do you answer?
   a) “I can sometimes be disorganized. I have been trying to become more organized by creating a calendar for myself and categorizing things in folders. So far, these methods seem to be working.”
   b) “Honestly, I don’t really have one.”
   c) “I’m a perfectionist. As a result, I often work very hard, perhaps even too hard. I’m usually at the office for more hours than the average employee.”
   d) “I work so hard that I over strain myself”

Q.48 Your interviewer asks you what your greatest strengths are. How do you respond?
   a) By listing five or ten qualities you think are your best ones.
b) Give two or three strengths and concrete examples of them.
c) Say all the qualities and requirements that were listed on the job description.
d) None of the Above.

Q.49 In an official email, signature includes:
a) Your name
b) Your company name & designation
c) How to get in touch with you
d) All of the above

Q.50 In a CV, professional enhancements include:
a) Trainings done in college
b) Trainings done outside curriculum preview
c) Trainings done in school
d) None of the above
End Semester Examination, Dec. 2015
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 any five:
   a) Need of quality.
   b) Background of quality.
   c) Cost of quality.
   d) Quality of design.
   e) Advantages of six sigma.
   f) Control limit theorem.

PART-A

Q.2 What are principles of TQM? Explain in detail.

Q.3 Explain quality and cost relationship with a neat sketch.

Q.4 What is statistical quality control system, and how it is used with control charts?

PART-B

Q.5 Explain how quality control and inspection are inter related and how it carries the total responsibility.

Q.6 What is supplier customer relationship participation? Explain your view.

Q.7 Write short notes on:
   a) Dimension of quality.
   b) Documentation and its control.
   c) Quality audit and its need.
   d) Supplier and customer partnership.
End Semester Examination, Dec. 2015
B. Tech. – Eight Semester
MARKETING MANAGEMENT (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 a) Explain your ‘p’ s in marketing.
b) What is order to payment cycle?
c) What is behavioural segmentation?
d) What is product life cycle?
e) What is supply chain?
f) What is multi channel marketing?
g) Concept of social marketing.
h) What is hybrid level channel marketing?
i) Importance of motivation in marketing.
j) What is customer relationship management?

2x10

PART -A

Q.2 Explain the term marketing. Explain briefly the core marketing concepts associated with it. 20

Q.3 What is marketing research system? Explain the major forces that are used to analyze the macro environment. 20

Q.4 Explain in detail the buying decision process the five stage model. 20

PART -B

Q.5 Explain psychographic, geographic and demographic segmentation with suitable examples 20

Q.6 Explain in brief:
a) Product characteristics and classifications. 8
b) Price discount and allowances. 6
c) Promotional and differentiated pricing. 6

Q.7 a) What is hybrid channels and multi channel marketing? 12
b) What is corporate social responsibility? 8
End Semester Examination, Dec. 2015
B. Tech. – Seventh / 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) Discuss the importance of pay for “performance”.
   b) Discuss the process of career planning.
   c) What is induction? Discuss its importance.
   d) Discuss the essential competencies of a HR manager. 5x4

PART-A

Q.2 Define management. Discuss the strategic importance of HRM. 20

Q.3 What is HRP? Discuss the forecasting techniques of HRP. 20

Q.4 Define recruitment. Discuss the process of recruitment in detail. 20

PART-B

Q.5 How would you design and administer a training program? Discuss the steps involved in it. 20

Q.6 Discuss the process of PMS in detail. 20

Q.7 a) Employee leasing.
    b) Role of HR in mergers and acquisitions. 10x2
Q.1  Explain briefly:
   a) Project and its characteristics.
   b) Project identification.
   c) Project information system.
   d) Post project review.
   e) Contract and its types.

   **PART-A**

Q.2  a) Explain the term: taxonomy of projects.
     b) Distinguish between forward and backward integration projects with an example.

Q.3  a) What is project formulation or project preparation? Explain in detail.
     b) What is project cycle? Explain in details?

Q.4  a) Explain CPM and PERT methods of project networking.
     b) The precedence relation and other information of the project are given in table below. Draw the network and calculate the project duration:

     | TASK/ACTIVITY | A | B | C | D | E | F | G | H | I |
     |---------------|---|---|---|---|---|---|---|---|---|
     | PREDECESSOR   | - | - | A | A | B, D| C | C | F, G|
     | TIME (DAYS)   | 8 | 10| 8 | 10| 16 |17 |18 |14 | 9 |

   **PART-B**

Q.5  a) What is project organization? Explain types of project organizations in detail.
     b) Explain the tendering process in detail.

Q.6  a) What is project inventory and its types?
     b) Derive economic order quantity algebraically and graphically.

Q.7  a) Explain project termination and its causes in detail.
     b) Write down the qualities and responsibilities of a project manager.
End Semester Examination, Dec. 2015
B. Tech. – Fourth Semester
CAREER SKILLS-II (HM-402)

Time: 2 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 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.2 If b equals 10% of a and c equals 20% of b, then which one of the following equals 30% of c?
   a) 0%  b) 5%  c) 10%  d) 40%

Q.3 Two pipes can fill the cistern in 10hr and 12 hr respectively, while the third empty it in 20hr. 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.4 How many prime numbers are there in the first 100 natural numbers?
   a) 22  b) 23  c) 24  d) 25

Q.5 In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?
   a) 120  b) 720  c) 4320  d) 2160

Q.6 In how many different ways can the letters of the word 'GAMER' be arranged?
   a) 8!  b) 6!  c) 3! * 2!  d) 5!

Q.7 In how many ways playing eleven can be selected from 16 players of a cricket team?
   a) \(16 \binom{11}{11}\)  b) \(16 \binom{11}{11}\)  c) 16!  d) None of the above

Q.8 Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?
   a) 57%  b) 60%  c) 65%  d) 90%

Q.9 Reeya obtained 65, 67, 76, 82 and 85 out of 100 in different subjects, what will be the average?
   a) 70  b) 75  c) 80  d) 85

Q.10 A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:
   a) 100 kmph  b) 110 kmph  c) 130 kmph  d) 120 kmph

Q.11 A man buys an article for Rs. 27.50 and sells it for Rs 28.60. Find his gain percent
   a) 1  b) 2  c) 3  d) 4
Q.12 An airplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same
distance in \(\frac{2}{3}\) hours, it must travel at a speed of:
   a) 300 Kmph  b) 360 kmph
   c) 600 kmph  d) 720 kmph

Q.13 The smallest 6 digit number exactly divisible by 111 is?
   a) 111111  b) 110011
   c) 100011  d) 110101

Q.14 What is the unit digit in \((6376)^{1793} \times (625)^{317} \times (341^{491})\)?
   a) 0  b) 2  c) 3  d) 5

Q.15 Find the remainder when \(9^{31}\) is divided by 8.
   a) 2  b) 1  c) 3  d) 7

Q.16 Look at this series: 2, 6, 18, 54, ... What number should come next?
   a) 108  b) 162  c) 156  d) 148

Q.17 66 cubic centimeters of silver is drawn into a wire 1 mm in diameter. The length of the wire
in meters will be
   a) 84  b) 90  C  c) 168  d) 336

Q.18 A hollow iron pipe is 21 cm long and its external diameter is 8 cm. If the thickness of the
pipe is 1 cm and iron weighs 8 g/cm\(^3\), then the weight of the pipe is:
   a) 3.6 kg  b) 3.696 kg
   c) 36 kg  d) 36.9 kg

Q.19 35 persons can repair a road in 12 days. In how many days will 30 persons complete the
work?
   a) 14  b) 10
   c) 13  d) 15

Q.20 3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4
pumps work to empty the tank in 1 day
   a) 9  b) 10
   c) 11  d) 12

Q.21 How many times are the hands of a clock at right angle in a day?
   a) 22  b) 11
   c) 33  d) 44

Q.22 A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can
they do the work if they work together?
   a) 18 days  b) 15 days
   c) 19 days  d) 10 days

Q.23 The ratio 5:20 expressed as percent equals to
   a) 50  b) 125
   c) 25  d) None of these

Q.24 The length of the bridge, which a train 130 meters long and travelling at 45 km/hr can cross
in 30 seconds, is
Q.25 Evaluate $5^9 P_3$
- a) $195052$
- b) $195053$
- c) $195054$
- d) $195055$

Q.26 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) $1/4$
- b) $1/10$
- c) $7/15$
- d) $8/15$

Each of the questions 27-30 given below consists of a statement and / or a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statement(s) is / are sufficient to answer the given question. Read the both 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.
- Give answer (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.
- Give answer (C) if the data either in Statement I or in Statement II alone are sufficient to answer the question.
- Give answer (D) if the data even in both Statements I and II together are not sufficient to answer the question.
- Give answer (E) if the data in both Statements I and II together are necessary to answer the question.

Q.27 Average age of employees working in a department is 30 years. In the next year, ten workers will retire. What will be the average age in the next year?
I. Retirement age is 60 years.
II. There are 50 employees in the department.

Q.28 What is Sonia's present age?
I. Sonia's present age is five times Deepak's present age.
II. Five years ago her age was twenty-five times Deepak's age at that time.

Q.29 How much time did X take to reach the destination?
I. The ratio between the speed of X and Y is 3 : 4
II. Y takes 36 minutes to reach the same destination

Q.30 Two cars pass each other in opposite direction. How long would they take to be 500 km apart?
I. The sum of their speeds is 135 km/hr.
II. The difference of their speed is 25 km/hr.

Q.31 To be able to give a good presentation, a full rehearsal is:
- a) Useful
- b) Optional
- c) Necessary
- d) Audience based

Q.32 Which of these behaviors in a team obstructs the achievement of the team’s goal?
- a) Conflict
- b) Compliance
- c) Brainstorming
- d) Commitment
Q.33. Creativity is good only when it leads to:
   a) Lethargy   b) Divinity
   c) Trespassing  d) Productivity

Q.34 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 a) and b)
   d) None of these

Q.35 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.36 The idea of effective cross cultural communication is to:
   a) Respect cultural differences & work together
   b) Stereo typing a culture
   c) Delegate work to the other person
   d) Changing oneself as per the other culture

Q.37 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.38 Diversity in teams is caused best by:
   a) Religion
   b) Gender
   c) Competencies
   d) Educational background

Q.39 To cite several works by one author in different years, the reference is cited in which way?
   a) Jones (1992, 1994)
   b) Jones (1994, 1992)
   c) Both a) and b)
   d) None of the above

Q.40 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.41 Team members who do not work towards the Team goal are called
   a) Free Riders
   b) Sharp Shooters
   c) Rebels
   d) Non Conformist

Q.42 A team is a group of people with ___________ Skills
   a) Great    b) Exclusive
Q.43 Passing somebody’s work as your own piece of work is called:
   a) Plagiarism
   b) Copy
   c) Imitation
   d) None of the above

Q.44 Android Kit Kat and Android Jelly bean are what type of Innovations?
   a) Continuous
   b) Incremental
   c) Both
   d) None of the Above

Q.45 I call my team for a meeting and invite their views on a particular problem area. What have I involved my team into?
   a) Brainstorming
   b) Soul Searching
   c) Group Discussion
   d) None of the above

Q.46 Logic is related to __________ brain.
   a) Right
   b) Left
   c) Rear
   d) Posterior

Q.47 When you try to take more work load than you can handle it is called
   a) Overreaching
   b) Procrastination
   c) Delegation
   d) Remuneration

Q.48 What is KRA?
   a) Knowledge Reference Area
   b) Key Responsibility Area
   c) Key Regular Adaptability
   d) None of these

Q.49 Reflection is a function of
   a) Interpersonal Intelligence
   b) Social Intelligence
   c) Rhythmic Intelligence
   d) Intrapersonal Intelligence

Q.50 Teamwork is not about
   a) Personal Success
   b) Shared Vision
   c) Complimentary Skills
   d) Common Goals
End Semester Examination, Dec. 2015
M. Tech. (Industrial Engineering) – First Semester
ADVANCED MATHEMATICAL TECHNIQUES (MAM-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 Let \( A = \begin{bmatrix} 1 & 2 & 1 & 3 & 1 & 2 \\ 2 & 5 & 5 & 6 & 4 & 5 \\ 3 & 7 & 6 & 11 & 6 & 9 \\ 1 & 5 & 10 & 8 & 9 & 9 \\ 2 & 6 & 8 & 11 & 9 & 12 \end{bmatrix} \)

Find :
(a) Basis of row space of \( A \)
(b) Basis of column space of \( A \)
(c) Each column of \( A \) that is a linear combination of preceding column of \( A \).
(d) Dimension of \( A \)

Q.2 Let \( F: \mathbb{R}^4 \rightarrow \mathbb{R}^3 \) be the linear mapping defined by:
\( F(x, y, z, t) = (x - y + z + t, 2x - 2y + 3z + 4t, 3x - 3y + 4z + 5t) \)

Find :
(a) Basis of the image of \( F \).
(b) Dimension of the image of \( F \).
(c) Basis of the kernel of the map \( F \).
(d) Dimension of the kernel of the map \( F \).

Q.3
(a) Find the moment generating function of:
\( f(x) = me^{-mx}, \quad x, m > 0 \)

(b) The mean height of 500 male students is a certain college is 151 cm. and their standard deviation is 15 cm. Assuming the height is normally distributed, find how many students have height between 120 cm and 155 cm.

Q.4 Use simplex method to solve the following linear programming problem.
Max \( z = 3x_1 + 5x_2 + 4x_3 \)
Subject to the constraints
\( 2x_1 + 3x_2 \leq 8 \)
\( 2x_2 + 5x_3 \leq 10 \)
\( 3x_1 + 2x_2 + 4x_3 \leq 15 \)
and \( x_1, x_2, x_3 \geq 0 \)

Q.5 Use dynamic programming, to solve the following LP problem:
Max \( z = 3x_1 + 5x_2 \)
Subject to the constraints
\( x_1 \leq 4; x_2 \leq 6; 3x_1 + 2x_2 \leq 18 \)
and \( x_1, x_2 \geq 0 \)
Q.6  (a) Fit a poison distribution for the following data and calculate their theoretical frequencies:

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>122</td>
<td>60</td>
<td>15</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

(b) A random variable has the following distribution as:

<table>
<thead>
<tr>
<th>$x$</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>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p(x)$</td>
<td>$a$</td>
<td>$3a$</td>
<td>$5a$</td>
<td>$7a$</td>
<td>$9a$</td>
<td>$11a$</td>
<td>$13a$</td>
<td>$15a$</td>
<td>$17a$</td>
</tr>
</tbody>
</table>

Find:

i) The value of $a$

ii) $P(2 \leq x < 5)$

Q.7 An infinite long string having one end at $x = 0$ is initially at rest on the $x$-axis. The end $x = 0$ undergoes a periodic transverse displacement given by $\alpha \sin nt, t > 0$. Find the displacement of any point on the string at $t > 0$.

Q.8 Solve the partial differential equation:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Subject to the conditions

$u(0, t) = 0$;

$u(2, t) = 0$

$u(x, 0) = 4 \sin 2\pi x,$

$0 < x < 2$

$t > 0$
End Semester Examination, Dec. 2015  
B. Tech. – First Semester  
APPLIED MATHEMATICS-I (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 the convergence of the following series:

\[ 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \cdots \]

b) State the necessary condition for a series to be convergent.

c) If \( y = (ax + b)^{n-2} \), find \( y_{n-1} \).

d) Expand \( f(x) = \log(1 - x) \) in the powers of \( x \).

e) If \( z = \log(y) \cdot \tan^{-1}(x^2 - y^2) \), find \( \frac{\partial z}{\partial x} \) and \( \frac{\partial z}{\partial y} \).

f) If \( u = \cos ec^{-1}\left[ \frac{1}{x^2 + y^2} \right]^{\frac{1}{2}} \), find \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \).

g) Using double integral, find the area of the curve \( x + y \leq a \).

h) If \( \vec{F} = xyz \hat{i} + 3x^2 y \hat{j} + (xz^2 + y^2 z) \hat{k} \), find \( \nabla \times \vec{F} \).

i) If \( \phi = (x^2 + y^2 + z^2 - 3xyz) \) find \( \text{grad} \phi \).

j) Solve: \( x^2 \frac{dy}{dx} + y^2 \frac{dx}{dx} = 0 \).

2x10

PART-A

Q.2  
Discuss the convergence of the series:

a) \[ 1 + \frac{1}{2} + \frac{1.3}{2.4} + \frac{1.3.5}{2.4.6} + \cdots \]

b) \[ \sum_{n=1}^{\infty} 3\sqrt{n^3 + 1} - n \text{ or } \sum_{n=1}^{\infty} (n^3 + 1)^{\frac{1}{3}} - n \]

c) \[ \sum_{n=1}^{\infty} \frac{(n+1)^n}{n^{n+1}} \cdot x^n \]

Q.3  
a) By forming a differential eq., prove that \( \cos(m \sin^{-1} x) = 1 - \frac{m^2}{2!} x^2 - \frac{m^2(2^2 - m^2)}{4!} x^4 + \cdots \).

b) Expand \( f(x) = \cos x \) in the powers of \( x - \frac{\pi}{6} \). Hence find \( \cos 32^\circ \) correct to three decimal places.

Q.4  
a) If \( u = \tan^{-1}\left[ \frac{x^2 - y^2}{x - y} \right] \), prove that \( \frac{x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}}{1/2 \sin 2x} \).
b) If \( x = r \sin \theta \cos \phi; y = r \sin \theta \sin \phi; z = r \cos \theta \), then find \( \frac{\partial (x, y, z)}{\partial (r, \theta, \phi)} \).

c) Find the extreme value of the function: \( x^3 + y^3 - 3axy \).

**PART-B**

**Q.5**

a) Evaluate: \( \int_0^a \int_{x/a}^{2a-x} xy \, dy \, dx \) by changing the order of integration.

b) Prove that \( \Gamma \left( \frac{1}{2} \right) = \sqrt{\pi} \).

c) Find the volume of sphere \( x^2 + y^2 + z^2 = a^2 \) by using triple integral.

**Q.6**

a) If \( \vec{r} = x\hat{i} + y\hat{j} + z\hat{k} \), show that

i) \( \nabla r^n = nr^{n-2}\vec{r} \);

ii) \( \nabla \left( \frac{1}{r^2} \right) = \frac{-2\vec{r}}{r^4} \) where \( |\vec{r}| = r \).

b) If \( \vec{F} = (2x^2 - 3y)\hat{i} - 2xy\hat{j} - 4x\hat{k} \), evaluate \( \iiint \int (\nabla \cdot \vec{F}) \, dv \), where \( v \) is bounded by the planes \( x = 0; y = 0; z = 0 \) and \( 2x + 2y + z = 4 \).

**Q.7**

a) Solve: \( \frac{d^2y}{dx^2} + 4y = e^x + \sin 2x \).

b) Solve: \( \frac{dx}{dt} + y = \sin t; \frac{dy}{dt} + x = \cos t \), given that, when \( t = 0; x = 2 \) and \( y = 0 \).
End Semester Examination, Dec. 2015
B. Tech. – First Semester
APPLIED MATHEMATICS (MA-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) Discuss the convergence of sequence \( u_n \) where:
\[
u_n = 1 + \frac{1}{3} + \frac{1}{3^2} + \ldots + \frac{1}{3^n} \]
b) Define Leibnitz test.
c) Expand \( a^{x+h} \) upto \( h^2 \).
d) Find degree of \( (x^n + y^n) \).
e) If \( u = xe^y z \) where \( y = \sqrt{a^2 - x^2}, z = \sin^2 z \) find \( \frac{dy}{dx} \).
f) Find grad \( \phi \) when \( \phi \) is given by \( \phi = 3x^2 y - y^3 z^2 \).
g) Solve: \( ye^y dx + (e^y + 2y) dy = 0 \).
h) Solve: \( \frac{d^2 x}{dt^2} + 6 \frac{dx}{dt} + 9x = 0 \).
i) Change the order of integration.
\[
\int_{0}^{1} \int_{x}^{2-x} \frac{x}{y} dy dx
\]
j) Find \( \sqrt[3]{5/6} \).

PART A

Q.2
a) Discuss the convergence of the following series.
\[
\left( \frac{1}{3} \right)^2 + \left( \frac{1.2}{3.5} \right)^2 + \left( \frac{1.2.3}{3.5.7} \right)^2 + \ldots
\]
b) Find the interval of convergence of the series:
\[
x - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \frac{x^4}{\sqrt{4}} \]

Q.3
a) Expand \( \log \left( x + \sqrt{1 + x^2} \right) \) by forming a differential equation.
b) Compute value of \( \sin 31^\circ \) upto 3 decimal places.
c) Prove \( \log \frac{\tan x}{x} = \frac{x^2}{3} + \frac{7}{90} x^4 + \ldots \)

Q.4
a) If \( u = f(y-z, z-x, x-y) \) prove \( \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0 \).
b) Find shortest and the largest distance from the point \((1, 2, -1)\) to the sphere \(x^2 + y^2 + z^2 = 24\).

c) If \(u = \sec^{-1}\left(\frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}\right)^{1/2}\). Prove that \(x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial y^2} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{144} (13 + \tan^2 u)\)

PART-B

Q.5 a) Evaluate \(\int \int \frac{rdrd\theta}{\sqrt{a^2 + r^2}}\) over one loop of the lemniscates \(r^2 = a^2 \cos 2\theta\).

b) Change the order of integration in the following integral and evaluate.
\(\int_{\frac{\pi}{4a}}^{\frac{\pi}{2}} dydx\).

c) Evaluate \(\int_{0}^{\frac{\pi}{2}} \sqrt{\tan \theta} d\theta\).

Q.6 a) Evaluate \(\int_{S} F \cdot ds\) where \(F = 2x^2 y\hat{i} - y^2 \hat{j} + 4xz^2 \hat{k}\) and \(S\) in the closed surface of the region in the first octant bounded by the cylinder \(y^2 + z^2 = 9\) and the planes \(x = 0, x = 2, y = 0\) and \(z = 0\).

b) If \(\vec{R} = xi + y\hat{j} + z\hat{k}\), \(r^2 = x^2 + y^2 + z^2\) prove that:
\(\nabla \left( \frac{1}{r^2} \right) = -\frac{2\vec{R}}{r^4}\).
\(\nabla \left( \frac{\vec{R}}{r} \right) = -\frac{3\vec{R}}{r^3}\).

c) Apply the method of variation of parameter to solve:
\(\frac{d^2 y}{dx^2} + 4y = 4\sec^2 2x\).

Q.7 a) Solve \(\frac{d^2 y}{dx^2} - 4y = x\sinh x\).

b) Solve \((2xy + 1) dydx + x(1 + 2xy - x^3 y^3) dy = 0\).

c) Apply the method of variation of parameter to solve:
\(\frac{d^2 y}{dx^2} + 4y = 4\sec^2 2x\).
End Semester Examination, Dec. 2015
B. Tech. – Second Semester
APPLIED MATHEMATICS-II (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) If \( A = \begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix} \) is an orthogonal matrix, then find \( A^{-1} \).

b) Find the sum and product of the eigen values of the matrix
\[
\begin{bmatrix}
1 & 0 & 0 \\
0 & 3 & -1 \\
0 & -1 & 3
\end{bmatrix}
\]

c) Write the period of \( f(x) = \cos x + \sin 2x \).

d) Explain why constant function is periodic.

e) Solve the differential equation \( z = px + qy + \frac{p}{q^2} \).

f) Solve the differential equation \( p^3 - q^3 = 0 \).

g) Find the Laplace transform of \( 3^t \).

h) Find \( L^{-1} \left[ \frac{e^{-2s}}{s^2} \right] \).

i) Find the Fourier transform of \( f(t) = 1 \).

j) \( \omega = \log z \) is analytic everywhere except at \( z = \ldots \).

**PART-A**

Q.2 a) If \( x_1 = (3,1,-4), x_2 = (2,2,-3), x_3 = (0,-4,1), \) then show that the vectors \( x_1, x_2 \) and \( x_3 \) are linearly dependent over the field of rational numbers. Also find the relation between them.

b) Reduce the following matrix into normal form and hence find its rank:
\[
A = \begin{bmatrix}
8 & 1 & 3 & 6 \\
0 & 3 & 2 & 2 \\
-8 & -1 & -3 & 1
\end{bmatrix}
\]

c) Find the eigen values and eigen vectors of the matrix:
\[
A = \begin{bmatrix}
-2 & 2 & -3 \\
2 & 1 & -6 \\
-1 & 2 & 0
\end{bmatrix}
\]

Q.3 a) Expand \( f(x) = x \sin x, \ 0 < x < 2\pi \) as a Fourier series.

b) Find the Fourier series of the function \( f(x) = x + x^2 \) in the internal \( (-\pi, \pi) \).

2x10

5

10

10

10
Q.4  a) Solve \( p - 5q = \tan(y + 5x) \).
   b) Solve \( z^2(x^2 + p^2 + q^2) = 1 \).
   c) A rod of length \( \ell \) with insulated sides is initially at a uniform temperature \( \mu_0 \). Its ends suddenly cooled to \( 0^\circ \) C and are kept at that temperature. Find the temperature function \( \mu(x,t) \).

\[ \text{PART-B} \]

Q.5  a) Determine the analytic function \( f(z) = u + iv \) where \( v = \log \sqrt{x^2 + y^2} \).
   b) Evaluate \( \int \frac{\sin^2 z}{e^{(z - \frac{\pi}{6})^3}} \; dz \); \( C : |z| = 1 \).
   c) Expand in series the function \( f(z) = \frac{1}{z^2 - 3z + 2} \) in the regions:
      i) \( 0 < |z| < 1 \)
      ii) \( 0 < |z - 1| < 1 \)

Q.6  a) Verify convolution theorem for \( f(x) = g(x) = e^{-x^2} \).
   b) Using Parseval's identity, evaluate \( \int_{-\infty}^{\infty} \frac{x^2}{(a^2 + x^2)(b^2 + x^2)} \; dx \).
   c) Find the Fourier transform of \( f(x) = \begin{cases} 1 - x^2 & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases} \).

Q.7  a) With the help of Laplace transforms, evaluate \( \int_{0}^{\infty} e^{-t} \sin^2 \frac{t}{t} \; dt \).
   b) Find the inverse Laplace transform for \( F(s) = \frac{5s}{s^2 + 4s + 4} \).
   c) Solve the simultaneous differential equations:
      \[ \frac{dx}{dt} + 3x + y = 0 \; , \; \frac{dy}{dt} - x + y = 0 \]
      subject to the conditions \( x(0) = y(0) = 1 \).
End Semester Examination, Dec. 2015
B. Tech. – Third Semester
QUANTITATIVE APTITUDE (MA-301)

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 Which of the following is a prime number?  
   a) 9  b) 2  
   c) 4  d) 8  

Q.2 Simplify 586645 * 9999  
   a) 5865863355  b) 5665863355  
   c) 4865863355  d) 4665863355  

Q.3 Find the HCF of 54, 288, 360  
   a) 18  b) 36  
   c) 54  d) 108  

Q.4 Raju age after 15 years will be 5 times his age  
   5 years back, what is the present age of Raju?  
   a) 15  b) 14  
   c) 10  d) 8  

Q.5 Reeya obtained 65, 67, 76, 82 and 85 out of  
   100 in different subjects, what will be the  
   average?  
   a) 70  b) 75  
   c) 80  d) 85  

Q.6 Find the number if difference between  
   number and its 3/5th is 50.  
   a) 120  b) 123  
   c) 124  d) 125  

Q.7 Worker A takes 8 hours to do a job. Worker B  
   takes 10 hours to do a job. How long should it  
   take both A and B, working together to do  
   same job?  
   a) 4/9  b) 22/9  
   c) 31/9  d) 40/9  

Q.8 A train is 100 meter long and is running at the  
   speed of 30 km per hour. Find the time it will  
   take to pass a man standing at a crossing.  
   a) 10 S  b) 12 S  
   c) 14 S  d) 16 S  

Q.9 Find the average of first 10 multiples of 7  
   a) 35.5  b) 37.5  
   c) 38.5  d) 40.5.  

Q.10 A and B can together complete a piece of  
   work in 4 days. If A alone can complete the  
   same work in 12 days, in how many days can  
   B alone complete that work?  
   a) 4  b) 5  
   c) 6  d) 7  

Q.11 What will be the fraction of 20%  
   a) 1/4  b) 1/5  
   c) 1/10  d) None of these  

Q.12 36 men can complete a piece of work in 18  
   days. In how many days will 27 men complete  
   the same work?  
   a) 24  b) 28  
   c) 32  d) 36  

Q.13 If Rahul rows 15 km upstream in 3 hours and  
   21 km downstream in 3 hours, then the speed  
   of the stream is  
   a) 5 km/hr  b) 4 km/hr  
   c) 2 km/hr  d) 1 km/hr  

Q.14 Find the rate at Simple interest, at which a  
   sum becomes four times of itself in 15 years  
   a) 10  b) 20  
   c) 30  d) 40  

Q.15 What will be the compound interest on Rs.  
   25000 after 3 years at the rate of 12 % per  
   annum  
   a) 10123.20  b) 10123.30  
   c) 10123.40  d) 10123.50  

Q.16 One side of rectangular field is 15 meter and  
   one of its diagonals is 17 meter. Then find the  
   area of the field.  
   a) 120  b) 130  
   c) 140  d) 150  

Q.17 In a throw of dice what is the probability of  
   getting number greater than 5  
   a) 1/2  b) 1/3  
   c) 1/5  d) 1/6  

Q.18 Find the number which when multiplied by 15  
   is increased by 196  
   a) 10  b) 12  
   c) 14  d) 16  

Q.19 A man can do a piece of work in 5 days, but  
   with the help of his son he can do it in 3 days.  
   In what time can the son do it alone?  
   a) 7.5  b) 6.5  
   c) 5.5  d) 4.5  

Q.20 If 15% of 40 is greater than 25% of a number  
   by 2, the number is  
   a) 14  b) 16  
   c) 18  d) 20  

Q.21 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.22 A cistern can be filled by a tap in 4 hours  
   while it can be emptied by another tap in 9  
   hours. If both the taps are opened
simultaneously, then after how much time cistern will get filled?

Q.23 A person travels from P to Q at a speed of 40 km/hr and returns by increasing his speed by 50%. What is his average speed for both the trips?

a) 44 b) 46 c) 48 d) 50

Q.24 If 16 toys cost 240, then what do 40 toys cost?

a) 600 b) 620 c) 640 d) 680

Q.25 In one hour, a boat goes 11km along the stream and 5 km against it. Find the speed of the boat in still water.

a) 6 b) 7 c) 8 d) 9

Q.26 There was simple interest of Rs. 4016.25 on a principal amount at the rate of 9%p.a. in 5 years. Find the principal amount.

a) 8925 b) 7625 c) 7675 d) None of these

Q.27 Find the surface area of a 10cm*4cm*3cm brick.

a) 154 b) 158 c) 162 d) 164

Q.28 Evaluate 30! / 28!

a) 970 b) 870 c) 770 d) 670

Q.29 Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is

a) 4:5 b) 3:4 c) 1:2 d) None of these

Q.30 Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

a) 3/4 b) 1/2 c) 3/5 d) 2/3

Q.31 Find the HCF of 2/3, 4/6, 8/27

a) 2/27 b) 8/3 c) 2/3 d) 8/27

Q.32 Y is in the East of X which is in the North of Z. If P is in the South of Z, then in which direction of Y, is P?

a) North b) South c) South-East d) None of these

Q.33 If log 27 = 1.431, then the value of log 9 is:

a) 0.934 b) 0.944 c) 0.954 d) 0.964

Q.34 36, 34, 30, 28, 24, ... What number should come next?

a) 20 b) 22 c) 18 d) 24

Q.35 A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is

a) 1/13 b) 2/13 c) 1/26 d) 1/52

Q.36 Evaluate 100C100

a) 10000 b) 1000 c) 100 d) 1

Q.37 Sumit and Ravi started a business by investing Rs 85000 and 15000 respectively. In what ratio the profit earned after 2 years be divided between Sumit and Ravi respectively.

a) 17:1 b) 17:2 c) 17:3 d) 17:4

Q.38 If x:y = 1:3, then find the value of (7x+3y):(2x+y)

a) 14:5 b) 15:5 c) 16:5 d) 17:5

Q.39 In a college, the ratio of the number of boys to girls is 8 : 5. If there are 200 girls, the total number of students in the college is

a) 420 b) 520 c) 620 d) 720

Q.40 In how many words can be formed by using all letters of the word BHOPAL

a) 120 b) 36 c) 720 d) None of these

Q.41 Today is Monday. After 61 days, it will be:

a) Friday b) Saturday c) Sunday d) Wednesday

Q.42 Introducing a boy, a girl said, "He is the son of the daughter of the father of my uncle." How is the boy related to the girl?

a) Brother b) Nephew c) Uncle d) Son-in-law

Q.43 53, 53, 40, 40, 27, 27, ... What number should come next?

a) 12 b) 14 c) 27 d) 53

Q.44 A, P, R, X, S and Z are sitting in a row. S and Z are in the centre. A and P are at the ends. R is sitting to the left of A. Who is to the right of P?
Q.45 If one-third of one-fourth of a number is 15, then three-tenth of that number is:
   a) 35  b) 36  c) 48  d) 54

Q.46 A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6500?
   a) 4991  b) 5991  c) 6991  d) 6001

Q.47 A and B together have Rs. 1210. If \( \frac{4}{15} \) of A's amount is equal to \( \frac{2}{5} \) of B's amount, how much amount does B have?
   a) 460  b) 484  c) 510  d) None of these

Q.48 The sum of the digits of a two-digit number is 15 and the difference between the digits is 3. What is the two-digit number?
   a) 78  b) 96  c) 69  d) Cannot be determined

Q.49 Statements: Some actors are singers.
    All the singers are dancers.
Conclusions: 1. Some actors are dancers
    2. No singer is actor
   a) Only (1) conclusion follows
   b) Only (2) conclusion follows
   c) Either (1) or (2) follows
   d) Neither (1) nor (2) follows

Q.50 Which of the following diagrams indicates the best relation between Profit, Dividend and Bonus?
   a)  
   b)  
   c)  
   d)  
End Semester Examination, Dec. 2015
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 derivative of \( e^{x^2} \)
    b) Find derivative of \( f(x) = xe^x \)
    c) Solve \( \int x^2 \, dx \)
    d) Solve \( \int \cos^{-1} x \, dx \)
    e) Expand \( f(x) = x^3 \) in terms of \( (x - 2) \).
    f) If \( u = x^3 \), find \( \frac{\partial u}{\partial x} \) and \( \frac{\partial u}{\partial y} \).
    g) Evaluate \( \int_0^\infty \int_0^\infty \int_0^\infty x^2 \, dxdy \)
    h) Show that \( \int_0^\infty e^{-x^2} \, dx = \frac{1}{4} \left( \frac{1}{4} \right) \)
    i) Find \( \nabla \phi \) or grad \( \phi \), where \( \phi = \log(x^2 + y^2 + z^2) \).
    j) Define scalar and vector function with an example.

PART-A

Q.2  a) Differentiate the following functions w.r.t. \( x \).
    i) \( f(x) = [\log x]^3 \)
    ii) \( f(x) = \sin x \sin 2x \)
    b) Find \( \frac{dy}{dx} \), where \( y = \frac{e^{ax}}{\sin(bx + c)} \)

Q.3  a) Solve the following integrals:
    i) \( \int_3^4 |x + 1| \, dx \)
    ii) \( \int_0^\infty \frac{2x + 5}{x^2 - x - 2} \, dx \)
    b) Solve \( \int_0^{\pi/2} x^2 \sin x \, dx \)

Q.4  a) If \( u = \sin^{-1} \left( \frac{x + y}{\sqrt{x} + \sqrt{y}} \right) \), show that \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u \)
    b) If \( u_1 = x_2x_3/x_1, \ u_2 = x_3x_1/x_2, \ u_3 = x_1x_2/x_3 \)
    Prove that \( \frac{\partial (u_1, u_2, u_3)}{\partial (x_1, x_2, x_3)} = 4 \).

P. T. O.
**PART-B**

Q.5  
\[a) \text{ Use Maclaurin’s series to show that } e^x \sec x = 1 + x + \frac{2x^2}{2!} + \frac{4x^3}{3!} + \ldots.\]

\[b) \text{ Discuss the maximum or minimum value of } u = x^2 - 3xy + y^2 + 2x.\]

Q.6  
\[a) \text{ Show that } \int \int \int_0^2 \int_0^2 \int_0^2 x^2yz \, dz \, dy \, dx = 1.\]

\[b) \text{ Evaluate } \int \int xy(x + y) \, dx \, dy \text{ over the area between } y = x^2 \text{ and } y = x.\]

Q.7  
\[a) \text{ If } r = |\vec{r}| \text{ where } \vec{r} = x\hat{i} + y\hat{j} + z\hat{k}. \text{ Prove that } \nabla r = \frac{\vec{r}}{r}.\]

\[b) \text{ Find the directional derivative of } \phi = xyz \text{ at } (1, 2, 3) \text{ in the direction of the vector.}\]

\[c) \text{ Given } f(t) = (5t^2 - 3t)\hat{i} + 6t^3\hat{j} - 7tk, \text{ evaluate } \int_{t=2}^{t=4} f(t) \, dt.\]
End Semester Examination, Dec. 2015  
B. Tech. – Fourth Semester  
BIOSTATISTICS (MA-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) What is frequency polygon?  
b) Define primary data.  
c) Define coefficient of skewness.  
d) How many parameters are there in binomial distribution?  
e) What is null hypothesis?  
f) Write formula of Poisson’s distribution.  
g) State whether Normal distribution is discrete or continuous.  
h) What are chances of 4 tails in 8 tosses?  
i) Define analysis of variance (ANOVA).  
j) What is standard error?

PART-A

Q.2  
a) In the usual notations, it is given:  
\[ N = 15 \quad \bar{X} = 25 \quad \sigma_x = 3.01 \quad \sigma_y = 3.03 \quad \tau(X - \bar{X})^2 = 132 \]  
\[ \sum (Y - \bar{Y})^2 = 138 \quad \text{and} \quad \sum xy = 122 \]  
Find the value of \( r \) (correlation coefficient).  
b) Explain coefficient of determination and also rank correlation coefficient.

Q.3  
a) State and explain the basic laws of probability with an example.  
b) A box contains 3 white, 5 red and 6 blue balls. If three balls are drawn at random, find the probability that:  
   i) Two of the balls drawn are white.  
   ii) Exactly one ball is white.  
   iii) At least one ball is white.

Q.4  
a) State and explain the properties of normal distribution.  
b) One fifth percent of the blades produced by a blade manufacturing factory turn out to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing:  
   i) One defective  
   ii) Two defectives  
   iii) No defectives  
respectively in a consignment of 100000 packets. Given \( e^{-0.02} = 0.9802 \)

PART-B

Q.5  
a) Explain ANOVA in brief and its applications.  
b) A random sample of boots worn by 36 soldiers in a desert region showed an average life of 1.08 years with a standard deviation of 0.6 years. Under the standard condition the boots are known to have an average life of 1.28 years. Is there a reason to assert, at 1% level of significance that use in desert causes the mean life of such boots to decrease. What will be your conclusion if the level of significance is 5%. Assume that the life boots in normally distributed. Values of
standardized normal variate are -2.33 and -1.645 at 1% level and 5% level respectively?

Q.6  
a) Explain $\chi^2$ test with respect to $2 \times 2$ contingency table as test of independence.

b) A sample of 20 observations gave a standard deviation 5. Is this compatible with the hypothesis that the sample is from a normal population with variance 64 at 5% level of significance. Tabulated value of $\chi^2$ for 19 degrees of freedom at 5%, level of significance is 30.14.

Q.7  
Write short notes on:

a) Degrees of freedom.
b) Sign test.
c) Sampling error.
d) Binomial and Poisson probability distribution.
End Semester Examination, Dec. 2015  
B. Tech. – Fourth Semester  
APPLIED MATHEMATICS (MA-441A)

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) Solve: \( 3x(xy - 2)dx + (x^3 + 2)dy = 0 \).  
3  
b) State and prove modulation theorem.  
3  
c) Solve: \( yp + xq + pq = 0 \)  
2  
d) Write auxiliary equation for Lagrange’s method.  
2  
e) Check whether the function is odd or even: \( f(x) = \begin{cases} x^2, & 0 \leq x \leq \pi \\ -x^2, & -\pi \leq x \leq 0 \end{cases} \)  
4  
f) Find the rank of matrix: \( A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix} \).  
3  
g) Find: \( L \left[ \int_0^t e^s \sin t \frac{dt}{t} \right] \)  
3

**PART-A**

Q.2  
a) Solve: \( y'' + 5y' + 4y = x^2 + 1 \).  
10  
b) Solve: \( \frac{d^2y}{dt^2} + \frac{dy}{dt} - 2y = \sin t; \quad \frac{dx}{dt} + x - 3y = 0 \).  
10  

Q.3  
a) Find: \( L^{-1} \left[ \frac{5s + 3}{(s-1)(s^2 + 2s + 5)} \right] \).  
10  
b) State and prove convolution theorem for Laplace transforms.  
10

Q.4  
a) Find \( A^{-1} \) for \( A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix} \).  
10  
b) Find Eigen values and Eigen vectors of \( A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \).  
10

**PART-B**

Q.5  
a) Find Fourier series for \( e^{-ax} \) in the interval \((0, 2\pi)\).  
10  
b) Develop Fourier series in the interval \((-2, 2)\) if:
\[ f(x) = \begin{cases} 0, & -2 < x < 0 \\ 1, & 0 < x < 2 \end{cases} \]

Q.6  
   a) Solve: \((p - q) = \log(x + y)\)  
   b) Solve: \(z^2 = pq xy\)  
   c) Solve by method of separation of variables: \(\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0\)

Q.7  
   a) Find Fourier sine transform of \(\frac{e^{-ax}}{x}\)  
   b) Express \(f(x) = \begin{cases} 1, & 0 \leq x < \pi \\ 0, & x > \pi \end{cases}\) as Fourier sine Integral and hence evaluate:

\[ \int_0^\infty \frac{1 - \cos(\pi \lambda)}{\lambda} \sin(x\lambda) d\lambda \]
End Semester Examination, Dec. 2015  
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) Define extrapolation.  
b) Define intermediate mean value theorem.  
c) Write forward difference table if:  

<table>
<thead>
<tr>
<th>x</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>1.1</td>
<td>2.0</td>
<td>4.4</td>
<td>7.9</td>
</tr>
</tbody>
</table>

d) What do you mean by algebraic and transcendental equations, give an example of each?  
e) Which of the following methods converges faster: Gauss Seidal or Gauss Jocobi method?  
f) Write Newton’s coté quadrature formula.  
g) The names of two self-starting methods to solve \( y' = f(x, y) \) given \( y(x_0) = y_0 \) are \( \)_____.

h) Define feasible region.  
i) Write mathematical form of LPP.  
j) The number of strips required in Weddle’s rule is _________.  

PART-A

Q.2  
a) Determine \( f(x) \) as a polynomial in \( x \) for the following data:  

<table>
<thead>
<tr>
<th>x</th>
<th>-4</th>
<th>-1</th>
<th>0</th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>1245</td>
<td>33</td>
<td>9</td>
<td>1335</td>
<td></td>
</tr>
</tbody>
</table>

b) Fit a straight line to the following, using method of least squares:  

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>14</td>
<td>27</td>
<td>40</td>
<td>55</td>
<td>68</td>
</tr>
</tbody>
</table>

PART-B

Q.3  
a) Find the root of the equation \( xe^x = \cos x \) using Regula Falsi Method.  
b) Using Newton Rephson Method, establish the formula  

\[
x_{n+1} = \frac{1}{2} \left[ x_n + \frac{N}{x_n} \right], \text{Where } N \text{ is square root of a +ve number.}
\]

Q.4  
Solve the following system of equations using Gauss Seidal Method:  

\[
\begin{align*}
8x - 3y + 2z &= 20 \\
4x + 11y - z &= 33 \\
6x + 3y + 12z &= 35
\end{align*}
\]
Q.5  
   a) From the following table find the maximum value of $y$:

   \[
   \begin{array}{c|c|c|c|c}
   x & 0 & 2 & 4 & 6 \\
   \hline
   y & 3 & 3 & 11 & 27 \\
   \end{array}
   \]

   b) Evaluate $\int_{0}^{6} \frac{dx}{1 + x^2}$ by using Trapezoidal Rule.

10

Q.6  
   a) Find by Taylor’s series method, the values of $y$ at $x = 0.1$, $x = 0.2$ from

   \[
   \frac{dy}{dx} = x^2 y - 1; \quad y(0) = 1
   \]

   b) Using R-K method of order 4, find $y(0.2)$ for $\frac{dy}{dx} = \frac{(y-x)}{(y+x)}$, $y(0) = 1$, Take $h = 0.2$.

10

Q.7  
   Maximize $Z = 107x_1 + x_2 + 2x_3$, Subject to

   \[
   14x_1 + x_2 - 6x_3 + 3x_4 = 7
   \]

   \[
   16x_1 + \frac{1}{2} x_2 - 6x_3 \leq 5
   \]

   \[
   3x_1 - x_2 - x_3 \leq 0
   \]

   \[
   x_1, x_2, x_3, x_4 \geq 0.
   \]

   Using simplex method.

20
End Semester Examination, Dec. 2015  
B. Tech. – Fifth / Sixth Semester  
NUMERICAL METHODS AND OPTIMISATION 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) An approximate value of $\pi$ is given by 3.1428571 and its true value is $X = 3.1415926$. Find the absolute and relative error.
b) Prove that $y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$, where $\Delta$ denotes the forward difference operator.
c) Using Newton-Raphson method, establish the formula:
$$x_{n+1} = \frac{1}{2} \left[ x_n + \frac{N}{x_n} \right],$$
where $N$ is the square-root of any $+ve$ number.
d) State the convergence criteria of Gauss-Jacobi method for the system of simultaneous linear equations.
e) Write down Simpson’s $3/8^{th}$ rule to integrate $y = f(x)$, where $a < x < b$.
f) Explain why Runge-Kutta method is better than Taylor’s series method for solving ordinary differential equations.
g) Write a formula to find the maximum of any function $y = f(x)$.
h) State feasible solution and basic feasible solution of a LPP.

PART-A

Q.2 a) Find $f(1.5)$ and $f(7.5)$ from Newton’s forward and backward interpolation method for the given data:

<table>
<thead>
<tr>
<th>$x$</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>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>1</td>
<td>8</td>
<td>27</td>
<td>64</td>
<td>125</td>
<td>216</td>
<td>343</td>
<td>512</td>
</tr>
</tbody>
</table>

b) Fit a straight line for the given data:

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>14</td>
<td>27</td>
<td>40</td>
<td>55</td>
<td>68</td>
</tr>
</tbody>
</table>

Q.3 a) Use the fixed point iteration method to find a root of the following equation correct to 3 decimal places $x^3 + x^2 - 1 = 0$.
b) Find the root of the equation: $xe^x = \cos x$, using secant method correct to 4 decimal places.

Q.4 a) Solve by Gauss-Seidal method, the following equations:
$$8x - 3y + 2z = 20$$
$$4x + 11y - 2z = 33$$
$$6x + 3y + 12z = 35$$
b) Find numerically largest eigen value of:
\[ A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix} \quad \text{and} \quad A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix} \]

Corresponding eigen vector.

\textbf{PART-B}

Q.5  
\begin{itemize}
\item \textbf{a)} Find \( y'(1) \) and \( y^n(1) \) from the given data:
\end{itemize}

\begin{tabular}{|c|c|c|c|c|c|}
\hline
\( x \) & 1 & 2 & 3 & 4 & 5 & 6 \\
\hline
\( y \) & 8 & 27 & 64 & 125 & 216 & \\
\hline
\end{tabular}

\begin{itemize}
\item \textbf{b)} Evaluate: \( \int_{0}^{10} \frac{dx}{1 + x^2} \) by using:  
  \begin{itemize}
  \item i) Trapezoidal rule
  \item ii) Simpson’s 3/8-rule
  \end{itemize}
\end{itemize}

Q.6  
\begin{itemize}
\item \textbf{a)} Compute \( y(0.2) \) correct to 4 decimal places from the Taylor’s series solution of the equation \( y' = y^2 - 2x, \quad y(0) = 1 \)
\end{itemize}

\begin{itemize}
\item \textbf{b)} Using \( R-K \) method of order 4, find \( y \) at \( x = 0.1, 0.2, 0.3 \) given that:
\end{itemize}
\[ \frac{dy}{dx} = x - y^2, \quad y(0) = 1 \]

Q.7  
\begin{itemize}
\item \textbf{a)} Use graphical method to solve:
\end{itemize}

\[ \text{Max } z = 3x_1 + 2x_2, \]
subject to \( x_1 - x_2 \geq 1, \ x_1 - x_2 \geq 3 \) and \( x_1, \ x_2 \geq 0 \)

\begin{itemize}
\item \textbf{b)} Solve the following LPP:
\end{itemize}

\[ \text{Max } z = 2x + 3y, \]
subject to \( -2x + 3y \leq 2, \ 3x + 2y \leq 5 \) and \( x, \ y \geq 0 \)
Q.1 List and describe three influences on cognitive psychology. What events contributed to its emergence as a separate discipline?

Q.2 What are the early, middle and late models of auditory attention? Describe each with examples.

Q.3 How are mental set images like perception? How are they different from perception?

Q.4 What are the functions of language? Discuss structure of language.

Q.5 Discuss the meaning and aspects of creativity.

PART-B

Case study:

Mary-Jo Sapulla was her evening walk as always. Mary decided to take her usual route along the Smoky River trial. Along the way Mary passed a young dark hair man walking rather quickly in the opposite direction. Mary thought it was odd to see someone whom she did not know as most of the people who walk along the trail live in Mary’s neighborhood. About 15 minutes after passing the man on the trail, Mary was startled by a loud gun shot. She looked up and saw a person running up the hillside. Although Mary was far enough away to not be seen, she swears that she’ll never forget what the person looked like. .... (time passes).... Mary id’s a person in the line-up as the person she saw running up the hill away from the crime, a young man with dark hair and a mustache. The defense has called upon you as an expert witness in the case. As an expert witness you are asked to give the facts with respect to eye-witness testimony.

Q.6 Read the case study carefully given above and answers the following question:
   a) What do you tell the court (give you testimony)?
End Semester Examination, Dec. 2015
MA (Applied Psychology) – First Semester
RESEARCH METHODOLOGY-I (MA-AP-102)

Time: 3 hrs
Max Marks: 50
No. of pages: 1

Note: Attempt FIVE questions in all; PART-B is compulsory. Attempt any FOUR questions from PART-A.

**PART-A**

Q.1 What is statistics? Describe the descriptive and inferential statistics in detail.

Q.2 Calculate the appropriate statistics from the data given below:

<table>
<thead>
<tr>
<th>x_1</th>
<th>x_2</th>
<th>x_3</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>7</td>
</tr>
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<td>8</td>
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<td>1</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

(With df = (2, 21) f must be atleast 3.46 to reach p<.05, so f score is statistically significant)

Q.3 What are the major components of experimentation?

Q.4 Describe major experimental designs.

Q.5 Explain the major elements from the qualitative analysis.

Q.6 Write short notes on following topics:
   a) Data.
   b) Measure of central tendency.

**PART-B**

Q.7 Calculate product moment correlation from the following:
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Variable 1</th>
<th>Variable 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
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<tr>
<td>4</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>
End Semester Examination, Dec. 2015  
MA (Applied Psychology) – First Semester  
APPLIED SOCIAL PSYCHOLOGY (MA-AP-103)

Time: 3 hrs  
Max Marks: 50  
No. of pages: 2

Note: Attempt FIVE questions in all; PART-B is compulsory. Attempt any FOUR questions from PART-A.

PART-A

Q.1 We construct our social reality! What are the factors that help in framing our social reality?  
10

Q.2 Which according to you is the most comprehensive method of studying social psychology? Prove with the help of any classical experiment.  
10

Q.3 How do the opinion of others impact the way you think, act and respond? Explain with examples from the domain of social psychology.  
10

Q.4 Define your ‘self’ in social context. Which theory do you think best describes your ‘self’?  
10

Q.5 Write short notes on any two:  
a) Schemas.  
b) Group Formation.  
c) Festinger’s Theory.  
5x2

PART-B

Case study:

Part I Tim Hinks  
I was an instructor at a suburban community college in a unique program for students who had very poor academic records in high school. As the social science instructor for 120 students, I worked to coordinate my teaching with three other instructors; one each in natural science, the humanities, and composition. Being a “sixties liberal,” I wanted to make a contribution to integration and take a strong stand against racism. Tim Hanks, the only African-American student in my course, wasn’t helping any. He attended class sporadically, turned assignments in late, missed others altogether, and performed poorly on tests. When he did come to class, he was usually late and always left before I had a chance to talk to him. Like the other faculty in the program, I felt it was my responsibility to pull each student, regardless of race, through. I wouldn’t lower standards but was prepared to do everything in my power to help all students meet the requirements. Nothing that worked with other students
seemed to work with Tim. He made appointments to meet with me and his other instructors, only not to show up. Offers of extra time and assistance on assignments didn’t help either. Attempts to call Tim at the phone number listed for him with the college were unsuccessful; the number had been disconnected. Letters to his listed address were returned as undeliverable.

Part II Turnaround
Eventually I came to the conclusion that Tim simply lacked the motivation to complete assignments and attend class regularly. He didn’t have the academic skills to do the work nor the drive to correct his deficiencies. As the semester drew to a close, it was clear that Tim would fail the course. It was painful to flunk any student but this was doubly so; something was obviously deficient in me. I didn’t have what it took to succeed with African-American students. Shaking my head, I wrote an F on the grade sheet. When I received my class list for the next semester I saw that Tim Hanks was in my class again. Feeling somewhat uncomfortable I wondered why Tim didn’t try some other instructor. Tim obviously couldn’t get motivated to do the work in my class the previous semester. Was he just a glutton for punishment? Seven or eight weeks later Tim came in to get his midterm test from me. It was an A-. He had earned no lower than a B+ on any of his assignments. As he sat down to talk (a big smile on his face after seeing the grade on his midterm), I asked him, “What makes the difference between someone I had to fail last winter and someone I’ll have to give an A to this fall?” “I have a car,” he said. “How can a car make such a difference?” I asked, puzzled. “Well, I live downtown near the Art Center. In a car it’s a thirty minute trip. On a bus it’s an hour and half both ways on a good day.” Embarrassed, he looked down at the floor as he said, “On a bad day I would be OK till I got out here to Main Road. Then it would be hit or miss whether the bus drivers would pick me up. A couple of them would even swerve to splash slush all over me. If they did, I’d feel so bad I just got on a bus going back home.” When asked why he didn’t come in and tell me about these difficulties he said, “I was so embarrassed about doing so poorly in your class I just couldn’t get myself to come in.”

Q.6 Read the case study carefully given above and answers the following questions:

a) How is prejudice different from discrimination? For example, would you have considered the instructor racist if he had told the readmission committee about his view of Tim as lacking academic skills and the motivation to improve them? Would you consider the instructor racist if he had confronted Tim on his low motivation?

b) Take some time to think back and see where your attitudes towards people different from you may have come from. How has the culture and society played a role in shaping them?
End Semester Examination, Dec. 2015  
MA (Applied Psychology) – First Semester  
SYSTEMS AND THEORIES OF PSYCHOLOGY (MA-AP-111)

Time: 3 hrs  
Max Marks: 50  
No. of pages: 1

Note: Attempt any **FOUR** questions from **PART A. PART B is compulsory.** Each question carries equal marks.

**PART-A**

Q.1 Describe the process of transformation of psychology from arts to science.  
Q.2 Explain the major elements from the first force of psychology.  
Q.3 What is behaviourism? Describe the effects of scientific development on the development of behaviourism.  
Q.4 Describe Gestaltism and Perceptual organization in detail.  
Q.5 Explain the major elements from the Humanistic Existential perspective.  
Q.6 In your views based on the history what is the future of psychology?  

**PART-B**

Q.7 Write short notes on the following:  
a) Signal Detection Paradigm  
b) Ego Defence Mechanism  
c) Positive Psychology  
d) B F Skinner  

2½x4
End Semester Examination, Dec. 2015  
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 $16P_3$ and $20C_5$.  
b) Using Binomial theorem, find the value of $(104)^4$.  
c) If $\tan \theta = \frac{16}{5}$, find the values of $\sin \theta$, $\sec \theta$.  
d) Find the first three terms of the sequence defined by $a_n = 3n^2 + 3$.  
e) Write the section formula in three dimensions.  
f) Find the equation of the line passing through the point $(2, 4)$ having slope 3.  
g) Find the equation of the line passing through the points $(2, 1), (3, 4)$.  
h) Write the equation of the circle whose centre is $(5, 2)$ and radius is $(4, 5)$.  
i) Find the equation of the parabola with vertex $(0, 0)$ and focus at $(3, 0)$.  
j) Find the distance between the points $(2, 3, 4)$ and $(5, 6, 7)$.  

PART-A

Q.2  
a) $A$ is the A.M. between $a$ and $b$. Show that:  
\[ \frac{A + 2a}{A - b} + \frac{A + 2b}{A - a} = 4 \]  
b) In an increasing G.P. the sum of the first and last term is 66, the product of the second and the last but one term is 128. If the sum of the series is 126, find the number of terms in the series.

Q.3  
a) Find the coefficient of $x^5$ in the expansion of the product $(1 + 2x)^6(1 - x)^7$.  
b) Resolve the partial fractions,  
\[ \frac{4x + 1}{(x + 2)(x + 1)^2} \]  

Q.4  
a) Find the number of arrangements of the words.  
i) MRU  
ii) MRIU  
iii) MRCE  
b) Find the value of $m$, if  
\[ \frac{n}{3(m-3)} \quad \text{and} \quad \frac{n}{5(m-4)} \] are in the ratio 3:1

PART-B

Q.5  
a) Show that $\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ = \frac{\sqrt{3}}{2}$  
b) If $\tan x = 2 \tan y$. Prove that $\frac{\sin(x+y)}{\sin(x-y)} = 3$
c) If $\sin x = \frac{3}{5}$, $\cos y = -\frac{12}{13}$ and $x, y$ both lie in the second quadrant, find the values of: 
   i) $\sin(x + y)$  
   ii) $\tan(x + y)$

Q.6  a) Find the equations of the lines which pass through the point $(4, 5)$ and make equal angles with the lines $5x - 12y + 6 = 0$ and $3x - 4y - 7 = 0$.

b) If $p, q$ are the lengths of perpendicular from the origin to the lines $x \cos \theta - y \sin \theta = k \cos 2\theta$ and $x \sec \theta + y \csc \theta = k$ respectively, prove that: $p^2 + 4q^2 = k^2$

Q.7  a) Find the coordinates of foci, the vertices, the length of major axis, minor axis, latus-rectum and the eccentricity of the conic represented by the equation: $4x^2 + 9y^2 = 36$

b) Find the equation of the circle, whose centre is $(4, -3)$ and which passes through the intersection of the line $3x + 5y = 1$ and $4x - 3y = 3$
Q.1 a) Find the modulus of complex numbers \( z = -3 + 5i \) and \( z = 4 + 3i \)

b) Find determinant of matrix \( A \) given by \( A = \begin{bmatrix} 2 & -4 & 3 \\ 3 & 1 & 2 \\ 7 & 6 & 1 \end{bmatrix} \)

c) Find inverse of \( A = \begin{bmatrix} 5 & 4 \\ 9 & 3 \end{bmatrix} \)

d) Find \( \frac{dy}{dx} \) if \( y = e^{7x} \) and \( y = \log(2x^2 + 7) \)

e) Define a convex region in linear programming problems.

Q.2 a) If \( A = \begin{bmatrix} 1 & -1 & -1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix} \) then find \( A^{-1} \) and show that \( A^{-1} = A^2 \)

b) If \( A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix} \) then show that \( A^2 - 4A - 5I = 0 \)

Q.3 a) Prove that
\[
\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left( 1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)
\]

b) If \( A = \begin{bmatrix} a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{bmatrix} \) then show that \( A = (a-b)(b-c)(c-a)(ab+bc+ca) \)

Q.4 a) Express the following complex number \( Z \) in the form of \( (a + ib) \):
\[
Z = \frac{5 + \sqrt{2}i}{5 - \sqrt{2}i}
\]

b) Find the modulus and argument of the following \( Z \) given by:
\[
Z = \frac{1+2i}{1-3i}
\]
PART-B

Q.5  Find \( \frac{dy}{dx} \) if,
   a) \( y = (\sin x)^2 \)                 b) \( y = 5^x + \log(2x^2 + 7) \)
   c) \( y = e^{x^2} + 2\cos x \)            d) \( 5e^{2x^2}(2\tan x + 3\sec x) \)  

Q.6  a) A cylindrical tank standing upright (with one circular base on the ground) has radius 20 cm. How fast does the water level in the tank drop when the water is being drained at 25 cm\(^3\)/sec

b) Let \( f(x) = \begin{cases} 
1 + 4x - x^2 & \text{for } x \leq 3 \\
(x+5)/2 & \text{for } x > 3 
\end{cases} \)

   find the maximum and minimum value of \( f(x) \) for \( x \) in \([0,4]\)

Q.7  a) Solve using graphical method the following problems:

   Maximize \( z = 3x + 2y \)
   Subject to:
   \( 2x + y \leq 18 \)
   \( 2x + 3y \leq 42 \)
   \( 3x + y \leq 24 \)
   \( x \geq 0, \ y \geq 0 \)

b) Minimize \( z = 6x + 7y \)
   Subject to:
   \( 2x + 3y \leq 12 \)
   \( 2x + y \leq 8 \)
   \( x \geq 0, \ y \geq 0 \)
End Semester Examination, Dec. 2015  
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) Form the differential equation by:  
y = Ax + A²  
2  
(b) Define the different methods of measuring dispersion.  
3  
(c) Two coins are tossed together. Describe the sample space.  
3  
(d) Write down the definition of vector and scalar quantities.  
2  
(e) State the fundamental theorem of calculus.  
2  
(f) Find: \( \int x^2 \cdot e^x \, dx \).  
4  
(g) Find the area included between the parabola \( y^2 = 4ax \) and its latus rectum.  
2  
(h) Write down the equation of first order and first degree.  
2

**PART-A**

Q.2  
(a) Evaluate: \( \int \sin^{-1} \frac{x^2}{a^2} \, dx \).  
6  
(b) Evaluate: \( \int_{1}^{2} (x + x^2) \, dx \) as a limit of sum.  
6  
(c) Prove that \( \int_{0}^{\pi} \frac{x \tan x}{\sec x + \cos x} \, dx \) is a finite integral.  
8

Q.3  
(a) Find the area bound by \( y^2 = 9x \) and \( x^2 = 9y \).  
10  
(b) Find the area of region bounded by:
\[
\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.
\]

Q.4  
\(a)\) Solve: 
\[
(x + 1) \frac{dy}{dx} + x(y^2 + 1) = 0.
\]

\(10\)  
\(b)\) Solve the Homogeneous equation: 
\[
\frac{dy}{dx} = \frac{y}{x} + x \sin \frac{y}{x}
\]

\(10\)  

\textbf{PART-B}\]

Q.5  
\(a)\) Find the variance and standard deviation for the following set of numbers 25, 30, 45, 30, 70, 42, 36, 48, 34, 60.  

\(10\)  
\(b)\) The mean and variance of 7 observations are 8 and 16 respectively. It five of the observations are 2, 4, 10, 12 and 14 find the remaining two observations. 

\(10\)  

Q.6  
\(a)\) A card is drawn at random from an ordinary deck of 52 playing cards. Find the probability that its is i) an ace, ii) a jack of hearts iii) a six of diamonds iv) a heart.  

\(10\)  
\(b)\) A ball is drawn from a bag containing 5 white and 7 black balls.  
\(i)\) What is the probability of drawing a white ball?  
\(ii)\) What are the odds against drawing a white ball?  
\(iii)\) If two balls are drawn simultaneously what is the probability that both balls are white.  

\(10\)  

Q.7  
\(a)\) Find the angle between two vectors \(\vec{a}\) and \(\vec{b}\) with magnitude 1 and 2 respectively and such that \(\vec{a} \cdot \vec{b} = 1\).  

\(10\)  
\(b)\) Find \(\vec{a} \times (\vec{b} \times \vec{c})\). If \(\vec{a} = \hat{i} + \hat{j} + \hat{k}\), \(\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}\) and \(\vec{c} = 2\hat{i} + \hat{j} + 4\hat{k}\)  

\(10\)
Q.1  
  a) What do you understand by the term: up-milling?  
  b) How is a milling machine specified?  
  c) Draw a neat sketch of face milling.  
  d) Which materials are used in manufacture of grinding wheels?  
  e) What are mounted wheels? Where are they used?  
  f) Describe the principal parts of a shaper.  
  g) Describe the working principle of a planer.  
  h) Which materials are used in manufacture of broach tools?  
  i) What do you understand by press working?  
  j) What is the difference between open die and cold die forging?  

2x10

PART-A

Q.2  
  a) Draw a neat sketch of vertical milling machine and describe its constructional features.  
    8  
  b) What is the difference between form milling and gang milling?  
    6  
  c) Define the terms: cutting speed, feed and depth of cut in milling operations.  
    6

Q.3  
  a) What do you understand by grain, grit, structure and grade of a grinding wheel?  
    8  
  b) Write a short note on surface grinding.  
    7  
  c) Why truing and dressing are necessary in grinding wheel?  
    5

Q.4  
  a) Explain with the help of a neat sketch the working principle of a shaper.  
    10  
  b) What are the main operations performed on a planer?  
    5  
  c) How does a planer differ from a shaper?  
    5

PART-B

Q.5  
  a) What is broaching? Describe the elements of a broach tool.  
    8
b) What is the principle of broaching? Describe vertical type pull up broaching machine with a neat sketch.

Q.6 a) How are the dies classified? Give a few names of each type.

b) Write short notes on:
   i) Embossing.
   ii) Notching.

Q.7 a) Differentiate between hot and cold forging.

b) What are the different types of rolling mills? Explain with neat sketches.

c) What do you understand by extrusion? What is the difference between hot and cold extrusion?
End Semester Examination, Dec. 2015
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) Name the commonly used unit of refrigeration.
b) What is meant by COP?
c) Differentiate between wet and dry compression.
d) Define a refrigerant and name a few widely used refrigerants.
e) State the characteristics of an ideal refrigerant.
f) State the different types of compression.
g) State the function of condenser in a refrigeration system.
h) What is psychrometric chart? What information does it provide?
i) Define thermostat.
j) What is the principle of electrolux refrigeration system?

2x10

PART-A

Q.2 a) Explain various methods of refrigeration.
b) Explain air refrigeration cycle.

10

10

Q.3 a) Draw and find out COP of vapour compression refrigeration system. Also explain vapour compression refrigeration system with P-H and T-S chart.
b) Compare air refrigeration system with vapour compression refrigeration system.

15

5

Q.4 a) Write down desirable properties of refrigerant.
b) Explain physical and chemical properties of different refrigerants.

10

10

PART-B

Q.5 a) What is the function of condenser? Explain different types of condenser with diagrams.
b) Explain with diagram any two types of evaporators.

12

8

Q.6 a) The atmospheric condition is 32°F and specific humidity is 13.4 g/kg of air. Determine:
   i) Partial pressure of vapour.
   ii) Relative humidity.
   iii) Dew point temperature.
   Given: Atmospheric pressure= 758 mm of Hg.
   At 32°F [Dry bulb temperature]
   Value of $P_{vs}$ is 0.0476 bar.
b) Draw psychometric chart and write down all parameter in chart.

15

5

Q.7 a) Explain working of electrolux refrigeration system with a diagram.
b) Explain ice plant in brief.

15

5

544/3
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Fifth Semester
CNC MACHINES AND AUTOMATION (M-I-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 Write short note on the following:
   a) Programmable logic controllers.
   b) Fixtures for CNC machines.
   c) Point to point position control.
   d) Diagnosis of CNC machines.  

Q.2
   a) What are CNC machines? What is the basic concept of their operation?  
   b) Write differences between conventional and non-conventional machines.  
   c) What are the advantages and disadvantages of CNC machines? 

Q.3
   a) What do you understand by MCU of a CNC machine? Write its various components and their functions.  
   b) Write down various safety provisions of CNC machines.  
   c) What are PLC? Discuss their advantages and disadvantages.  

Q.4
   a) What is ATC? How the use of an ATC can enhance the performance of CNC machines? What safety factors one need to consider while using ATC?  
   b) What is tool in a CNC machine? Discuss various types of tools used in a CNC machine.  

Q.5
   a) What do you understand by position control? Explain continuous position control system.  
   b) What are the differences between open and closed loop control system?  
   c) Discuss fundamental problems in control system.  

Q.6 Discuss following terms:  
   a) Cutter radius compensation.  
   b) Cutter wear compensation.  
   c) Lead in and lead out.  

Q.7
   a) What is automation? Discuss various types of automation mechanisms.  
   b) Discuss advantages and disadvantages of automated systems.  

5x4
End Semester Examination, Dec. 2015
B. Tech. (Integrated) – Fifth Semester
COMPUTER INTEGRATED MANUFACTURING (M-I-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 Explain any five terms briefly:
   a) Software selection for CIM implementation.
   b) Differentiate between hard and soft automation.
   c) Geometric adaptive control.
   d) Advantages of CAPP.
   e) Painted guided vehicle.
   f) NC control unit.
   g) Computer aided scheduling.

PART-A

Q.2 Briefly explain the main elements of C.I.M. system. 20
Q.3 Explain manufacturing automation protocol in detail. 20
Q.4 Define different part programming languages in brief with codes. 20

PART-B

Q.5 a) Describe any one computer aided process planning software. 10
      b) Distinguish between variant approach and generative approach. 10
Q.6 a) Write a note on AGV and mention its application. 10
      b) How selection of appropriate material handling is done for a particular type of material? 10
Q.7 Sketch the layout of a typical FMS and explain. 20
End Semester Examination, Dec. 2015  
B. Tech. (Integrated) – Sixth Semester  
INSPECTION AND QUALITY CONTROL (M-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) Define limits, fits and tolerances.  
b) Name any four measuring instruments.  
c) Briefly describe total quality management (TQM).  
d) What do you mean by National Standards?  
e) What is electro mechanical transducers?

4x5

**PART-A**

Q.2 a) Explain the planning procedure for inspection.  
b) Write down the various factors influencing the quality of manufacture.

10  
10

Q.3 Explain the term inspection. Also write down any four inspection methods with suitable examples.

20

Q.4 a) Explain the working of Vernier Caliper with a neat sketch  
b) Explain the term 'error'. Also explain the effect of error on product quality.

10  
10

**PART-B**

Q.5 a) Write down the basic statistical concepts.  
b) Explain the sampling process used in statistical analysis.

10  
10

Q.6 Discuss the concept, evolution and implications of ISO: 9000.

20

Q.7 Write short notes on **(any four):**  
a) Control charts.  
b) International codes.  
c) Measurement of mechanical quantities.  
d) Maintenance of measuring instruments.  
e) Geometrical errors.

4x5
Q.1  a) What is necessity of testing?
    b) What do you mean by overhauling of machines?
    c) Define availability and maintainability.
    d) What is computerization of maintenance?
    e) Discuss maintenance schedule in brief.
        4x5

PART-A

Q.2  a) Explain the concept of maintenance in detail.
        10
    b) What do you mean by material management? Explain.
        10

Q.3  a) Explain the importance of location, identification and positioning of machines in industry.
        10
    b) Write down the various types of foundations used in industries for foundation and installation of machines.
        10

Q.4  Explain the inspection procedure of lathe machines in detail.
        20

PART-B

Q.5  a) Differentiate between centralized and decentralized maintenance strategies.
        10
    b) Write down the importance of maintenance for machines and equipments.
        10

Q.6  Describe any four types of maintenance strategies with suitable examples.
        20

Q.7  Write short notes on:
    a) Maintenance history card.
    b) Causes of frequent failures.
    c) Maintenance planning.
    d) Calibration.
        5x4
Q.1 Briefly explain the following:
   a) Kurtosis.
   b) Pearson’s coefficient of correlation.
   c) Secular trend in time series.
   d) Parsimony and shrinkage principles in forecasting.
   e) Smoothing in forecasting.  

Q.2 Calculate Karl Pearson’s coefficient of skewness:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Variable</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-80</td>
<td>11</td>
<td>30-40</td>
<td>21</td>
</tr>
<tr>
<td>60-70</td>
<td>22</td>
<td>20-30</td>
<td>11</td>
</tr>
<tr>
<td>50-60</td>
<td>30</td>
<td>10-20</td>
<td>6</td>
</tr>
<tr>
<td>40-50</td>
<td>35</td>
<td>0-10</td>
<td>5</td>
</tr>
</tbody>
</table>

Q.3 a) Explain types of errors in testing of hypothesis. 
   b) From the data given below about the treatment of 250 patients suffering from a disease, state whether the new treatment is superior to the conventional treatment.

<table>
<thead>
<tr>
<th>No. of patient</th>
<th>Favourable</th>
<th>Not favourable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>140</td>
<td>30</td>
<td>170</td>
</tr>
<tr>
<td>Conventional</td>
<td>60</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>50</td>
<td>250</td>
</tr>
</tbody>
</table>

[Given: For degrees of freedom=1, Chi-square 5%=3.84]

Q.4 a) Explain briefly the components of a time series.
   b) Describe the method of moving averages with its merits and limitations in measurement of trend in a time series.

Q.5 Describe basic considerations of a successful forecasting.

Q.6 Explain autoregressive moving average (ARMA) forecasting model in detail.

Q.7 Explain accounting for parameter uncertainty in confidence intervals for conditional forecasts.
End Semester Examination, Dec. 2015
M. Tech. (Industrial Engineering) - First Semester
OPERATIONS PLANNING AND CONTROL (M-IE-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 do you mean by operation planning and control? Write down the elements of control of OPC. 8
b) Explain the role and applications of computers in OPC. 7

Q.2 a) What do you mean by inventory? Explain the various types of inventory in detail. 9
b) Differentiate between ‘P’ and ‘Q’ systems for inventory management. 6

Q.3 Explain the following:
a) Just in time methodology used for inventory control. 5
b) 5’S concept. 3
  "c) Work in process inventory. 5

Q.4 a) Define routing. Explain the procedure for routing in detail. 8
b) Write down the various factors affecting routing procedures. 7

Q.5 a) What do you mean by line balancing? Explain the importance of line balancing in an manufacturing assembly unit. 10
b) Differentiate between aggregate planning and chase planning with suitable examples. 5

Q.6 a) What is dispatching? Explain the various activities associated with dispatching. 7
b) Why is follow up important in dispatching? 3
c) Write down the dispatching procedure in an industry. 5

Q.7 Write short notes on any two:
a) VED analysis. 3
b) Scheduling. 3
c) Expediting controlling. 7

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End Semester Examination, Dec. 2015
M. Tech. (Industrial Engineering) - First Semester
MANAGEMENT CONCEPT AND ORGANISATION 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 Identify and discuss the five major perspectives of management thoughts. 15

Q.2 a) Explain five personality traits and access various sub traits that each personality trait is made up of. 10
    b) Explain the concept of attitude in an organization. 5

Q.3 Define group. What are the reasons for the need of groups? Also explain how group formation and development takes place. 15

Q.4 a) Explain Maslow’s theory of need hierarchy. 10
    b) Explain X and Y theory of motivation. 5

Q.5 a) Define culture. What are strong and weak cultures? 6
    b) Explain various approaches that can be used in bringing the cultural changes. 9

Q.6 a) Explain the managerial functions in international business. 10
    b) Write short notes on business process re-engineering. 5

Q.7 Write short notes on:
    a) Knowledge management. 7½
    b) E-commerce. 2

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End Semester Examination, Dec. 2015  
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) Define productivity and explain different types of productivity measurements.  
   7  
b) Explain the relationship of productivity and production. What is the role of  
   management in productivity improvement?  
   8

Q.2  
a) Describe flow diagram, travel chart, string diagram and their applications in layout  
   development.  
   10  
b) What is work sampling? What are its advantages and limitations?  
   5

Q.3  
a) What do you understand by allowances in context with time study? What are  
   various allowances?  
   5  
b) A work sampling study was conducted for 100 hours in the machine shop in order  
   to estimate standard time. The total number of observations recorded were 2500.  
   No working activity could be noticed for 400 observations. The ratio between  
   manual and machining elements was 2:1. Average rating factor was estimated as  
   1.15 and total number of articles produced during study period were 6000. Rest  
   and personal allowance may be taken as 12% of normal time. Find out the normal  
   time and standard time.  
   10

Q.4  
a) Explain the purpose and application of micromotion study.  
   7  
b) Explain the construction, application and advantages of SIMO chart.  
   8

Q.5  
a) Explain the term ergonomics and its significance. Describe four major constituent  
   areas of ergonomics study.  
   10  
b) What do you understand by man-machine system? How are the man-machine  
   systems classified?  
   5

Q.6  
a) Explain the design considerations of visual displays.  
   7  
b) Explain the difference between hand and foot controls.  
   8

Q.7  
Write short notes on any two:  
a) Effect of incentives on motivation and productivity.  
   7½  
b) Difference between method study and work measurement.  
   7½  
c) Work design considerations.  
   7½

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End Semester Examination, Dec. 2015
M. Tech. (Industrial Engineering) - First Semester
PROJECT MANAGEMENT (M-IE-204)

Time: 3 hrs
Max Marks: 75
Note: Attempt any **FIVE** questions in all. Each question carries equal marks.

Q. 1 a) Define project identification, formulation and implementation.
b) List any two software packages of CAPM. What are the advantages of CAPM?
c) Compare between CPM and PERT.
d) What are limitations of Gantt chart?
e) Briefly describe sensitivity analysis.

Q. 2 a) What are the objectives of pre-feasibility study? Enumerate the steps involved in a pre-feasibility study.
b) From the following table first determine the degree of linear correlation (find and interpret the correlation coefficient of determination) and find the line that best fit the data:

<table>
<thead>
<tr>
<th>x</th>
<th>10.4</th>
<th>16.5</th>
<th>22.9</th>
<th>26.6</th>
<th>33.8</th>
<th>42.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>11.8</td>
<td>12.5</td>
<td>15.7</td>
<td>19.2</td>
<td>21.9</td>
<td>23.3</td>
</tr>
</tbody>
</table>

Q. 3 a) What is computer-aided project management (CAPM)? What are requirements of good project information system?
b) What are desired features of project management software?

Q. 4 a) Describe functional organisation. What are its limitations?
b) What is project appraisal? Explain various aspects of project appraisal involved in project management.

Q. 5 a) What is meant by crashing of project time? Explain the steps involved in project crashing.
b) Define risk analysis. What are various risks in international projects?

Q. 6 a) Explain the importance of resource allocation in project management.
b) Explain the term ‘Tender’. What are normally contained in tender documents?

Q. 7 List of activities for erecting a canteen in the factory is given below with other relevant details. Job ‘A’ must precede all others while Job ‘E’ must follow all others. Apart from this, job scan run concurrently also:

<table>
<thead>
<tr>
<th>Code</th>
<th>Job Description</th>
<th>Normal Duration (Day)</th>
<th>Normal Cost (` )</th>
<th>Crash Duration (Days)</th>
<th>Crash Cost (` )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Lay foundation and build walls</td>
<td>5</td>
<td>3000</td>
<td>4</td>
<td>4000</td>
</tr>
<tr>
<td>B</td>
<td>Tile flooring</td>
<td>6</td>
<td>1200</td>
<td>2</td>
<td>2000</td>
</tr>
<tr>
<td>C</td>
<td>Install electricity</td>
<td>4</td>
<td>1000</td>
<td>3</td>
<td>1800</td>
</tr>
</tbody>
</table>
Questions:

a) Draw the network and critical path.

b) Crash the network fully to find out minimum work duration.

c) Indirect costs are $300/day, determine the time cost trade off for the project.
End Semester Examination, Dec. 2015  
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 study of effect of smoking on sleep patterns is conducted. The measure observed is the time in minute, that it takes to fall asleep. These data are obtained:

<table>
<thead>
<tr>
<th>Smoker:</th>
<th>69.3</th>
<th>56.0</th>
<th>22.1</th>
<th>47.6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53.2</td>
<td>48.1</td>
<td>52.7</td>
<td>34.4</td>
</tr>
<tr>
<td></td>
<td>66.2</td>
<td>43.8</td>
<td>23.2</td>
<td>13.8</td>
</tr>
<tr>
<td>Non Smoker:</td>
<td>28.6</td>
<td>25.1</td>
<td>26.4</td>
<td>34.9</td>
</tr>
<tr>
<td></td>
<td>29.8</td>
<td>28.4</td>
<td>38.5</td>
<td>30.2</td>
</tr>
<tr>
<td></td>
<td>30.6</td>
<td>31.8</td>
<td>41.6</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>36.0</td>
<td>37.9</td>
<td>13.9</td>
<td>-</td>
</tr>
</tbody>
</table>

a) Find the sample mean for each group.

b) Find the sample standard deviation for each group.

c) Comment on what kind of impact smoking appears to have on the time required to fall asleep.  

Q.2 a) Explain the various steps in simulation study, with the help of a neat flow diagram. 

b) Define linear and non-linear system in brief.

Q.3 a) Explain Monte Carlo method as a numerical computational techniques.

b) Write down the types of simulation software.

Q.4 a) Explain logistic curve as a combination of two types of growth models.

b) Define the concept of decay models.

Q.5 a) Explain the variance reduction techniques with a suitable example.

b) Define stochastic variables.

Q.6 Explain:

a) Simulation of Hydraulic system.

b) Simulation of manufacturing system. 

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 respectively the occurrence of swinging, hitting and being caught.  
[Hints use table of random digits.]  

15
End Semester Examination, Dec. 2015
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 What are the key components of pricing decisions that affect supply chain performance? 15

Q.2 What is the role of forecasting in supply chain? What are the characteristics of forecast? 15

Q.3 Discuss the various aggregate planning strategies. 15

Q.4 What are the obstacles in coordination in supply chain? As supply chain manager, what actions you will take. 15

Q.5 Elaborate few cases where availability of real time information has been used to improve supply chain performance. 15

Q.6 What modes of transportation are best suited for large low-value shipments? Explain in detail. 15

Q.7 Discuss the role of cycle inventory and safety inventory in supply chain management. 15

End Semester Examination, Dec. 2015
B. Tech. – Fifth Semester
PRODUCT DESIGN AND PROCESS PLANNING (M-II-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 Answer the following questions:
   a) Explain why new products are required to be introduced.
   b) Explain four new concepts of new products.
   c) What is cost sensitivity?
   d) Draw bath-tub curve.
   e) Describe 3 methods of improving the reliability of a product.
   f) Describe the various steps in value engineering.
   g) Draw the diagram of a cast iron mould for following part:
h) Why does Aluminum part in HPDC dies stick to core? How is it removed?

i) Name four processes that ensure precision accuracy in the range of $5 \mu m$ on a part.

j) How can you increase the stiffness of a sheet metal part?

**PART-A**

Q.2 What is new product development process based on Booz, Allen and Hamilton model.

Q.3 a) What are the ways to improve the reliability of a product?
    b) What is Mean Time Before Failure? What is the effect of mean time before failure on the usability of a product?

Q.4 a) What is the difference between fixed cost and variable cost? Give example.
    b) What is break-even point?
    c) How can you make a business reach break-even point early?

**PART-B**

Q.5 a) Explain the design consideration for cartings.
    b) Explain the design consideration for sheet metal parts.

Q.6 Write the main ergonomic considerations for reducing the fatigue and enhancing the ease of operating a product.

Q.7 a) Describe Kanban system briefly.
    b) Describe two techniques of rapid prototyping.
End Semester Examination, Dec. 2015
B. Tech. (Industry Integrated) – Fifth Semester
MEASURING TECHNIQUES AND COMPUTER AIDED INSPECTION
(M-II-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 is comparator?
b) What are go and no-go gauges?
c) What is straightness error?
d) What is tolerance analysis?
e) Explain the principle and use of sine bar.
f) What are the different types of CMM?
g) What is photo diode?
h) What are limit switches?
i) What are the advantages of using laser in measurement?
j) What is tactile sensor?
2x10

PART-A

Q.2 a) Discuss slip gauges and their uses in brief.
5
b) Explain construction and working principle of height gauges and depth gauges.
15

Q.3 a) Explain surface roughness.
5
b) Describe the auto collimator method of measuring straightness of a surface.
15

Q.4 Explain the acceptance test procedure for a lathe.
20

PART-B

Q.5 a) Explain principle and applications of optoelectronic devices.
10
b) What are offline and online inspection procedures? Explain in brief.
10

Q.6 Describe the construction and working principle of a co-ordinate measuring machine. What are its applications and advantages?
20

Q.7 a) Explain bar code system and its applications in brief.
5
b) Explain different types of proximity sensors in detail.
End Semester Examination, Dec. 2015
B. Tech. (Industry Integrated) – Fifth Semester

FACILITY PLANNING AND PLANT LAYOUT (M-II-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 the nature of facility planning?
    b) Define cost contours.
    c) What are the symptoms of a relayout for a facility?
    d) Define a product layout.
    e) Define an assembly line.
    f) What is the principle of gravity in material handling?
    g) Define screw feeders.
    h) What are the advantages of limit load?
    i) Define hoppers and feeders.
    j) What are the functions of warehouse?

2x10

PART-A

Q.2  a) Discuss the scope of facility planning.

5
    b) Explain location analysis. What are the various techniques used for analysis of a location?

15

Q.3  a) Define process layout. What are its advantages?

6
    b) Describe facility layout. Discuss its significance and objectives.

14

Q.4  a) Describe production flow analysis.

6
    b) An assembly consists of the following elements are given in the table below:

<table>
<thead>
<tr>
<th>TASK</th>
<th>→</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMMEDIATE PRECEDER</td>
<td>→</td>
<td>NIL</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>C,D</td>
<td>G</td>
<td>E</td>
<td>I,F</td>
<td>H,J</td>
<td>K</td>
</tr>
<tr>
<td>TASK TIME</td>
<td>→</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

The production rate required for one assembly is 15 mins. Determine the minimum numbers of work stations required so as to minimize the balance delay. Find station wise balance.

14

PART-B

Q.5  a) Define flow pattern. What are its advantages?

5

560/3
b) What are the various factors that govern the selection of the material handling equipments?

Q.6 Explain the principles of material handling. Also discuss the functions of material handling.

Q.7 Explain the following with their applications:
   a) Pneumatic conveyors.
   b) Bucket elevators.
   c) Viberatory conveyors.
   d) Bins.

5x4
End Semester Examination, Dec. 2015
B. Tech. (Industry Integrated) – Fifth Semester
COMPUTER AIDED DESIGN-I (M-II-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) What is the difference between .igs and .stp formats?
       b) What do you understand by the term CAD?
       c) How can you make a surface transparent in CATIA?
       d) Name four workbenches in CATIA.
       e) What is specification tree? How does it look?
       f) What is part modeling?
       g) How can you “fix” a model in assembly modeling?
       h) How can you make solid model hollow?
       i) What is top down assembly modeling?
       j) What is graphic kernel system?

2x10

PART-A

Q. 2 a) How can you make the following sketch?

b) Describe two ways of changing the shape of the above curve.

b) Describe two ways of changing the shape of the above curve.

b) Describe two ways of changing the shape of the above curve.

10

Q. 3 a) What are the advantages of using CAD systems?

b) What do you understand by Bezier curves and conic curves?

10

Q. 4 How can one create the following part in part modeling? The sections are unequal in size and shape channel is not straight.
Q.5 How will you make the following sheet metal part in surface modeling? Give thickness and convert into solid model.

Q.6 How will you make the following assembly model?

Q.7 How will you create three views and dimension them in CATIA?
End Semester Examination, Dec. 2015  
B. Tech. (Industry Integrated) – Fifth Semester  
JIGS AND Fixture DESIGN (M-II-505)

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 Briefly explain the following:

a) Draw the diagram of a drill bush.
b) Give one example of slide fit.
c) What will be the hole size in maximum material condition? Hole $DIA = 20 \pm 0.2$.
d) Draw the diagram of a shoulder bolt.
e) What is the material and hardness of a drill bush?
f) A drill jig is to be designed for the following part. Identify the reference in X and Y directions.

g) A block is located by two pins. How will you provide foolproofing so that the block does not get loaded upside down.

h) Draw the diagram of a grub screw.
i) Draw the diagram of an equalizing clamp.
j) Draw the diagram of a strap clamp.

PART-A

2x10

Q.2 a) What is through hardening? Why is it given? What are the features that are affected by through hardening?

10

b) Following part is made with through hardening steel. Give process planning of the part.

10
Q.3  
   a) What are the advantages of using diamond pin over round pin.  
      5  
   b) Calculate the maximum angular play in the following design.  
      15  

Q.4  
   a) Draw an internal clamp to clamp the ID of the following part.  
      10  
   b) Draw the diagram of a screw clamp with floating PAD.  
      5  
   c) Draw the diagram of a cam clamp.  
      5  

PART-B  

Q.5  
   Make a sketch of turning fixture for the following part. Clamp the square portion of the part on lathe Machine the round part on lathe.  
   20  

Q.6  
   a) What are the different types of valves that are used in pneumatics?  
      10  
   b) Draw the diagram of a pneumatic circuit for two-hand operation.  
      10  

Q.7  
   Draw the welding JIG for the following assembly:  
   20  

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End Semester Examination, Dec. 2015  
B. Tech. (Industry Integrated) – Fifth Semester  
VEHICLE ENGINEERING (M-II-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) Define camber.  
b) What is instantaneous centre of rotation?  
c) Define riding height.  
d) What is the function of panhard rod?  
e) Define universal joints.  
f) What do you understand by transaxle?  
g) Define calipers used in disc brakes.  
h) What are advantages of disc brakes?  
i) Define suspension system.  
j) What is the use of muffler in an exhaust system?  

Q.2  
a) Describe three quarter floating axle.  
b) Explain steering linkages in independent suspension system with a neat sketch.

Q.3  
a) Describe Davis’s steering system.  
b) Explain power steering system with a neat sketch.

Q.4  
a) Discuss the effect of driving thrust and torque on drive line.  
b) Explain the working and construction of a differential.

Q.5  
a) List the factors which affects brake performance.  
b) Explain the working and construction of disc brakes.

Q.6  
a) Define radial ply tyres and their advantages.  
b) Explain air suspension system with a neat sketch.

Q.7  
a) Explain exhaust system. What are its components?  
b) Explain exhaust gas re-circulation system with a neat sketch.
End Semester Examination, Dec. 2015
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) State Brewster’s law.
b) Define electric dipole moment and write its SI unit.
c) What is Seebeck effect?
d) State Ohm’s law.
e) Write the expression for time period of a simple pendulum.
f) State law of Malus.
g) Define wave front.
h) Give two applications of optical fibre.
i) What do you understand by population inversion?
j) What is pair production?
   2x10

PART-A

Q.2  
a) State and explain Coulomb’s law of electrostatics. Also define SI units of charge.  
   10
b) Derive an expression for capacitance of a parallel plate capacitor.  
   10

Q.3  
a) State Kirchhoff’s laws for an electric network and derive the condition for balance in a wheat stone’s bridge.  
   12
b) Derive the relation between drift velocity and current density.  
   8

Q.4  
a) What is a simple pendulum? Derive an expression for time period of a simple pendulum.  
   10
b) What do you understand by forced oscillations and resonance? Explain with examples.  
   7
c) A simple harmonic motion is represented by \( y = 0.2 \sin 50 \pi t \). Find the amplitude and time period of oscillation.  
   3

PART-B

Q.5  
a) What is diffraction of light? Explain Fraunhoffer diffraction at a single slit and obtain an expression for the width of central maxima.  
   10
b) Describe the construction and working of a Nicole prism.  
   10
Q.6  a) Explain the construction and working of Ruby laser.
    10
b) What is optical fibre? Explain the critical angle, acceptance angle and numerical
    aperture of the optical fibre.
    10

Q.7  a) Describe the construction and working of a G.M. counter.
    10
b) Discuss the construction and working of a scintillation counter.
    10
End Semester Examination, Dec. 2015
M.Sc. (Energy and Environment Science) – First Semester
ENVIRONMENT AND ECOLOGY (MSE-101)

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) Write a brief note on Keystone species.
   b) What are the major points of comparison between the energy pyramid and age pyramid?
   c) What do you mean by reed-swamp stage?
   d) Write a short note on endemism and its significance. 3x4

UNIT-I

Q.2 a) What is adaptation? Describe different aspects of adaptation. 7
    b) Explain the concept of ecad and ecotype. 5

Q.3 a) Define a community. Describe the features that characterize a community. 6
    b) “Ozone can be a destroyer and a protector.” Comment and explain. 6

UNIT-II

Q.4 a) What are the components of an ecosystem? What role can humans play in changing the environment? 6
    b) Define food chain and food web. Depict them with the help of suitable diagrams. 6

Q.5 a) What is ecological succession? Describe the cause, trends and basic types of succession. 7
    b) Explain the general process of succession in nature. 5

UNIT-III

Q.6 a) Explain the theory of population growth. How far this is applicable to real population growth in nature? 8
    b) Do pattern of survivorship differ in tropical and temperate populations? Comment. 4

Q.7 a) How do we measure the biodiversity in India? What are the three approaches used to determine the value of earth’s biological resources? 6
    b) Differentiate between In-situ and Ex-situ conservation of biodiversity. 6
End Semester Examination, Dec. 2015
M. Sc. (Biotechnology) - First Semester
NATURAL RESOURCES AND CONSERVATION (MSE-102)

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 Briefly answer:
   a) Write a brief note on “Hug the Tree Movement”.
   b) What is the use of gas hydrates?
   c) How geothermal energy is obtained?
   d) “Rain is very important source of water”. Explain.

UNIT-I

Q.2 What is a natural resource? Give an account of different natural resources with special reference to India.

Q.3 a) What is the role of an individual in conservation of natural resources?
    b) Write a short note on IUCN.

UNIT-II

Q.4 a) Comment on tidal potential in India and explain the various tidal power harvesting methods.
    b) How modern agricultural practices have resulted in serious loss of genetic variability of crops?

Q.5 a) What are the alternative energy resources? Describe briefly alternative energy resources utilized in India for our modern economic growth.
    b) Discuss the important features of watershed management.

UNIT-III

Q.6 a) Briefly explain the terms: wasteland reclamation and desertification.
    b) What are measures to be taken for the conservation of Wildlife?

Q.7 a) Discuss the importance of dams and its impact on environment.
    b) Write the ecological benefits of rain forests. Suggest some approaches towards the conservation of forest.
End Semester Examination, Dec. 2015
M.Sc. (Energy & Environment) - First Semester
ENVIRONMENTAL CHEMISTRY AND ANALYTICAL METHODS
(MSE-103)

Time: 3 hrs
Max Marks: 60
No. of pages: 1

Note: Attempt FIVE questions in all; taking at least ONE question from each Unit. Attempt FOUR more questions out of six; Q.1 is compulsory. All questions carry equal marks.

Q.1 a) What are photochemical reactions? Give suitable examples.
  b) How does redox potential affect soil composition?
  c) Mention briefly any two methods of sampling air.
  d) What is the principle of nephelometry?
  e) What is the role of monochromator in a spectrophotometer?
  f) What is IR-fingerprint? 2x6

UNIT-I

Q.2 Describe the structure of atmosphere and give main chemical reactions occurring in each of its layers. 12

Q.3 a) Elaborate the bronsted-lowry concept of acids and bases on the basis of titration curve of a weak acid. 6
  b) Briefly describe the composition of soil. 6

UNIT-II

Q.4 Give a detailed account of physio-chemical analysis of water. 12

Q.5 a) Explain the principle of element detection and quantification by flame photometry. 6
  b) Describe the working of a flame photometer. 6

UNIT-III

Q.6 Describe various components of HPLC unit. What are the factors affecting resolution in column chromatography? 12

Q.7 Write short notes on:
  a) Colorimeter.
  b) High volume sampler. 6x2
End Semester Examination, Dec. 2015
M. Sc. (Energy and Environment) - First Semester
BIOENERGY (MSE-104)

Time: 3 hrs
Max Marks: 60
No. of pages: 2

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 the term: bioenergy?
   b) Define the factors taken into consideration for selection of biomass for biofuel production.
   c) How is micro screening harvesting of algae conducted?
   d) “Corn is an excellent source of starch for fuel generation but is also a traditional food resource”. Comment.
   e) Explain plasma technology used for waste treatment.
   f) Fuel or Food is the debate of present time, enlist the key issues of it. 2x6

PART-I

Q.2 a) What is the principal reason for the usage of biofuels in terms of bioenergy with sustainability aspect? 6
   b) Discuss the Global Energy consumption forecast and correlate it with biofuel concept. 6

Q.3 a) What are the different processes and technologies required inevitably for biomass conversion to bioenergy? Enumerate the benefits and challenges of biofuel utilization. 8
   b) How does biomass utilization helps to contribute towards environment and ecology conservation? 4

PART-II

Q.4 a) Enumerate the different feed stocks in terms of perennial grass biomass? What are the quality and economic considerations for grass biomass? 6
   b) What are the major types of algae growth systems? Give the life cycle analysis, economics and environmental impacts of algae based biofuel. 6

Q.5 Explain briefly the corn to ethanol process technology. Which of the two processes is more economically viable? What are the by – products of corn ethanol? What is the industrial significance of corn ethanol? 12

OR

Explain briefly the chemical and enzymatic hydrolysis in Cellulosic Ethanol Technology. What are the co-products of Cellulosic Ethanol Technology? Comment upon cost of ethanol production from lignocellulosic material to corn starch. 12
**PART-III**

Q6.  a) What do you understand by biomass gasification? Which are the important chemical reactions taking place during biomass gasification?  
     b) Explain briefly the process of pyrolysis of thermal decomposition. What do you understand by biosyngas?

Q7.  a) What are the various types of waste and their distributions in terms of conversion to biofuel and bioproducts? Enlist advantages and disadvantages of biomass pre-treatment.  
     b) What is supercritical technology used for waste treatment? Discuss economic and environmental issues related to waste conversion.
End Semester Examination, Dec. 2015
M.Sc. (Energy & Environment) - First Semester
ENVIRONMENTAL STATISTICS (MSE-105)

Time: 3 hrs
Max Marks: 60
No. of pages: 2

Note: Attempt FIVE questions in all; taking at least ONE question from each Unit. Attempt FOUR more questions out of six; Q.1 is compulsory. All questions carry equal marks.

Q.1 Answer briefly:
   a) Differentiate between discrete and continuous data.
   b) Write advantage and disadvantage of parametric tests.
   c) What is skewness? State different kind of skewness.
   d) What is test of significance? 3x4

UNIT-I

Q.2 a) Write short notes on:
   i) Histogram.
   ii) Ogive. 3x2
   b) Following grouped data is obtained in an observation of rate of reproduction of 50 fishes of a species. Make a frequency polygon and frequency curve with the help of data provided:

<table>
<thead>
<tr>
<th>Class interval</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</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>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q.3 a) Ovary weight of 50 fishes and their frequency is given in class interval. Find standard deviation.

<table>
<thead>
<tr>
<th>Wt of ovary</th>
<th>2-2.9</th>
<th>3-3.9</th>
<th>4-4.9</th>
<th>5-5.9</th>
<th>6-6.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>6</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b) In a community survey of 100 families the following distribution of number of children was obtained. Find the median of the following distribution:

<table>
<thead>
<tr>
<th>No. of children</th>
<th>1-3</th>
<th>3-5</th>
<th>5-7</th>
<th>7-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of families</td>
<td>20</td>
<td>42</td>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UNIT-II

Q.4 A random sample of size 16 has 53 as mean. The sum of squares of the deviation from mean is 135. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99% confidence limits of the mean of the population.

   Table value of \( t_{0.05} \) = 1.753
   Table value of \( t_{0.01} \) = 2.95 12
Q.5  a) Define $\chi^2$ and mention its formula. What do you mean by goodness of fit table? Explain with examples.  
   b) What is sampling? Explain types of sampling with examples of each.  

   **UNIT-III**

Q.6  a) What is correlation coefficient?  
   b) Number of ponds in a town number of fishes were as follows. Find the rank correlation $\rho$ (Rho).

<table>
<thead>
<tr>
<th>X</th>
<th>17</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>230</td>
<td>210</td>
<td>290</td>
<td>230</td>
<td>330</td>
<td>320</td>
<td>360</td>
<td>340</td>
<td>320</td>
</tr>
</tbody>
</table>

Q.7  Write short notes on:
   a) Advantages and disadvantages of parametric and non parametric test.  
   b) Multiple correlation.  

   6x2
Q.1  a) What do you mean by stimulated emission of radiation?
b) What is laser pumping?
c) What is Compton effect?
d) The light from highway sodium lamp has wave length of 589 nm. How much energy is possed by an individual photon from each lamp?
e) What is the maximum possible velocity of a material particle?
f) Define electric potential.
g) What is Gauss’s law in electrostatics?
h) Explain briefly the molecular theory of dielectrics.
i) Writes the Clausius-Mossotti equation.
j) What are Bremsstrahlung radiations?

2x10

PART A

Q.2  a) Describe the construction and working of a semiconductor laser with necessary diagrams. 
10
b) Explain different types of optical fibres on the baiss of mode of propagation and index. 
8
c) The numerical aperture of an optical fibre is 0.7 and core refractive index is 1.65. Determine the refractive index of cladding. 
2

Q.3  a) Explain the concept of wave packet and show that the de-broglie group velocity associated with the wave packet is equal to the velocity of the particle. 
8
b) Write the Schrodinger wave equation for a free particle in one dimensional box. Also determine the energy eigenvalue and normalized wave function. 
12

Q.4  a) Derive Lorentz transformation equations for space and time. 
10
b) Explain and establish mass energy equivalence relation $E = mc^2$. 
7
c) What would be the mass of a particle, having rest mass $10^{-20} \text{kg}$, when it moves with a speed of $2 \times 10^8 \text{ m/s}$? 
3
PART-B

Q.5  a) What are Poisson’s and Laplace’s equations? Solve the Laplace equation in one dimension for a parallel plate capacitor.

b) Derive an expression for the potential energy of a discrete charge distribution.

c) Given electric potential \( V = x^2 y + yz + 3zx \), determine the electric field at point (1, 2, 0).

Q.6  a) Derive a relation between the three electric vectors E, P and D.

b) What happens when a dielectric is placed in an alternating electric field? Explain.

c) The distance between the parallel plates of a capacitor, having dielectric of dielectric constant 2.5, is 5mm. If, the electric field strength inside the capacitor is \( 10^5 \) \( V/m \), determine the polarization vector, displacement vector and energy density in dielectric.

Q.7  a) Explain different mechanisms of absorption of Gamma radiations by matter.

b) Explain with a diagram the response of pulse height with applied voltage in a gas filled detector.
End Semester Examination, Dec. 2015
B. Tech. – Second Semester
APPLIED PHYSICS-II (PH-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) For a simple cubic lattice calculate \( d_{100} : d_{110} : d_{111} \).
b) What are Schottky defects?
c) What is the order of the forbidden energy gap in case of silicon and germanium?
d) What is Hall Effect?
e) Explain the gain factor of a photoconductor.
f) What is magnetic moment of an atom?
g) Explain the term spontaneous magnetization.
h) Write the expressions for London equations.
i) What is isotopic effect in superconductors?
j) What is Bottom up approach for building nanomaterials?

**PART-A**

Q.2  a) What are Miller indices? How they are determined? Draw planes (123) and (222) in a simple cubic unit cell.

b) Explain rotating crystal method used for the determination of crystal structures.

c) Calculate the glancing angle on the cube (100) of a rock salt (\( a = 2.814 \, \text{Å} \)) corresponding to 2\(^{nd}\) order diffraction maxima for X-rays of wavelength 0.710 Å.

Q.3  a) What are semiconductors? Discuss physical properties of semiconductors.

b) What is the epitaxial crystal growth technique? Discuss briefly any two epitaxial techniques used for crystal growth.

c) The Hall coefficient for a specimen is \( 3.66 \times 10^{-4} \, \text{m}^3 \text{C}^{-1} \). If the resistivity of specimen is \( 8.93 \times 10^{-3} \, \text{Ohm}^{-1} \text{m} \), calculate the mobility and concentration of charge carriers.

Q.4  a) Define photoconductivity. How does the optical absorption affect the conductivity of a sample.

b) What are traps? Do they increase or decrease the conductivity of a sample? Explain.

c) Discuss in detail construction, working, characteristics and uses of a solar cell.

**PART-B**

Q.5  a) Distinguish between diamagnetism and paramagnetism.

b) Write a note on Ferrimagnetism and give an account of domain theory of Ferromagnetism.

c) Write short notes on Ferrimagnetism and Antiferromagnetism.

Q.6  a) Discuss in detail the types of superconductors. Mention some of the important applications of superconductors.
b) Describe Meissner effect in superconductors.

6

c) If $T_c$ represents the critical temperature of the superconductor, determine the temperature at which the critical field reduces to half its value at absolute zero.

4

Q.7  a) Briefly explain nanoscience and nanotechnology. Discuss the basics of quantum well, quantum wire and quantum dot in detail.

10

b) Write short notes on *(any two)*:
   
i) Sputtering.
   
ii) Electrical properties nanomaterials.
   
iii) Applications of carbon nanotubes.

5x2
End Semester Examination, Dec. 2015  
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) What do you understand by fundamental quantities and units?  
b) Check the dimension consistency of the equation \( v = u + at \).  
c) Give four examples of vector quantities.  
d) Define impulse. Give its SI units.  
e) State triangle law of forces.  
f) Write the relation between angular momentum and torque.  
g) What are conservative and non-conservative forces?  
h) Define surface tension.  
i) Define power of a lens and give its units.  
j) What do you mean by refractive index?  
2x10

PART-A

Q.2  
a) State the units of the following quantities in SI and MKS systems, charge, potential, capacitance, resistance and electric flux density.  
5  
b) Given two vectors: \( \vec{A} = 5\hat{i} - 7\hat{j} + 3\hat{k}, \quad \vec{B} = -4\hat{i} + 7\hat{j} - 8\hat{k} \)  
Deduce the value of (i) \( \vec{A} \times \vec{B} \), (ii) \( \vec{B} \times \vec{A} \)  
5  
c) Distinguish between scalar product and vector product. Also explain how will you add and subtract two vectors?  
10  

Q.3  
a) State the parallelogram and triangle law of forces. How would you verify them experimentally?  
8  
b) What is impulse of a force? Give an example.  
4  
c) Derive an expression for the maximum height and the velocity of projectile at any instant.  
8  

Q.4  
a) What is meant by radius of gyration? Give its physical significance.  
6  
b) Derive the expression for the angular momentum of a rigid body.  
6  
c) Calculate the angular momentum and rotational kinetic energy of earth about its own axis.
Given mass of the earth = \( 6 \times 10^{24} \text{ kg} \)

Radius of the earth = \( 6.4 \times 10^6 \text{ m} \)

**PART-B**

Q.5  

a) Prove and discuss the work-energy theorem.  

b) Discuss one dimensional elastic collision between two bodies.  

c) What do you understand by potential energy? Show that it is a function of position whose negative gradient gives the conservative force.

Q.6  

a) Explain the terms: stress, strain, young’s modulus, bulk modulus and modulus of rigidity.  

b) Derive an expression for thermal velocity attained by a spherical body falling through a viscous medium.  

c) What is Reynold’s number? Give its significance.

Q.7  

a) Derive the relation \( \frac{1}{u} + \frac{1}{v} = \frac{1}{f} \) for a concave mirror.  

b) Draw a diagram depicting the image formation in a simple microscope and determine its magnifying power.  

c) What is an image? Distinguish between a virtual and a real image.