End Semester Examination, May 2014
B.Tech. (Integrated) – First Semester
CHEMISTRY (CH-I-101)

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

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

Q.1  a) What are the constituent particles of an atom?
    b) Write electronic configuration of Na\(^{11}\).
    c) What are acidity and basicity? Define with examples.
    d) What is the value of Avagadro Number?
    e) What is the hybridization in ethylene (C\(_2\)H\(_4\))?
    f) Differentiate between adsorption and absorption.
    g) What is a battery? Define with two examples.
    h) What is a polymer? Give two examples of polymers.
    i) What is the pH value of acid, base and a neutral solution?
    j) Write the names of all the quantum numbers (only names).

\[2 \times 10\]

PART-A

Q.2  a) Discuss the postulates of Bohr’s model for an atom.
    b) Define:  i) Isotope  ii) Isobar with examples.
    c) Draw the shapes of s, p, d and f orbitals and state how many number of electrons can be present in them.

\[8\]

Q.3  a) What is the difference between sigma (σ)and pi (π) bonds?
    b) Explain the following with examples:
       i) Electrovalent Bond  ii) Covalent Bond
    c) What is meant by hybridization? Discuss the shapes of sp\(^3\), sp\(^2\) and sp hybridization.

\[4\]

Q.4  a) Write difference between normality and molarity.
    b) A solution is prepared by dissolving 4 gm of NaOH (mol wt 40) to give 1 liter of it. Calculate molarity of the solution.
    c) Write short notes on:
       i) Brownian movement  ii) Osmosis
    d) Write difference between a colloidal solution and suspension.

\[2 \frac{1}{2} \times 2\]

PART-B

Q.5  a) What are strong and weak electrolytes? State with examples.
    b) Explain the process of electrolysis and give two important applications of electrolysis.
    c) Give the details of lead-acid battery and write its applications.

\[4\]

Q.6  a) Distinguish between physical adsorption and chemical adsorption. Also write the applications of adsorption.
    b) What are important characteristics of a catalyzed reaction? Explain with examples.

\[10\]

Q.7  a) Explain with suitable examples:
    i) Addition polymerization  ii) Condensation polymerization
    b) Write the classification of polymers along with examples. Also write the uses and applications of polyvinyl chloride (PVC), urea formaldehyde resins, and rubber-SBR.

\[5 \times 2\]

\[10\]
End Semester Examination, May 2014
B.Tech. (Integrated) – First Semester
FUNDAMENTALS OF COMPUTERS AND PROGRAMMING-I (CS-I-101)

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

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

Q.1 a) Define system software. Name five different system softwares.
   b) Explain the functions printf() and scanf() with their syntax.
   c) Describe the types of symbol used in a flowchart.
   d) What is an operating system? Name any three common operating systems in use.
   e) Explain the syntax and use of the following MS-DOS commands:
      i) CLS
      ii) DIR
      iii) DELTREE
      iv) XCOPY

PART-A

Q.2 a) Discuss the function of CPU. What are the main sections of CPU and discuss the function of each section?
   b) Differentiate between the following:
      i) RAM and ROM.
      ii) Hard-disk and CD-ROM.
      iii) Hard copy and soft copy devices.

Q.3 a) Convert the following:
   i) \((383.125)_{10} = (?)_{16}\)
   ii) \((1010.1101)_{2} = (?)_{10}\)
   iii) \((705.0605)_{8} = (?)_{2}\)
   iv) \((6794.789)_{10} = (?)_{8}\)
   v) \((10101.101001)_{2} = (?)_{16}\)
   b) What are the various ways of representing the information inside a computer?

Q.4 a) Explain different generations of programming language with their limitations.
   b) Discuss the relationship between a compiler, an interpreter and a linker.
   c) How single-user system is different from a multiuser system?

PART-B

Q.5 a) Compare and contrast DOS and UNIX operating systems. Briefly explain.
   b) Define kernel, file system and shell part of UNIX operating system.
   c) What are the main features of UNIX operating system?

Q.6 a) Write different phases in program development process. Explain each of them.
   b) What is an algorithm? Explain its need.
   c) Draw a flowchart and write an algorithm for finding a smallest of three numbers.

Q.7 a) Explain logical operators in C language.
   b) What is a selection statement? Which selection statement does C language provide?
   c) Give the syntax of "For loop" and explain how it works with an example.
   d) Write a program for finding whether a number is prime or not.
End Semester Examination, May 2014
B. Tech. (Integrated) - First Semester
MATHEMATICS-I (MA-I-101)

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

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

Q.1 a) Evaluate 60 P_{18} and 12 C_5.
   b) Find the 20th term of the sequence defined by
      \[ a_n = \frac{n(n-2)}{n+3} \]
   c) Using Binomial theorem, find the value of (99)^4.
   d) If \( \cot 0 = -\frac{12}{5} \), find the value of \( \tan \theta, \sec \theta \).
   e) Find the equation of the line passing through the point (-1, 2) with slope 4.
   f) Find the equation of the line passing through the points (-1, 1) and (2, -4).
   g) Write the equations of the circle whose centre is (-3, 2) and radius is 4.
   h) Find the equations of parabola with vertex at (0, 0) and focus at (-2, 0).
   i) Find the distance between the points (1, 3, 4) and (-1, 6, 10).
   j) Write the section formula in three dimensions and distance formula in three dimensions.

\[ 2 	imes 10 \]

Q.2 a) The A.M. and G.M. between two positive numbers are 10 and 8, respectively. Find the numbers.
   b) Find the \( n^{th} \) term and sum of \( n \) terms of the series \( \frac{1}{2 \times 5} + \frac{1}{5 \times 8} + \frac{1}{8 \times 11} + ... \)

\[ 10 \]

Q.3 a) Find the coefficient of \( x^5 \) in the expansion of the product \((1+2x)^6(1-x)^7\).
   b) Resolve in partial fraction \( \frac{x^2+1}{(x-2)(x-3)(x-4)} \).

\[ 10 \]

Q.4 a) In how many ways can the letters of the word 'PERMUTATION' be arranged such that:
   i) All words are together.
   ii) Order of vowels remains unchanged.
   iii) There are always 4 letters between Pans.
   b) Find the value of \( n \), if \( \frac{n}{2n-2} \) and \( \frac{n}{4n-4} \) are the ratio 1:6.

\[ 10 \]

Q.5 a) Show that \( \cos 70^\circ \cos 10^\circ + \sin 70^\circ \sin 10^\circ = \frac{1}{2} \)
   b) \( \cos 105^\circ + \cos 15^\circ = \sin 75^\circ - \sin 15^\circ \)

\[ 6 \]

P. T. O.
c) \( \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan x \)

Q.6  
\[ x - 2 = 0 \text{ and } x + \sqrt{3}y - 5 = 0 \]

b) Find the perpendicular distance of the point \((-3, 4)\) from the line \(3x + 4y - 5 = 0\).

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 coordinates of the points which divides the line segment joining the points \((5, 4, 2)\) and \((-1, 2, 4)\) in the ratio 2:3 internally.
End Semester Examination, May 2014
B.Tech. (Integrated) – First Semester
PHYSICS-I (PH-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) Define CGS system of units.  
b) What do you understand by fundamental quantities?  
c) State triangle law of forces.  
d) What is meant by radius of gyration?  
e) Give four examples of vector quantities.  
f) Two forces of magnitude 15 N and 20 N are perpendicular to each other. Find the resultant of these forces.  
g) What do you understand by potential energy of a body?  
h) State Hooke’s law.  
i) Insect can walk and run on water surface. Explain.  
j) Define power of a lens and its unit.

PART-A

Q.2  
a) Distinguish between scalar product and vector product. Also explain how you will add and subtract two vectors.  
b) Check the correctness of the equation \( v = u + at \) by the method of dimensions.  
c) Derive using the method of dimensions, the expression for the time period of a simple pendulum.

Q.3  
a) State and prove parallelogram law of forces.  
b) Define centripetal force. Derive the expression for it.  
c) Define impulse of a force and write its S.I. units. Show that impulse of a force is equal to change in the momentum of the body produced by the force.

Q.4  
a) Write short notes on torque and moment of inertia.  
b) Obtain the expression for the rotational kinetic energy of a rigid body.  
c) State the law of conservation of angular momentum and give its two applications.

PART-B

Q.5  
a) State and prove work energy theorem.  
b) What are elastic and inelastic collisions? Show that in perfectly elastic collision, the relative velocity remains unchanged in magnitude but is reversed in direction.

Q.6  
a) Derive an expression for terminal velocity attained by a spherical body falling through a viscous medium.  
b) Define the terms: Young’s modulus, bulk modulus and shear modulus.  
c) Differentiate between streamlined and turbulent flow.

Q.7  
a) Distinguish between a real and virtual image. Derive a relation between object distance ‘u’, image distance ‘v’, and focal length ‘f’ for a convex lens.  
b) Describe an astronomical telescope. Derive an expression for its magnifying power when final image is at infinity.
End Semester Examination, May 2014
B. Tech. (Integrated) – First / Second Semester
BASICS OF ELECTRICAL ENGINEERING (EE-I-101)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

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

Q.1 a) What are the units of current and voltage?
    b) Define a primary cell.
    c) What do you mean by resonance in a RLC series circuit?
    d) Two resistances of values $R_1$ and $R_2$ are connected in parallel. Obtain the equivalent resistance.
    e) What is the relation between line current and phase current in a delta connected system?
    f) State Ohm’s law.
    g) State the difference between AC and DC.
    h) What is admittance?
    i) Write an expression for power in a three-phase circuit.
    j) State Fleming’s Right Hand rule.

2x10

PART-A

Q.2 a) What are the different forms of energy? What are the advantages of electrical energy?
    b) What do you mean by work? Explain the relation between power and work.

10
10

Q.3 a) Describe the charging and discharging methods of a lead acid battery.
    b) How can you keep this lead acid battery in good condition?

10
10

Q.4 a) Two 6 $\Omega$ resistors are connected in parallel and another resistor of 6 $\Omega$ is connected in series with this parallel combination. It is connected to a 9 V battery. Find the total current in the network.
    b) Explain Kirchhoff’s voltage and current law.

10
10

PART-B

Q.5 a) What is the force on a conductor placed in a magnetic field?
    b) Explain self-induced emf and mutually-induced emf.

10
10

Q.6 a) Explain the terms instantaneous value and peak value of an alternating quantity.
    b) An $RL$ circuit with resistance 10 $\Omega$ and inductance 100 $mH$ is connected to a 200 V, 50 Hz AC supply. Find impedance and current.

10
10

Q.7 a) Explain measurement of power in a three-phase system using two wattmeter methods.
    b) What are the advantages of three phase system over single phase system?

10
10
End Semester Examination, May 2014  
B. Tech. (Integrated) – Second Semester  
INDUSTRIAL CHEMISTRY (CH-101)

Time: 3 hrs  
Max Marks: 100

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

Q.1  
a) Define hardness of water. What is the difference between temporary and permanent hardness?  
b) Differentiate between dry and wet corrosion.  
c) Discuss any four applications of composites in different areas.  
d) What is viscosity index?  
e) Discuss application of nanotechnology in medical and engineering areas.  
f) What are disinfectants? Write any two disinfectants used in water purification.  
g) Define reduce phase rule.  
h) Discuss any two applications of electroluminescent polymers.  
i) What is meant by eutectic mixture?  
j) Discuss two broad approaches for the synthesis of nanomaterials.  

PART-A

Q.2  
a) Standard hard water contains 1 gm of CaCO_3 per litre. 50 ml of this standard hard water required 15 ml of EDTA solution for end point. 50 ml of a water sample required 10 ml of EDTA solution, 50 ml of water sample after boiling required 5 ml of EDTA solution. Calculate total, temporary and permanent hardness of water.  
b) What is meant by desalination? Describe the electrodialysis process for desalination of sea water.  
c) What is meant by ion exchange resins? Describe the ion exchange process for softening of water.  

Q.3  
a) Explain the mechanism of electrochemical corrosion.  
b) Discuss with suitable diagrams and equations:  
   i) Differential aeration corrosion  
   ii) Pitting corrosion  
   iii) Explain sacrificial protection method to control the corrosion with the help of a diagram.  

Q.4  
a) Explain the various curves, areas and points in the labeled phase diagram of Pb-Ag system.  
b) Calculate the number of components and degree of freedom in the following closed system:  
   i) CaCO_3(s) ⇌ CaO(s) + CO_2(g)  
   ii) CuSO_4·5H_2O(s) ⇌ CuSO_4·3H_2O(s) + 2H_2O(g)  
   iii) Explain the following with example:  
      i) Triple point  
      ii) Component  

P. T. O.
**PART-B**

Q. 5  
(a) Define constituents of composites. Classify different types of composites on the basis of matrix phase.  
(b) What are lubricating oils? Discuss boundary mechanism of lubrication.  
(c) Write short notes on the following:  
   i) Saponification number  
   ii) Flash and fire point  

Q. 6  
(a) What are biodegradable polymers? Discuss the application of biodegradable polymers.  
(b) Write short notes on:  
   i) Photoconductive polymers  
   ii) Liquid crystal polymers  
(c) Discuss the potential application of conducting polymers.  

Q. 7  
(a) Explain the principle and application of Atomic Force Microscope Techniques.  
(b) Discuss the electro deposition method to synthesize nanomaterials.  
(c) What are the advantages and disadvantages of AFM over SEM?
Q.1 Answer the following:
   a) Explain different types of error in C language.
   b) Differentiate between a union and a structure.
   c) List out five string manipulation functions in C.
   d) Define FILE in C language.
   e) Explain inheritance.

**PART-A**

Q.2 a) What is an array? Write a program to search an element in an integer array.
   b) What is recursion? Write a recursive function to find factorial of a given number.

Q.3 a) Write a program to pick largest among three numbers.
   b) Write note on static, global and local variables.

Q.4 a) Define string. How it is declared, give an example?
   b) What are the various file opening modes?

**PART-B**

Q.5 a) How do you access a variable through pointer? Demonstrate with an example.
   b) Differentiate between call by value and call by address function calling methods.

Q.6 a) Write a program to copy contents of one file to another.
   b) Explain the following functions:
      i) fopen()
      ii) fclose()
      iii) fgets()
      iv) feof()

Q.7 a) Differentiate between C and C++ language.
   b) What is encapsulation? Show with an example.
End Semester Examination, May 2014
B.Tech. (Integrated) – Second Semester
FUNDAMENTALS OF COMPUTERS 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 of following:
   a) Write a note on data types in C language.
   b) Define function prototype.
   c) Explain recursion.
   d) Differentiate between a flow chart and an algorithm.
   e) Distinguish between a structure and a union. 4x5

PART-A

Q.2 a) Draw and explain various flow chart symbols.
    b) List out the characteristic of an algorithm.
    10

Q.3 a) Write note on different operators used in C language.
    b) Write a program to design a calculator using switch statements.
    10

Q.4 a) Explain call by value and call by address function calling method.
    b) Write a note on global and local variables.
    10

PART-B

Q.5 a) Define a two dimensional array. How it is declared? Show with an example.
    b) Write a program to search an element in an array.
    10

Q.6 a) What is pointer explain with suitable example?
    b) Differentiate between '+' and '& ' operators.
    10

Q.7 a) Write a program to demonstrate use of a structure.
    b) Differentiate between a structure and an array.
    10
End Semester Examination, May 2014
B.Tech. (Integrated) – Second Semester
FUNDAMENTALS OF ELECTRICAL ENGINEERING (EE-I-201)

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

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

Q.1 Answer the following:
   a) Write the different forms of energy. 3
   b) Two batteries of 1.5 V are connected in parallel. What is the equivalent voltage? 3
   c) What is force on a conductor placed in a magnetic field? 2
   d) State Kirchoff’s voltage law. 2
   e) What is the relation between line voltage and phase voltage in a star-connected system? 2
   f) Write an expression for energy stored in a magnetic field. 2
   g) What do you mean by susceptance? 2
   h) State Fleming’s right hand rule. 2
   i) Three resistances $R_1$, $R_2$, $R_3$ are connected in series. What is the equivalent resistance? 2

PART A

Q.2 a) State the advantages of electrical energy over other forms of energy. 10
   b) Define the quantities: power and energy with their units. Write down the relation between the two. 10

Q.3 a) Explain charging and discharging of a lead acid battery. 10
   b) How can you keep this lead acid battery in good condition? 10

Q.4 a) Two 4 $\Omega$ resistors are connected in parallel and the combination is connected in series with a 2$\Omega$ resistor and supplied by an 8 V battery. Find the current in the circuit. 10
   b) Explain maximum power transfer theorem. 10

PART B

Q.5 a) Explain Faraday’s law of electromagnetic induction? 10
   b) Derive an expression for the force between two parallel current carrying conductors. 10

Q.6 a) Explain the terms: inductive reactance, capacitive reactance and impedance of RLC circuit. 10
   b) A series RC circuit with resistance 10 ohm and capacitance 25 $\mu$F is connected to a 100 V, 50 Hz AC supply. Find impedance, current and voltage across each element. 10

Q.7 a) Explain the advantages of three phases over single phase system. 10
   b) Explain hydro-power generation with a block diagram. 10
End Semester Examination, May 2014
B.Tech. (Integrated) – Second Semester
APPLIED MECHANICS (M-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 Define any ten:
   a) Resultant.
   b) Reaction.
   c) Free body diagram.
   d) Continuum.
   e) Rigid body.
   f) Principle of transmissibility.
   g) Self locking machine.
   h) Centroid.
   i) Static friction law.
   j) Mechanical advantage.
   k) Law of machines.
   l) Angle of repose.

   PART-A

   Q.2 Define basic principles of mechanics.

   Q.3 Resolve a 200 N forces as shown in the figure, into components in
   a) x and y directions.
   b) $x'$ and $y'$ directions.

   Q.4 Calculate the resultant of the system of forces shown in the figure. Also find its
   position and direction.

   P. T. O.
Q.5 A rectangular block of weight \( 'W' \) rests on a horizontal floor. The coefficient of friction between the block and the floor is \( \mu \). What is the highest position for a horizontal force \( P \) that would permit it to just move the block without tipping?

Q.6 Determine the centroid of z-section as shown in the figure.

Q.7 In a first system of pulleys there are 4 movable pulleys. If an effort of 100 N lifts a load of 1360 N, find:
   a) The effort wasted in friction.
   b) The load wasted in friction.
End Semester Examination, May 2014  
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 following determinant:  
\[
\begin{vmatrix}
1 & \log_a a \\
\log_a a & 1 \\
\end{vmatrix}
\]

b) If \( A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix} \), find determinant of matrix \( (A^2 - 2A) \).

c) Define a skew symmetric matrix with an example.

d) Write modulus and principle argument of \( 1+3i \).

e) Find the multiplicative inverse of \( z = 4+5i \).

f) Differentiate \( x^2 + e^{2x} + \sin x \).

g) Write an application of derivatives.

h) Find \( |z| \) if \( z = 2+3i \).

i) Define feasible solution.

j) What do you mean by optimization problems?

2x10

PART-A

Q.2  
a) Show that:
\[
\begin{vmatrix}
1 & 1+p & 1+p+q \\
2 & 3+2p & 1+3p+2q \\
3 & 6+3p & 1+6p+3q \\
\end{vmatrix} = 1.
\]

b) If the vertices of triangle are \((-2,4),(2,-6)\) and \((5,4)\), then find the area of triangle.

Q.3  
a) Find inverse of the matrix \( A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix} \).

b) Find a \( 2 \times 2 \) matrix \( B \) such that:
\[
\begin{bmatrix}
1 & -2 \\
1 & 4 \\
\end{bmatrix}
\begin{bmatrix}
6 & 0 \\
0 & 6 \\
\end{bmatrix}
\]

Q.4  
a) Express \( \frac{1}{2-3i} \) in the form \( a+ib \).

b) Find the values of \((1+i)^5 \times (1-i)^5 \).

PART-B

Q.5  
a) If \( x^y = y^x \), Find \( \frac{dy}{dx} \).

10

P. T. O.
b) If \( x = a(\theta - \sin \theta) \) and \( y = a(1 - \cos \theta) \) then find \( \frac{dy}{dx} \).

Q.6  

a) The side of a square sheet is increasing at the rate of 4 cm per minute. At what rate is the area increasing when the side is 8 cm long?  
b) If \( y = x^4 - 10 \) and if \( x \) changes from 2 to 1.99, what is the approximate change in \( y \)?

Q.7  

a) Solve graphically, maximize \( z = 6x + 7y \) go to \( 2x + 3y \leq 12; 2x + y \leq 8; x \geq 0; y \geq 0 \).

b) A farmer can plant upto 8 acres of land with wheat and barley. He can earn $5,000 for every acre he plants with wheat and $3,000 for every acre he plants with barley. His use of a necessary pesticide is limited by federal regulations to 10 gallons for his entire 8 acres. Wheat requires 2 gallons of pesticide for every acre planted and barley requires just 1 gallon per acre. Formulate the problem so that he can make maximum profit.
End Semester Examination, May 2014
B.Tech. (Integrated) – Second Semester
PHYSICS-II (PH-I-201)

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

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

Q.1
a) What is meant by electric flux?
b) Define the term: electric dipole moment.
c) Is electric current a vector or scalar quantity? Explain.
d) Define drift velocity.
e) Explain the meaning of the force constant of a spring.
f) What is a wavefront?
g) What is a coherent source?
h) Expand the term LASER.
i) Give two applications of optical fibres.
j) What is photo multiplication tube? 2x10

PART-A

Q.2
a) Derive an expression for electric field intensity at a point due to a point charge. 10
b) Derive an expression for the resultant capacitance when three capacitors C_1, C_2, and C_3 are connected:
   i) In series.
   ii) In parallel. 5x2

Q.3
a) State Kirchhoff’s laws of electric circuits and deduce Wheatstone bridge principle from these laws. 10
b) Briefly explain Thomson’s effect. 4
c) Find the net resistance between points A and B in the circuit shown below:

Q.4
a) Derive expressions for the kinetic and potential energy of a particle executing simple harmonic motion. Represent these energy terms graphically. 10
b) Write a short note on forced oscillations. 5
c) Obtain the equation of simple harmonic motion of a particle whose amplitude is 0.04 m and whose frequency is 50 Hz. The initial phase is π/3. 4

PART-B

Q.5
a) Discuss Fraunhofer diffraction at a single slit. 10
b) Explain the principle, construction and working of a Nicol prism. 10

Q.6
a) Explain principle, construction and working of a He-Ne laser. 10
b) Explain different types of optical fibres on the basis of mode of propagation and index. 10

Q.7
a) Discuss the interaction of light charged particles with matter with the help of a suitable diagram. 8
b) Explain the construction and working of a GM counter. 12
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
FLUID MECHANICS (C-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 Answer the following:
   a) When an orifice is said to be large?
   b) Define intensity of pressure.
   c) What is hydraulic mean depth?
   d) What is an internal mouthpiece?
   e) Define water hammer.
   f) What is the use of a monometer?
   g) Express the equation of continuity.
   h) What is the use of venturimeter?
   i) Write the Manning's formula for finding the discharge.
   j) Write one application of Pascal's law.

   PART-A

Q.2 Differentiate between the following:
   a) Real fluids and ideal fluids.
   b) Capillarity and viscosity.
   c) Fundamental units and international system of units.
   d) Vapour pressure and compressibility.
   5x4

Q.3 a) What is a piezometer tube? Explain the function of piezometer tube with a sketch.
   10

   b) Define the following terms:
      i) Hydrostatic pressure.
      ii) Vacuum pressure.
      iii) Pressure head.
      iv) Total pressure.
   2½x4

Q.4 a) Water in flowing through a pipe of 10 cm diameter with an average velocity of 10 m/s. What is the rate of discharge of the water? Also determine the velocity at the other end of the pipe, if the diameter in gradually changed to 20 cm.
   10

   b) State the difference between:
      i) Uniform flow and non-uniform flow.
      ii) Steady flow and un-steady flow.
   10

   PART-B

Q.5 a) A right angled V-notch is used to measure the discharge of a centrifugal pump. If the depth of water at V-notch is 20 cm, calculate the discharge over the notch in liter per minute.
   10

   b) Write short notes on any two:
      i) Coefficient of contraction and coefficient of velocity of a sharp-edged orifice.
      ii) Losses of head of liquid flowing in a pipe.
      iii) Velocity of approach of weir.
      iv) Advantages of V-notch over a rectangular notch.
   5x2

   P. T. O.
Q.6 a) Find the loss of head due to friction in a pipe of 1 m diameter and 15 km long, the velocity of water in the pipe is 1 m/s. Take co-efficient of friction on 0.005.  
   b) Write short notes on any two:  
      i) Hydraulic gradient.  
      ii) Total energy line.  
      iii) Flow through pipe in parallel.  
      iv) Critical velocity.  

Q.7 a) A rectangular channel is 4 m deep and 6 m wide. Find the discharge through channel, when it run full. Take slope of the bed as 1 m 1000 and Chezy’s constant as 50.  
   b) Explain all the conditions for maximum discharge through the following sections:  
      i) Rectangular.  
      ii) Trapezoidal.  
      iii) Circular.
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
GENERAL ENGINEERING (C-I-302)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

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

Q.1  
   a) Define power.  
   b) Write the basic principle of air-conditioning.  
   c) Classify different types of pumps.  
   d) Differentiate between DC and AC.  
   e) Define voltage and current.  
   f) What do you mean by a three-phase motor?  
   g) Write two applications of electricity.  
   h) Define the term COP.  
   i) Differentiate between electric motors and pumps.  
   j) Name the instruments used to measure voltage and current.  

2x10

PART-A

Q.2  
   a) Write short notes on:  
      i) Power transmission through rope.  
      ii) Gear drives.  
   b) What are different sources of power transmission? Explain any one with suitable sketch and write its application.  

5x2

Q.3  
What is the concept of split air conditioner? Describe its working and write its applications.  

10

Q.4  
   a) With a suitable sketch, describe the principle and working of a centrifugal pump.  
   b) Describe the applications of different types of pumps.  

10

PART-B

Q.5  
   a) Discuss various applications and advantages of DC power sources.  
   b) What are the advantages of electrical energy over other types of energy? Justify your answer with examples.  

10

Q.6  
Write short notes on:  
   a) Three-phase and single-phase power supply.  
   b) Neutral wire and earth wire.  
   c) Star-delta starter.  
   d) Voltage distribution system.  

5x4

Q.7  
Discuss a single-phase electric motor and explain the working and applications of single-phase electric motor with a suitable sketch.  

20
End Semester Examination, May 2014
B. Tech. (Integrated) – Fifth Semester
STRUCTURAL ANALYSIS-I (C-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 Define the following terms:
   a) Statically determinate structures.
   b) Flexural rigidity.
   c) Section modulus.
   d) Modulus of elasticity.
   e) Slenderness ratio.
   f) State moment area theorem.
   g) What are the advantages of method of sections over method joints?
   h) What is difference between a two hinged arches and three hinged arches?
   i) Explain Euler’s theorem on buckling loads.
   j) What are sign conventions for bending moment?  

\[ 2 \times 10 \]

**PART-A**

Q.2 a) Define:
   i) Longitudinal strain
   ii) Lateral strain
   iii) Working stress
   iv) Factor of safety

b) Find the maximum and minimum stress produced in the stepped bar as shown in figure due to axially applied compressive load of 25 kN.

\[ 10 \]

\[ \text{2.5 kN} \]
\[ \text{15 mm dia} \]
\[ \text{25 mm dia} \]

Q.3 a) What are the different types of beams? Explain each with neat sketch.  

b) Calculate bending stress at top and bottom surface of beam with cross section shown below. Assume moment=350 kN-m. Draw stress distribution diagram.

\[ 10 \]

\[ 10 \]

P. T. O.
Q.4  a) Why are arches preferred over beams?
     b) A three hinged parabolic arch of uniform cross-section has a span of 60 m and a
        rise of 10 m. It is subjected to udl of intensity 10 kN/m as in figure below. Show
        that the bending moment is zero at any cross-section of the arch.

        ![Arch Diagram]

Q.5  a) What are various types of frames in trusses?
     b) What are the assumptions made in finding out the forces in a frame?
     c) Determine forces in truss members AB, BC and BG.

Q.6  a) What are the causes of failure of a column? Explain in detail.
     b) Classify the column on the basis of slenderness ratio.
     c) An ISHB 300 is used as a column of length 6 m with both ends fixed. Calculate the
        maximum load it can safely carry using factor of safety = 3.
        \[ \sigma_c = 320 \text{ N/mm}^2 \]
        \[ a = \frac{1}{7500} \]
        Properties of ISHB 300 are as: \ Area=8025 \text{ mm}^2, \ I_{xx}=1.295 \times 10^8 \text{ mm}^4 \]
        \[ I_{yy}=2.247 \times 10^7 \text{ mm}^4 \]

Q.7  a) What are the various methods to find the slope and deflection? Explain any one in
     detail.
     b) A beam is simply supported at ends on a span of 3 m and carries a udl of 5 kN/m
        on the whole span. What point load at the centre it should carry so that the
        maximum deflection is doubled?
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
ELECTRONIC INSTRUMENTS AND MEASUREMENTS (EE-I-301)

Time: 3 hrs
Max Marks: 100

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

Q.1  a) Why calibration is required in instruments?
     b) Explain loading effect in measurements.
     c) Name the different types of CROs.
     d) Define the duty cycle for a pulse wave.
     e) Explain working principle of Q meter.
     f) What are special features of a dual beam CRO?
     g) What are typical specifications of an electronic voltmeter?
     h) Explain the principle of measurement of DC voltage using a multimeter.
     i) What is the difference between signal analyzer and logic analyzer?
     j) Explain the term: CMMR.

PART-A

Q.2  a) A moving coil voltmeter has a uniform scale with 100 divisions, the full scale reading is 200 v and 1/10 of a scale division can be estimated with a fair degree of certainty. Determine the resolution of instrument in volt.
     b) What is importance of standards? Also write its applications.

Q.3  a) Explain the principle and working of moving iron instruments.
     b) Draw a block diagram of multimeter and explain how voltage is measured with the help of a multimeter.

Q.4  a) Describe the circuit diagram and operation of an electronic voltmeter using a difference amplifier. How the range of the voltmeter can be extended?
     b) Draw the block diagram of a DC voltmeter and explain its operation.

PART-B

Q.5  a) Describe the different parts of CRT.
     b) Describe the principle of working and circuit diagram of a digital oscilloscope.

Q.6  a) With the help of a block diagram, explain the operation of a spectrum analyzer.
     b) Describe the circuit diagram and working of a function generator.

Q.7  Write short notes on any two:
     a) Logic probe.
     b) Comparison of analog and digital instruments.
     c) Logic comparator.

10x2
B.Tech. (Integrated) – Third Semester
BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING (EE-I-303)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

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

Q.1 Answer the following:
   a) Name the instrument used for measuring power.
   b) List the advantages of electrical energy.
   c) What is the working principle of a transformer?
   d) How will you change the direction of rotation of a three phase induction motor?
   e) State one difference between single phase and three phase supply.
   f) Name two different types of wirings.
   g) State the difference between AC and DC.
   h) What is a PNP transistor?
   i) What is a thyristor?
   j) What is a fuse?

   2x10

**PART-A**

Q.2 a) State the advantages of electrical energy over other form of energies.
   b) Define voltage and current and name its units. By which instrument and how these quantities can be measured?

   10

Q.3 a) Explain statically induced emf and dynamically induced emf.
   b) State the laws of electromagnetic induction.

   10

Q.4 a) Differentiate between high and low voltage distribution systems.
   b) Why we do earthing?

   10

**PART-B**

Q.5 a) Distinguish between single phase light circuit and power circuit.
   b) What are the precautions to be taken to prevent electric shock?

   10

Q.6 a) Explain various applications of single phase and three phase induction motors.
   b) How will connect a star-delta starter to a 3-phase induction motor for starting?

   10

Q.7 a) Explain the working of a PN junction diode. Draw its forward characteristic.
   b) What are the applications of servomotor?

   10
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
DIGITAL ELECTRONICS AND CIRCUITS-I (EC-I-303)

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

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

Q.1 a) Differentiate between analog and digital signals.
   b) Why NAND and NOR gates are called as universal gates?
   c) What is gray code? What is its significance?
   d) State De Morgans theorem.
   e) What is magnitude comparator?
   f) Differentiate between latch and flip-flop.
   g) What is race around condition? How it can be avoided?
   h) What is the difference between synchronous and asynchronous counters?
   i) What do you understand by modulus of a counter?
   j) Explain error detection and correction code with an example. 2x10

PART-A

Q.2 a) Explain the concept of positive and negative logic. 3
   b) Draw EXOR gate by using only:
      i) NAND gates
      ii) NOR gates 3x2
   c) Draw truth table and write Boolean expression for:
      i) Ex-OR gate
      ii) Ex-NOR gate
      iii) NAND gate
      iv) NOR gate
   d) What is need of digitization? Explain with examples. 2x4 3

Q.3 a) Solve:
   i) (10111)2 + (11111)2 = (?)2
   ii) (10011)2 - (01101)2 = (?)2
   iii) (1011)2 x (101)2 = (?)2
   iv) (110111)2 + (110)2 = (?)2 10
   b) Explain 7-bits Hamming code with an example. 4
   c) Convert:
      i) (1001)2 = (?)gray
      ii) (1101)2gray = (?)2
      iii) (1001)BCD = (?)excess-3
      iv) (1101)excess = (?)BCD 6

Q.4 a) Minimize the following functions using K-Map:
    F(A, B, C, D) = Σ(0, 1, 2, 3, 5, 6, 8, 10, 15)
    And realize the function using NAND gate. 10
   b) Prove that:
      i) (A+B)(A+C) = A+BC
      ii) A+ B = A+B
      iii) A+AB = A
      iv) (A+B)(A+C)(B+C) = AB+AC+BC 10

P. T. O.
PART-B

Q.5  a) Draw and explain circuit diagram of full adder.  
     b) Draw and explain with circuit diagram and truth table BCD to even segment decoder.  

Q.6  a) Explain operation of S-R flip-flop with its truth table.  
     b) Explain master slave flip-flop with operation, truth table and waveform.  

Q.7  a) Explain with circuit diagram and working:  
     i) SISO  
     ii) SIPO  
     iii) FISO  
     iv) PIPO  
     b) Draw and explain working circuit diagram of ring counter.
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
ENGINEERING MECHANICS (M-I-301)

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

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

Q.1  
(a) Define force and write its SI unit.
(b) What do you mean by translation of a force?
(c) Write the equation for equilibrium under coplanar force system.
(d) Explain free body diagram.
(e) Write Coulomb law of friction.
(f) What are the methods of solving truss problem?
(g) What is mass moment of inertia?
(h) Differentiate between kinematics and kinetics.
(i) Define normal and shear stresses.
(j) Write Hamilton principle.

P. A

Q.2  
(a) Two concurrent forces 134 kN and 76 kN are acting at an angle of 70° with each other. Determine their resultant.
(b) What is the moment of the force \( \mathbf{F} = 5\mathbf{i} + 5\mathbf{j} - 5\mathbf{k} \) N acting at position P(5, 3, 2)m relative to a co-ordinates system, about the point Q(3, -4, -2)m?

Q.3  
(a) What is a truss? What are methods to solve a problem of truss? Explain any one.
(b) Determine the range of magnitude of weight 'W' for which the block of 500 N will either slide down the plane or, slide up the plane.

Q.4  
(a) Determine the position of the centroid of an unequal channel section shown in the figure.
b) Determine moment of inertia of a rectangular block having length ‘l’ and width ‘b’.  

**PART-B**

Q.5  
  a) Write short notes on:  
    i) Translational and rotational motion  
    ii) Relative velocity  
  b) A body of mass 05 kg lying on a wedge of angle 30°, starts from rest and slides on wedge of mass 10 kg. Neglecting friction between body and wedge, determine acceleration of the wedge.

Q.6  
  a) Draw stress-strain diagram for a ductile material and explain.  
  b) Derive an expression for a beam of rectangular cross-section using simple bending theory.

Q.7  
  Write short notes on *any three*:  
    i) Variational mechanics  
    ii) Torsion of shaft  
    iii) D’Alembert's principle  
    iv) Parallel axes theorem
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
WORKSHOP TECHNOLOGY-I (M-I-302)

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

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

Q.1 Attempt any five:
a) Explain the constructional details of oxy-acetylene torch.
b) Explain methodology of inspection of welded joint.
c) Name various accessories being used on lathes and explain one accessory with a sketch.
d) Explain core prints and their usage.
e) What are properties of cutting tool materials?
f) Name various methods to check casting defects. Explain any one. 4x5

PART-A

Q.2 What welding process can be used to weld two steel plates without melting and without use of a filler material? 20

Q.3 Explain principle, advantages, disadvantages and applications of MIG welding process. 20

Q.4 a) Explain core materials and their properties. 10
b) Explain various types of sands as used in foundry and explain molding sand with its additives along with properties. 10

PART-B

Q.5 a) What is a risering system? Explain its necessity along with types of risers. 10
b) What is directional solidification? Explain in detail. 10

Q.6 a) Name various operations which can be performed on a drilling machine. Explain them with a neat sketch. 10
b) Describe classification of various boring machines. 10

Q.7 a) Explain through a neat sketch the tool geometry of single point cutting tool. What is function of back rake angle? 10
b) Explain use of various cutting fluids as applied to different machining operations. 10
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
STRENGTH OF MATERIALS (M-I-303)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

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

Q.1  
a) What is proof stress?  
b) Strength of a material depends upon its:  
i) Cross-section  
ii) Types of loading  
iii) Internal structure  
iv) Volume  
c) What is slenderness ratio?  
d) What is a concentric spring?  
e) Write down the formula of longitudinal stress.  
f) What is torsional rigidity?  
g) What is pure bending on beam?  
h) Moment area method is a method for determine the  
   i) B.M at a point  
   ii) S.F. at a  
   iii) slope at a point  
   iv) deflection at a point.  
i) What is a composite beam?  
j) Differentiate between open and closed coiled helical springs.  

**PART-A**

Q.2  
A bar of 800 mm length is attached rigidly at A and B as shown in the figure. Forces of 30 kN and 60 kN act on the bar. If E=200 MPa, determine reactions at two ends. If the bar diameter is 25 mm, find the stress and change in length of each portion.

![Diagram of a bar with forces](image)

Q.3  
Prove that the central deflection for a simply supported beam of a span 'l' and a point load W is \[ s = \frac{wL}{48EI} \]

Q.4  
A hollow circular shaft of 6 m length and inner and outer diameter of 75 mm and 100 mm is subjected to a torque of 10 kNm. If G=80 GPa, determine shear stress produced and the total angle of twist.

**PART-B**

Q.5  
a) Briefly explain the Castigliano’s theorem to obtain the deflection of beam.  
b) A steel specimen 1.5 cm² in cross-section, stretches 0.005 cm over a 5 cm gauge length under an axial load of 30 kN. Calculate the strain energy stored in the specimen at this point.

Q.6  
A thick cylinder pipe outside diameter 300 mm and internal diameter 200 mm is subjected to an internal fluid pressure of 14 N/mm². Determine the maximum hoop stress developed in cross-section. Sketch the variation of hoop stress across the thickness of the pipe.

Q.7  
a) Find the critical load using the column hinged at both end.  
b) A closed coil helical spring 10 cm mean diameter is made of 20 turns of 1 cm diameter steel rod. The spring carries an axial load of 100 N. Find shearing stress and deflection of load. Take G=84 GPa.
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
THERMODYNAMICS (M-I-304)

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

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

Q.1  a) Define thermodynamic systems.
    b) Define quasi-static process.
    c) What is sensible heat of water and latent heat of steam?
    d) What do you mean by PMM-I?
    e) What is free expansion process?
    f) What are the limitations of first law of thermodynamics?
    g) What is C.O.P. of refrigerator?
    h) State Avogadro’s law.
    i) Define the term available energy and unavailable energy.
    j) State third law of thermodynamics.

   Part-A

Q.2  a) What is meant by thermodynamic equilibrium? How does it differ from thermal equilibrium?
    b) What are similarities and dissimilarities of heat and work?

Q.3  a) Derive the expression for work done for a closed system.
    i) Constant volume process
    ii) Isentropic process
    b) 1.5 kg of nitrogen contained in a cylinder at pressure 6 bar and temperature 300 K expands three times its original volume. Assuming the expansion process to be isobaric, make calculations for:
    i) Initial volume
    ii) Final temperature
    iii) Work done by gas
    iv) heat added
    v) Change in internal energy
    For nitrogen $C_v = 1.05 \text{ kJ/kgK}$ and $R = 295 \text{ J/kgK}$.

Q.4  a) Prove that Kelvin-Planck and Clausius statement of second law of thermodynamics are equivalent.
    b) A heat engine is supplied with 2512 KJ/min of heat at 650°C. Heat rejection takes place at 100°C. Specify which of the following heat rejections represent a reversible, irreversible or impossible result:
    i) 867 KJ/min
    ii) 1015 KJ/min
    iii) 1494 KJ/min

   Part-B

Q.5  a) Explain Helmholtz and Gibbs function.

P. T. O.
b) 0.2 kg of air initially at 575 k temperature receives 300 KJ of heat reversibly at constant pressure. Determine the available and unavailable energies of the heat added. Take $C_v$ for air=1.005 KJ/kgK and temperature of surroundings 300 K.  

Q.6  

a) Describe with a neat sketch throttling calorimeter and explain how dryness fraction of steam is determined.  
b) Steam is available at 8 bar and 0.9 dryness fraction. Make calculations for the final dryness fraction of steam in each of the following cases.  
i) There is a loss of 125 KJ from the steam at constant pressure.  
ii) The temperature of steam falls to 160°C.  

Q.7  

a) State the Gibbs-Dalton's law of partial pressure. On what assumption this law is based?  
b) 0.75 kg of an ideal gas at 15ºC temperature is contained in a cylinder of 0.5 m³ capacity. The gas is heated at constant pressure until it attains a temperature of 150ºC. Determine the density of gas when it has been heated.
End Semester Examination, May 2014
B.Tech. (Integrated) – Third Semester
MATHEMATICS-III (MA-I-301)

Time: 3 hrs
Max Marks: 100

No. of pages: 2

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

Q.1
a) Evaluate \( \int_0^1 (x+1)^2 \, dx \)  

b) State fundamental theorems of Calculus.  

c) Find the area bounded by the curve \( y = x^3 \), x-axis and the lines \( x = 2, x = 3 \).  

d) Define differential equation, find degree and order of \( \frac{dy}{dx} = x^2 - 1 \).  

e) Define dispersion.  

f) From a group of 2 boys and 3 girls, two children are selected. Find the sample space associated to this random experiment.  

g) If D is the midpoint of the side BC of a triangle ABC, prove that: \( \frac{AB + BC}{2} = 2 \overrightarrow{AD} \).  

\[ \text{PART-A} \]

Q.2
a) Evaluate \( \int \sec^3 x \tan x \, dx \).  

b) Evaluate \( \int \frac{2x + 5}{(x-2)(x+1)} \, dx \).  

c) Evaluate \( \int_0^{\pi/2} \frac{\cos^3 x}{\sin^3 x + \cos^3 x} \, dx \).  

Q.3
a) Solve the differential equation: \( x \frac{dy}{dx} = x + y \).  

b) Find the particular solution of the differential equation:
\( \log \left( \frac{dy}{dx} \right) = 3x + 4y \), given \( y = 0 \), when \( x = 0 \).  

Q.4
a) Find the area of the region bounded by the curve \( y = 4x^2 \), \( x \geq 0 \), y-axis and the lines \( y = 1, y = 4 \).  

b) Find the whole area of the circle \( x^2 + y^2 = a^2 \).  

c) Find the area between the curves \( y = \sin x \) and \( y = \cos x \), \( 0 \leq x \leq \frac{\pi}{4} \).  

\[ \text{PART-B} \]

Q.5
a) Find the variance and standard deviation of the following frequency distribution:

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f )</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>15</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

P. T. O.
b) In an examination, 25 students secured the following marks:
23, 28, 30, 35, 36, 40, 41, 43, 44, 45, 48, 49, 52, 53, 54, 56, 58, 61,
62, 65, 68.
Arrange the data with 'less than' and 'more than' cumulative frequency
distribution. [10]

Q. 6 a) Four cards are drawn from a pack of cards. Find the probability that:
   i) All are diamonds.
   ii) There is one card of each suit.
   iii) There are two spades and two hearts. [10]
   b) Given \( P(A) = \frac{3}{5}, \ P(B) = \frac{1}{5}, \) find \( P(A \text{ or } B), \) if \( A \) and \( B \) are mutually exclusive. [10]

Q. 7 a) If \( \vec{i} + \vec{j} + \vec{k}, \ 2\vec{i} + 5\vec{j}, \ 3\vec{i} + 2\vec{j} - 3\vec{k} \) and \( \vec{i} + 6\vec{j} - \vec{k} \) are the position vectors of points \( A, \ B, \ C \) and \( D. \) Find the angle between the straight lines \( AB \) and \( CD. \) Deduce that the
   lines \( AB \) and \( CD \) are parallel. [10]
   b) Show that the distance of the point \( \vec{c} \) from the line joining \( \vec{a} \) and \( \vec{b} \) is:
   \[
   \frac{\vec{b} \times \vec{c} + \vec{c} \times \vec{a} + \vec{a} \times \vec{b}}{||\vec{b} - \vec{a}||}
   \] [10]
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
CONCRETE TECHNOLOGY (C-I-401)

Max Marks: 100
No. of pages: 1

Time: 3 hrs

Note: Attempt FIVE questions in all. Q.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 bleeding.
     b) List the various types of cements.
     c) Why fly ash is added to concrete?
     d) What is the use of mineral admixture?
     e) What is the purpose of conducting slump test on concrete?
     f) What do you mean by hydration of cement?
     g) What is cold weather concreting?
     h) What are water reducing admixture?
     i) What are the factors affecting workability of concrete?
     j) What is bulking of sand?  2x10

PART-A

Q.2  a) Explain in brief the various ingredients of concrete.  10
     b) What do you mean by grading of an aggregate?  5
     c) Why concrete is preferred over other building materials?  5

Q.3  a) Explain in brief the properties of concrete in plastic state.  8
     b) What are the factors affecting the workability of concrete?  6
     c) How water cement ratio is related to the strength of concrete?  6

Q.4  a) Difference between normal and controlled concrete. Explain with a suitable example.  10
     b) How proportioning of concrete is done as per IS: 456-2000?  10

PART-B

Q.5  Explain the following:
     a) Set controlling admixture.
     b) Silica fume.
     c) Plasticizers.
     d) Air entraining admixture.  5x4

Q.6  a) Explain fly ash concrete along with its applications.  10
     b) Describe under water concreting along with examples.  10

Q.7  a) How storage of cement is done? What are the precautions to be taken during cement storage?  10
     b) Explain briefly the procedure of placement of concrete.  10
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
SOIL AND FOUNDATION ENGINEERING (C-I-403)

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

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

Q.1  a) Define bulk density.
     b) What is relationship between void ratio and porosity?
     c) A constant head permeameter is used for __________.
     d) What is effective stress?
     e) What is a compaction curve?
     f) List various methods of field compaction.
     g) Define ultimate bearing capacity.
     h) Soil transported by wind is known as __________.
     i) Classify piles on the basis of its load transmission.
     j) What is difference between a shallow foundation and a deep foundation?  2x10

PART-A

Q.2  a) Distinguish between:
     i) Percent voids and percentage air voids.
     ii) Water content and air content.  10
     b) What do you mean by Atterberg limits? Explain its use and practical significance.  10

Q.3  a) State Darcy’s law and define coefficient of permeability. What are the limitations in the application of Darcy’s law to flow through soil media?  10
     b) Enumerate and briefly explain the factors affecting permeability of a soil.  10

Q.4  a) Define soil water. What are its main types? Explain.  10
     b) What do you mean by total stress, neutral stress and effective stress? What is the importance of effective stress?  10

PART-B

Q.5  a) Describe direct shear test. What are the advantages of triaxial shear test over the direct shear test?  10
     b) The following are the results of a standard compaction test performed on a sample of soil.

<table>
<thead>
<tr>
<th>Water content (%)</th>
<th>7.7</th>
<th>11.5</th>
<th>14.6</th>
<th>17.5</th>
<th>19.7</th>
<th>21.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass of wet soil (kg)</td>
<td>1.7</td>
<td>1.89</td>
<td>2.03</td>
<td>1.99</td>
<td>1.96</td>
<td>1.92</td>
</tr>
</tbody>
</table>

If the volume of the mould used was 950 cc and specific gravity of soil grains was 2.65, make necessary calculations and plot the water content-dry density curve and obtain the optimum moisture content and the maximum dry density.  10

Q.6  a) Explain the various factors affecting bearing capacity of soil.  10
     b) What is purpose of conducting plate load test? What are its limitations?  10

Q.7  a) How would you fix the depth of foundation? Discuss Rankine’s formula for the minimum depth.  10
     b) Describe various types of pile foundations.  10
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
SURVEYING-II (C-I-404)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

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

Q.1 a) Define a contour.
b) Write down two uses of a contour map.
c) Explain transiting operation of a theodolite.
d) Explain temporary adjustment of a theodolite.
e) Explain tacheometry.
f) Explain the general principle of stadia tacheometry.
g) What are the two types of curves?
h) What is the use of a planimeter?
i) Define EDM.
j) Explain the use of total station.

PART-A

Q.2 a) Write down ten characteristics of a contour and also define a contour.
b) Describe indirect method of locating contours in details.

Q.3 a) Describe repetition method for horizontal angle measurement in details.
b) Describe any five essential parts of a theodolite.

Q.4 a) Describe an expression for distance equation in tacheometry.
b) Describe the distance and elevation formulae for staff vertical: Inclined sight.

PART-B

Q.5 a) Describe the setting out of simple circular curve by deflection angle method with a sketch.
b) Describe the method of deflection distance in linear method of setting out of simple circular curve.

Q.6 a) Describe the use of planimeter in details.
b) Write short notes on Ceylon Ghaf Tracer and explain how to measure a slope and how to set out a gradient with it.

Q.7 a) What is EDM? Describe its types and use.
b) What is auto level? Can a total station be used as an auto level? If yes, how?
End Semester Examination, May 2014  
B.Tech. (Integrated) – Fourth Semester  
STRUCTURAL MECHANICS (C-I-405)

Time: 3 hrs  
Max Marks: 100

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

Q.1  
a) Define strain.  
b) Explain a ductile material with suitable examples.  
c) What are the different assumptions in the Euler’s column theory?  
d) What is bulk modulus of elasticity?  
e) Explain Hooke’s law.  
f) What are the different types of supports?  
g) Write down the sign convention for bending moment.  
h) Define eccentric loading.  
i) What do you understand by centre of gravity?  
j) What are the different types of beams?  

2x10

PART-A

Q.2  
a) Stress-strain figure.  
b) Yield stress.  
c) Ultimate stress.  
d) Necking of the specimen.  

5x4

Q.3  
In an experiment a steel specimen of 13 mm diameter was found to elongate 0.02 mm in a 200 mm gauge length, when it was subjected to a tensile force of 26.8 kN. If the specimen was tested within the elastic range, what is the value of Young’s modules of steel specimen?  

20

Q.4  
Draw shear force and bending moment diagram for the given simply supported beam.

PART-B

Q.5  
An I-section is made up of three rectangles as shown in the figure. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.

20

P.T.O.
Q.6 Calculate the slope and deflection at the free end of a cantilever beam carrying u.d.l. over its entire span.

Q.7 a) Explain the Rankine's column formula.  
b) A hollow alloy tube 4 m long with external and internal diameters of 40 mm and 25 mm respectively, was found to extend 4.8 mm under a tensile load of 60 kN. Find the buckling load for the tube with both ends fixed.
End Semester Examination, May 2014
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) What is information?
     b) What is a data base?
     c) What are the different expressions used in C language?
     d) What is the function of scanf?
     e) Write the syntax of switch statement.
     f) Write the declaration statement for two dimensional arrays.
     g) Write the output of the following statements:
        int a=5;
        printf("%d", a++);
     h) Write any two relational operators.
     i) Write the names of any two header files used in a C program.
     j) Describe the use of escape sequence: 
        \t.

    2x10

PART-A

Q.2  How will you create a database file? Explain querying a database file on single and multiple keys.

    20

Q.3  Explain the following with the help of a C program:
     a) getch()
     b) putch()

    10x2

Q.4  Write a program in C language to add the elements of two dimensional arrays.

    20

PART-B

Q.5  Explain commercial and business data processing applications in detail.

    20

Q.6  Explain the following:
     a) CAE
     b) CAI

    10x2

Q.7  Explain computer applications in the area of data communication.

    20
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
ELECTRONIC DEVICES AND CIRCUITS-II (EC-I-401)

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

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

Q.1 a) Explain the need for a multistage amplifier.
b) What do you understand by a push-pull amplifier?
c) Differentiate between positive and negative feedbacks.
d) Explain Barkhausen criterion for oscillation.
e) What is phase shift oscillator?
f) What are wave shaping circuits? Explain with example.
g) Define CMRR? What is its significance?
h) Draw OP-AMP as a scale changer and write its output expression.
i) Define line regulation.
j) Draw block diagram of D.C. power supply.

PART-A

Q.2 a) Explain in brief:
   i) Class A amplifier.
   ii) Class C amplifier.
b) Explain R-C coupled amplifier with its frequency response.

Q.3 a) Explain the effect of positive feedback on the following:
   i) Input impedance.
   ii) Voltage gain.
   iii) Output impedance.
b) Explain Emitter follower with its features and applications.

Q.4 a) Explain with working principle of Hartley and Colpitts oscillators.
b) Explain single and double tuned voltage amplifiers with their frequency response characteristics.

PART-B

Q.5 a) What are clamping circuits? Give different type of clamping circuits along with their input and output waveforms.
b) Explain RC integrator and differentiator with their applications.

Q.6 a) Explain characteristics of an ideal operational amplifier.
b) Explain with working and applications of:
   i) Schmitt trigger circuit.
   ii) Sample / hold circuit.

Q.7 Write short notes on:
   a) Fixed and variable voltage regulators.
b) SMPS.
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
DIGITAL ELECTRONICS AND CIRCUITS-II (EC-I-402)

Time: 3 hrs

Max Marks: 100

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

Q.1 a) Which is the fastest logic family?
   b) What do you mean by noise margin?
   c) What is the major advantage of parallel A/D converter?
   d) Give one disadvantage of dual slope A/D converter.
   e) How are ROM and RAM classified?
   f) How does PLA differ from PAL?
   g) What do you mean by minterm of Boolean expression?
   h) How many cells are there on an n-variable K-map?
   i) Distinguish between combinational and sequential circuits.
   j) Why NAND and NOR gates are called universal gates? 2x10

PART-A

Q.2 a) Explain TTL logic family in open collection arrangement with a diagram. 15
   b) Define the following characteristics of a logic family:
      i) Power dissipation.
      ii) Fan-out.
   5

Q.3 a) List the various types of DACs and ADCs. Name the most widely used D/A converter. 10
   b) What are advantages and disadvantages of flash type A/D converters? 5
   c) Explain the working of successive approximation type A/D converter with a diagram. 5

Q.4 a) How are data stored in a CCD memory? What are principle advantages and disadvantages of CCD memory? 10
   b) Write short notes on:
      i) ROM
      ii) PROM
      iii) DROM
      iv) EPROM
      v) EEPROM 2x5

PART-B

Q.5 a) Reduce using K-map the expression:
   \[ \sum m(0,1,3,4,5,6,7,13,15) \] 10
   b) Simplify the given expression using Q-map.
   \[ f = \sum m(1,2,3,5,6,7,8,9,12,13,15) \] 10

Q.6 a) Design and implement mod 6 asynchronous counter using J-K flip flop. 10
   b) Differentiate between asynchronous and synchronous sequential circuits. 10

Q.7 a) Explain arithmetic logic unit w.r.t. IC 74181 and its applications. 10
   b) Implement binary multiplication and division using ALU. 10
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
COMMUNICATION SYSTEM-I (EC-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) Give classification of transmitters on the basis of frequency.
b) Draw the block diagram of low level and high level transmitters.
c) What is a TRF receiver?
d) Give selection criteria for intermediate frequency.
e) Explain the need of limiting and de-emphasis in FM reception.
f) Explain the concept of radiation of electromagnetic energy from a dipole.
g) What is rhombic and disc antenna?
h) What is duct propagation?
i) Define spread spectrum.
j) What is PN sequence?

PART-A

Q.2 a) Explain the drawbacks of a TRF receiver.
b) Find the image frequency for a standard broadcast AM receiver using 455 kHz IF and tuned to a station 640 kHz.

Q.3 a) Draw and explain the block diagram of an Armstrong FM transmitter.
b) Explain the concept of simple and delayed AGC.

Q.4 a) What is double spotting and how it arises?
b) How the use of RF amplifier improves the signal to noise ratio of super heterodyne receiver?

PART-B

Q.5 a) Explain the different modes of propagation.
b) Write short notes any two:
   i) Space wave propagation.
   ii) Ionosphere wave propagation.
   iii) Sky wave propagation.

Q.6 a) Explain the terms: Critical frequency and maximum usable frequency.
b) What is directivity? Derive the mathematical expression.

Q.7 a) Write short notes on any two:
   i) Signal fading.
   ii) Noise in radio communication.
   iii) CDMA.
b) With a suitable diagram, explain the concept of frequency hopping spread spectrum (FHSS) system.
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
MICROPROCESSORS-I (EC-I-404)

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

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

Q.1 Attempt any ten:
   a) Name three classes of computers. What are the main similarities and differences between them?
   b) Differentiate between vectored and non-vectored interrupt with an example.
   c) What are difficulties in writing program in machine language?
   d) Why data bus is bidirectional while address bus is unidirectional in a typical microprocessor?
   e) What is the difference between RSTN instruction and unconditional call instruction?
   f) Distinguish between synchronous and asynchronous data transfer.
   g) What is the function of priority resolver in PIC 8259?
   h) Explain DTR and DSR signals of 8251.
   i) Explain the terms: Instruction cycle and machine cycle.
   j) Explain any two registers of 8237 IC.
   k) What are interfacing devices? Why are they required?
   l) How stack pointer is initialized in 8085? Explain.

PART-A

Q.2 a) Explain the history of microprocessors with their various applications.
   b) What are the general purpose and special purpose registers of 8085 CPU? Discuss their functions.

Q.3 a) Draw the programming model of an 8085 microprocessor and explain each of its components in detail.
   b) Explain various addressing modes of an 8085 microprocessor. Give example in each case to illustrate your answer.

Q.4 a) How the RIM and SIM instructions of 8085 A allow to perform the serial-parallel conversion needed for serial I/O devices? Explain.
   b) Explain the significance of the following instruction of 8085:
      i) DAA
      ii) LHLD address
      iii) STC
      iv) CMC
      v) Call 9000 H
      vi) RET

PART-B

Q.5 a) Interface 16 K ROM and 16 K RAM consecutively with microprocessor 8085. The available ICs are 8 K ROM and 8 K RAM. Also draw the necessary diagram for it.

P. T. O.
b) How block transfer DMA differs from cycle stealing DMA? Explain using a flow diagram.

Q.6  
   a) Explain the various modes of 8255 (using its control card) in which it can be functionally programmed.  
   b) Explain the block diagram of an 8251 UART in detail.

Q.7  
   a) Draw the block diagram of Motorola 6800 and explain the function of each block.
   b) Draw the block diagram of Z-80 microprocessor and explain the function of each block.
End Semester Examination, May 2014
B. Tech. (Integrated) - Fourth Semester
MATERIALS AND METALLURGY (M-I-401)

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

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

Q.1  a) Martensite is produced by __________ process.
b) Atoms such as that of __________, __________ and __________ replace host atoms thereby forming substitutional defect.
c) An atom is made up of three fundamental particles called __________ and __________.
d) Which heat treatment refines grain structure and also relieves internal stresses?
e) Which of the following has high corrosion resistance?
   i) Non-ferrous metal
   ii) Ferrous metals
f) Which process reduces yield point in cold condition?
g) Viscous flow in metals under conditions of temperature, time and steady stress is called __________.
h) Which type of failures has an endurance limit fatigue failure or creep failure?
i) Which heat treated steel has better tensile strength: annealed or normalized?
j) Ceramic material is organic or inorganic.

PART-A

2x10

Q.2  For a B.C.C crystal structure:
a) Name five such metals 2
b) Write number of atoms in a unit cell 2
c) Write its coordination number 2
d) Derive its atomic packing factor 8
e) Derive relation between lattice parameter a and atomic radius r 6

Q.3  a) State Gibb’s Phase rule. Apply this rule to each phase of cooling diagram of a binary eutectic alloy to find degree of freedom. 10
b) Define phase diagram. Write its importance. 5
c) Write difference between phase diagram and iron-iron carbide equilibrium diagram. 5

Q.4  a) What do you understand by the term surface hardening? Write different methods of surface hardening. 6
b) Explain process of carburizing. For which type of steels is carburizing done? What are its advantages and disadvantages? 10
c) What should be the carbon content in steel to carry out hardening process? 4

PART-B

Q.5  a) Sketch and explain creep testing of a metal in the laboratory. 10
b) Name different ways by creep distortion be minimized. 5
c) How can corrosion be minimized in iron and steel. 5

P. T. O.
Q.6  a) Define fracture. Differentiate ductile fracture from brittle fracture.  
b) How is recovery process carried out for a cold worked material? What is the effect  
of this process on material’s properties?  
c) What is season cracking?  

Q.7  a) Define a polymer. How are plastics made from polymers? Name different additives  
used to make plastics.  
b) Write short notes on any three:  
i) Martensite  
ii) Hardening  
iii) Strain ageing  
iv) Flame hardening  
v) Ferrite.
End Semester Examination, May 2014  
B. Tech. (Integrated) - Fourth Semester  
HYDRAULICS AND HYDRAULIC MACHINES (M-I-402)

Time: 3 hrs  
Max Marks: 100

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

Q.1  
a) What is bulk modulus of elasticity?  
b) Define the terms:  
i) Laminar sub-layer  
ii) Turbulent boundary layer  
c) What is a stream function?  
d) Explain impulse-momentum principle.  
e) Define: i) Irrotational flow ii) Steady flow  
f) What is meant by axial flow and mixed flow turbines?  
g) What is Reynolds number?  
h) Show that the force exerted by a jet of water on a stationary vertical plate is  
\[ F = \rho av^2 \]  
i) Define the terms:  
i) Static head  
ii) Overall efficiency for centrifugal pump  
j) What is negative slip of reciprocating pump?  

2x10

PART-A

Q.2  
a) Explain the conditions of equilibrium for floating and submerged bodies.  
b) Prove that the relationship between surface tension and pressure inside a droplet of liquid is  
\[ P = \frac{4\sigma}{d}. \]  
c) Determine the total pressure on a circular plate of diameter 3.5 m which is placed vertically in water is such a way that the centre of the plate is 6 m below the free surface of water. Find the position of centre of pressure also.  

10  
4  
6

Q.3  
a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.  
b) Explain the terms:  
i) Vortex flow  
ii) Path line  
iii) Streak line  
iv) Local acceleration  
v) Stream tube.  

15  
1x5

Q.4  
a) Explain Prandtl mixing length hypothesis.  
b) A pipe-line carrying water has average height of irregularities projecting from the surface of the boundary of pipe as 0.15 mm. What type of boundary is it? The shear stress is 6.9 N/m². The kinematic viscosity is 0.1 Stoke.  
c) What do you mean by boundary layer separation?  

10  
5  
5

P. T. O.
PART-B

Q.5  
a) With the help of a neat sketch, explain governing of Pelton wheel.  
b) A jet of water of 3.5 cm diameter, moving with a velocity of 10 m/s strikes a hinged square plate of weight 98.1 N at the centre of the plate. The plate is of uniform thickness. Find the angle through which the plate will swing.

Q.6  
a) What is a draft tube? What are its functions? Explain types of draft tubes.  
b) With the help of a sketch, explain the main characteristic and operating characteristic curve of reaction turbine.

Q.7  
a) With the help of a neat sketch, explain the principle and working of a reciprocatory pump.  
b) Explain multistage centrifugal pumps for high heads and high discharge.
End Semester Examination, May 2014
B. Tech. (Integrated) - Fourth Semester
APPLIED THERMODYNAMICS (M-I-403)

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

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

Q.1 a) Explain following terms:
   i) Stroke of an IC engine.
   ii) Dead centre.
   b) Name four important parts of an IC engine.
   c) MPFI, electronic ignition system.
   d) Supercharging and turbo-charging.
   e) Thermostat in cooling system of an IC engine.
   f) Cooling towers.
   g) Mechanical efficiency.
   h) Economizer.
   i) Closed cycle gas turbine.
   j) Ram Jet.

2x10

PART-A

Q.2 a) Draw Otto cycle on P-V and T-S diagram.
   b) Explain the difference between two-stroke and four stroke-engines.
   10
   10

Q.3 a) Explain with a line diagram the working of solex carburetor.
   b) Explain the working of fuel injection pump and injectors.
   10
   10

Q.4 a) Explain functions of cooling system in an IC engine.
   b) Explain the properties of good lubricant.
   10
   10

PART-B

Q.5 a) Explain Morse test for petrol engine and heat balance sheet.
   b) Explain the methods of reducing pollution in IC engines.
   10
   10

Q.6 a) Explain the working of governers in a steam turbine.
   b) Show main parts of power plant with a line diagram.
   c) Explain classification of turbines.
   5
   5
   10

Q.7 a) Explain the difference between a cycle and a closed cycle gas turbine.
   b) Explain the working of a rocket engine, its principle and application.
   10
   10
End Semester Examination, May 2014
B.Tech. (Integrated) – Fourth Semester
MECHANICAL ENGINEERING DESIGN (M-I-405)

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

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

Q.1 a) How will you define design?
   b) Write names of four types of V-thread forms used for screw threads.
   c) Why is factor of safety required?
   d) What is fatigue loading?
   e) Write advantages of riveted joints.
   f) What are the advantages of bolted joints?
   g) Name four types of keys used in shafts.
   h) Which materials are used for making shafts?
   i) What is a clutch?
   j) What is strength of a riveted joint? 2x10

Q.2 a) Explain any one:
   i) Preliminary design
   ii) Detail design 5x2
   b) What are the factors which determine magnitude of factor of safety? 10

Q.3 a) Two steel plates are joined together with two pairs of steel bolts and nuts of size M 20. How much shearing force can the bolts of the joint resist if its factor of safety = 4 and ultimate shear strength of the bolt material is 400 MPa? Also make a neat sketch of the joint. 10
   b) Sketch a square thread form of power screws, showing its proportions. What are its applications? 5
   c) Name various types of fasteners. 5

Q.4 a) Two rectangular steel plates having a cross-section of 80 mm x 25 mm are joined together by a butt weld. Find the strength of the joint in tension if the permissible tensile stress of the weld is 110 MPa and its efficiency=80%. Also make a neat sketch of the joint. 12
   b) What are advantages and disadvantages of welded joints? Give applications of various welded joints. 8

Q.5 a) Describe V-belt drives. 10
   b) What do you know about wire ropes? Give their construction, advantages and disadvantages. 10

Q.6 a) The cross-section of a flat key for a \( \phi 40 \text{mm} \) shaft is \( 22 \times 14 \text{mm} \). The power transmitted by the shaft to the hub is 25 kW at 300 rpm. The key is made of steel \( (S_y = S_u = 300 \text{ N/mm}^2) \) and factor of safety is 2.8. Determine the length of the key. Assume \( S_y = 0.577 S_u \). 12
   b) How will you design a shaft as per ASME code? 8

Q.7 a) A multidisc clutch consists of four pairs of contacting surfaces. The inner and outer diameters of the friction disc are 100 and 200 mm, respectively. The coefficient of friction is 0.2 and the permissible intensity of pressure is 1 N/mm\(^2\). Assume uniform wear theory. Calculate the power transmitting capacity of the clutch at 750 rpm. 12
   b) Classify brakes and explain the working of any one of them. 8
End Semester Examination, May 2014
B.Tech. (Integrated) – Fifth Semester
QUANTITY SURVEYING (C-I-504)

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

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

Q.1 a) Write down the importance of quantity surveying.
b) Write down the various stage involved in detailed estimate.
c) What is the purpose of rate analysis?
d) What all factors come under overhead or establishment chargers?
e) Write down the purpose of inspection chamber in a sewage system.
f) Draw a neat free hand sketch of a surface drain.
g) Name any four factors on which running and maintenance cost of a construction equipment is depends.
h) While calculating rate of brick work, what all items are considered.
i) What do you understand by cubic rate estimate?
j) Mention the purpose of approximate estimate. 2x10

PART-A

Q.2 a) What do you understand by preliminary estimates? Describe in detail. 10
b) Write a short note on detailed estimates. 10

Q.3 a) Describe various rules for measurement of any item in detail. 10
b) Find out the quantity of brick work in foundation and up to plinth level for the building given in the figure:

PLAN

P. T. O.
Q.4 a) What are the various items considered in estimate of a building? Describe them.
   b) Write short notes on:
      i) Long and short wall method of estimate.
      ii) Center line method of estimate; explain the difference with help of a neat sketch.

Q.5 a) Manhole is an important item in sewerage system. Write a short note on it.
    b) What are the sanitary fittings used in a residential multistoried building? Describe them in brief.

Q.6 The cross section of a compound wall is given in the figure. Find out the following quantities for 100 m length.
a) Brickwork in cement mortar.
b) 12 mm thick cement plaster.
c) Cement concrete 1:3:6 in foundation.

Q.7  a) Explain the factors in detail which affect the rate of any items in civil engineering works.
b) Do the rate analysis for cement concrete 1:5:10 in foundation. Assume various data required suitably.
Q.1  a) Define loop and junction of a network.
     b) Define KCL.
     c) Define quality factor.
     d) Explain maximum power transfer theorem.
     e) State the condition for parallel resonance.
     f) Express the equation for hybrid parameters.
     g) Draw the circuit diagram for T-network.
     h) Give the classification of filters.
     i) Discuss the types of transmission lines.
     j) Draw the $\pi$ section of a low pass filter.  

PART-A

Q.2  a) Find the current in various branches by using mesh analysis.

![Mesh Analysis Diagram]

b) Find the total power consumed by the passive element of the network by using nodal method.

![Nodal Analysis Diagram]

Q.3  a) Explain superposition theorem. Write down the steps of superposition theorem by taking any example.
     b) For the network shown calculate the current in 2 $\Omega$ resistors by using Norton theorem.

![Network Diagram]

P. T. O.
Q.4  
   a) Explain series resonance with all relevant diagrams and derive an expression for resonant frequency. 
   b) Find the impedance, current, power factor of the following series circuits and draw the corresponding phasor diagram. 
      i) R and L 
      ii) R and C 
      iii) R, L and C 
      In each case applied voltage is 200 volts, 50 Hz frequency. R=10 ohm, L=50 mH and C=100 µF. 

   PART-B

Q.5  
   a) Derive ABCD and Z-parameters. 
   b) Derive an expression for cascade type of interconnection. 

Q.6  
   a) Derive the expression for m-derived high pass filters. 
   b) Design constant K high pass filter T and π section having $f_c = 5 \text{ kHz}$ and nominal characteristics impedance $R_0=600 \Omega$. 

Q.7  
   a) Explain in detail the distortion in transmission lines. 
   b) Discuss T and Pi representation of a transmission line.
End Semester Examination, May 2014  
B.Tech. (Integrated) – Fifth Semester  
POWER ELECTRONICS (EE-I-501)

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

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

Q.1  
a) Draw static V-I characteristics of a power diode.  
b) Define turn-on and turn-off times as applied to an SCR.  
c) List various applications of SCR.  
d) Discuss the effect of source inductance on the performance of single phase full converter.  
e) Describe the principle of step-up chopper.  
f) What is the purpose of connecting diodes in antiparallel with thyristors in inverter circuits?  
g) What are the two main types of inverters? Distinguish between them explicitly.  
h) Describe the basic principle of working of single phase to single phase step-down cycloconverter.  
i) Enumerate the various single phase dc drives used.  
j) Define string efficiency of an SCR.  

2x10

PART-A

Q.2  
a) Discuss the two transistor model of a thyristor. Using this model, describe the various mechanisms of turning on a thyristor.  
b) Compare an UJT firing circuit with R and RC firing circuits.  

10

Q.3  
a) A single phase half-wave SCR circuit feeds power to a resistive load. Draw waveforms for source voltage, load voltage, load current and voltage across the SCR for a given firing angle \( \alpha \). Hence obtain expressions for average and rms load voltages in terms of source voltage and firing angle.  
b) Why freewheeling diodes are used in converter circuit?  

15  
5

Q.4  
a) Describe the working of a single phase parallel inverter with relevant circuit and waveforms.  
b) Distinguish between current source inverter and voltage source inverter.  

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PART-B

Q.5  
a) Describe the principle of dc chopper operation. Derive an expression for its average dc output voltage.  
b) What are various types of choppers? Explain any one in detail.  

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Q.6  
Describe the operating principle of single phase step-up cycloconverter with the help of midpoint and bridge type configurations. Illustrate your answer with appropriate circuit and waveforms.  

20

Q.7  
a) Describe the working of a single phase semi converter fed dc separately-excited motor with relevant waveforms and expressions.  
b) Explain v/f control of a 3-phase induction motor for its speed control.  

10  
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Q.1  
   a) List various advantages of microwaves.
   b) What is the wavelength in the free space of a microwave signal whose frequency is 5.2 GHz?
   c) Explain the effect of inter-electrode capacitance on high frequency performance of conventional vacuum tubes.
   d) List the applications of a typical reflex-klystron.
   e) What do you mean by thermionic emission?
   f) What do you understand by TE mode? In TE_{mn}, what do m and n signify?
   g) Define the terms: group velocity and phase velocity.
   h) Draw a neat and clean diagram of E-H plane Tee.
   i) Differentiate between active and passive satellites.
   j) List the applications of radar.  

   PART-A

Q.2  
   a) What are microwaves? Explain all microwave frequency bands with their applications.  
   b) Briefly list the typical applications of microwaves.  
   c) Define velocity, frequency and wavelength of an electromagnetic wave.  

Q.3  
   a) Differentiate between reflex klystron and travelling wave tube (TWT). Also explain the working principle and operation of travelling wave tubes.  
   b) Explain the Gunn-Effect.  

Q.4  
   a) Sketch the field pattern of: TE_{10}, TE_{20}, and TM_{11}.  
   b) Write short notes on: 
      i) Propagation constant of rectangular waveguides.
      ii) Cut-off wavelength and cut-off frequency.
      iii) Guide wavelength and free space wavelength.
      iv) Impossibility of TEM mode in a waveguide.
      v) Circular waveguide and its applications.  

   PART-B

Q.5  
   a) What is directional coupler? Describe the working of two-hole directional couple.  
   b) What is the basic principle on which a circulator works? Also discuss its applications.  

Q.6  
   a) Write a short note on horn antenna.  
   b) With the help of a block diagram, explain the working principle of microwave communication link.  
   c) Write a note on troposcatter propagation.  

Q.7  
   a) Explain FMCW Doppler radar with a block diagram. Also discuss its application and limitations.  
   b) Write short notes on any two.  
      i) Satellite communication link.  
      ii) Satellite orbits.  
      iii) Satellite link losses.  
      iv) Multiple access techniques.
End Semester Examination, May 2014
B.Tech. (Integrated) – Fifth Semester
THEORY OF MACHINES (M-I-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) Distinguish between closed and unclosed pairs.  
b) Write the name of any two inversions of double slider crank chain mechanics.  
c) What is difference between a flywheel and a governor?  
d) What is an inertia governor?  
e) Define pitch curve and pressure angle.  
f) What is law of belting?  
g) Define velocity ratio for gears.  
h) State the law of gearing.  
i) Explain free and damped vibrations.  
j) What do you mean by balancing?  

2x10

PART-A

Q.2  
a) Discuss various types of constrained motions.  
b) Describe the any two inversions of a single slider cranck chain with a neat sketch.

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Q.3  
a) Find a relation for the co-efficient of fluctuation of speed in terms of maximum fluctuation of energy and kinetic energy of the flywheel at mean speed.  
b) Each arm of a Porter governor is 200 mm long and pivoted on the axis of governor. The radii of rotation of the balls at the minimum and maximum speed are 120 mm and 160 mm, respectively.  
The mass of sleeve is 24 kg and each ball is 4 kg. Find the range the governor.

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Q.4  
The following data relates to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent.  
Maximum radius of cam =25 mm  
Roller diameter =7.5 mm  
Lift =28 mm  
Offset of the follower axis =12 mm toward right  
Angle of ascent =60°  
Angle of descent =90°  
Angle of dwell between ascent and descent =45°  
Speed of cam =200 r.p.m.  
Draw the profile of cam and determine the maximum velocity and uniform acceleration of the follower during the outstroke and return stroke.

20

PART-B

Q.5  
a) Derive a relation for the length of cross belt.  
b) A belt run over a pulley of 800 mm diameter at a speed of 180 rpm. The angle of lap is 165° and the maximum tension in the belt is 2 kN. Determine the power transmitted if the coefficient of friction between the belt and the pulley is 0.3.

10

P. T. O.
Q.6  a) What is the difference between the double helical and Herringbone gears?  
    b) Explain the procedure to analyse an compound gear train.  

Q.7  a) Describe Dunkerley's method to find the natural frequency of a shaft carrying several loads.  
    b) A circular disc mounted on a shaft carrier three attached masses of 4 kg, 3 kg and 2.5 kg at radial distance of 75 mm, 85 mm and 50 mm and at the angular position of 45°, 135° and 240°, respectively. The angular positions are measured counter clockwise from the reference line along x-axis. Determine the amount of counter masses at a radial distance of 75 mm required for the static balance.
End Semester Examination, May 2014  
B.Tech. (Integrated) – Fifth Semester  
REFRIGERATION AND AIR-CONDITIONING (M-I-502)  

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

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

Q.1 a) Define the following terms:  
i) Refrigerating effect. ii) C.O.P.  
b) Write short notes on ammonia and R-134A.  
c) Describe the frosting and defrosting evaporators.  
d) Discuss the operation of a capillary tube in a refrigeration system.  
e) When is dehumidification of air necessary and how is it achieved?  

4x5

PART-A

Q.2 a) What is the difference between a refrigerator and a heat pump? Derive an expression for the performance factor for both if they are running on reversed Carnot cycle.  
b) Sketch the T-S and P-h diagram for the vapour compression cycles when vapour after compression is i) dry saturated, and ii) wet.  

10

Q.3 a) What are desirable properties of an ideal refrigerant?  
b) Explain the working of an automatic expansion valve.  

10

Q.4 a) What do you understand by a hermetically sealed compressor? Give its advantages.  
b) What is the function of a condenser in a refrigeration system?  

10

PART-B

Q.5 a) A quantity of air having a volume of 300 m$^3$ at 30 °C dry bulb temperature and 25 °C wet bulb temperature is heated to 40 °C dry bulb temperature. Estimate the amount of heat added. Find relative humidity temperature. The air pressure is 1.013 bars.  
b) Define the sensible heat factor.  

12

Q.6 a) Define the following:  
i) Relative humidity.  
ii) Dew point temperature.  
b) With the help of psychrometric chart, explain sensible heating and sensible cooling process.  

5x2

10

Q.7 a) Draw a neat diagram showing all components of an ice-cream plant and describe their functions.  
b) Write a short note on a domestic refrigerator.  

10

10
Q.1 Explain the following:
   a) Production.
   b) Performance rating.
   c) Process symbols.
   d) SIMO chart.
   e) Material flow chart.
   f) Expected time.
   g) Method study.
   h) Basic time.
   i) Flow process chart.
   j) Cycle graph.  

PART-A

Q.2 a) Explain the factors affecting the productivity of an organization.  
     b) How productivity can be measured and explain causes of decrease of productivity?  

Q.3 a) Explain the factors which decide the plant layout in a factory.  
     b) Explain the necessity of material handling equipment and factors considered for its selection.  

Q.4 a) Explain scope of work-study and its application in industry to improve productivity.  
     b) Explain how information is collected using recording techniques and its use?  

PART-B

Q.5 a) Explain the objectives of job evaluation and methods employed to evaluate the job.  
     b) Explain incentives and their types and how are they related to productivity.  

Q.6 a) Explain functions of production planning and control (PPC).  
     b) A small engineering project consists of 6 activities namely A, B, C, D, E and F with duration of 5, 7, 6, 4, 4 and 3 days, respectively. Draw the network diagram and calculate EST, LST, EFT, LFT and mark the critical path and find total project duration.  

Q.7 a) Explain with a neat sketch the ladder of cost.  
     b) A certain product is manufactured in batches of 100. The direct material cost is Rs. 500, direct labour cost is Rs. 750 and the factory overheads are 50% of the prime cost. If the selling expenses are 30% of the factory cost, what would be the selling price of each product so that a profit is 10% of the total cost.
End Semester Examination, May 2014
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 Explain any four:
   a) What are profitable applications of CNC machines?
   b) What are advantages and disadvantages of PLC control?
   c) Explain subroutines and do loops in part programming.
   d) Explain the steps in NC manufacturing.
   e) Write a note on the DNC machine tool.
   f) What are the advantages and disadvantages of automation?

PART-A

Q.2 a) State and explain the general constituents of NC/CNC machine tools. 10
     b) State advantages, limitations and applications of NC machine tools. 10

Q.3 a) Explain adaptive control as it pertains to numerical control. 10
     b) Write a note on the lubrication and cooling of CNC machines. 10

Q.4 a) What are the work-holding methods suitable for CNC machining centres? 10
     b) Explain point-to-point, straight cut and contouring with reference to NC motion control. Also write their advantages, limitations and applications. 10

PART-B

Q.5 a) What is part programming? Explain the terminology used in part programming. 5
     b) Write NC part program for following job. All dimensions are in mm.
        Work material: Aluminum, Blank length =35mm, dia. =19 depth of cut= 0.75 mm.

        \[ \text{Diagram} \]

Q.6 a) Write down the steps which are sequentially followed for writing CNC part program. 10
     b) What are the common problems in mechanical and PC components of NC machines? Explain in brief. 10

Q.7 a) Compare hard, programmable and soft automation systems. 10
     b) State and explain the strategies in automation. 10
End Semester Examination, May 2014
B.Tech. (Integrated) – Fifth Semester
COMPUTER INTEGRATED MANUFACTURING (M-I-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 Explain any five:
   a) ALU
   b) CIM
   c) Hard automation
   d) NC m/c tools
   e) Batch production
   f) CAPP

   PART-A

Q.2 Describe CAD /CAM and its components.

Q.3 Compare hard and soft automation.

Q.4 What is part programming and define 5 codes?

PART-B

Q.5 What is group technology, part families and how different parts are coded?

Q.6 Describe automated guided vehicle and its working.

Q.7 Explain how FMS is best suitable for batch production.
Q.1  a) Describe the relation between stress and strain of an elastic body.
     b) Define ductility.
     c) Define buckling.
     d) What is the physical significance of moment of inertia?
     e) Define centre of gravity.
     f) Define Hooke's law.
     g) What do you mean by point of contraflexure?
     h) What is Poisson's ratio?
     i) Define radius of gyration.
     j) Define shear force.

2x10

Q.2  a) Give the classification of materials and differentiate between elastic materials and ductile materials.
     b) Explain in detail:
        i) Tensile test
        ii) Compressive test.

10

Q.3  a) Establish the stress-strain relationship of an elastic body with the help of a graph.
     b) Explain various types of stresses. Also explain longitudinal strain, lateral strain and volumetric strain.

10

Q.4  a) Explain various types of beams and loadings.
     b) A cantilever beam 5 m long carries a gradually varying load, zero at free end to 6 kN/m at fixed end. Draw S.F. and B.M. diagram for the beam.

10

PART-B

Q.5  a) What are the different methods for finding centre of gravity of a body? Explain any two in brief.
     b) Find the centroid of an unequal angle section 80 mm X 20 mm.

10
Q.6  a) State and prove parallel axis theorem applied to moment of inertia.
    b) An I-section is made of three rectangles as shown in the figure. Find the moment of inertia of the section about the horizontal axis passing through centre of gravity of the section.

Q.7  a) Explain Euler’s theory of long column.
    b) Differentiate between long columns and short columns in detail.
End Semester Examination, May 2014  
B. Tech. (Integrated) - Sixth Semester  
STRUCTURAL MECHANICS (C-I-607)

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

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

Q.1  
a) List the different types of load.  
b) How does one calculate the degree of indeterminacy?  
c) What are the conditions of equilibrium?  
d) What do you mean by modified stiffness?  
e) How many types of two-hinged arches are there? Explain with diagrams.  
f) Give the points of difference between an arch and a beam.  
g) Explain a kinematically indeterminate structure.  
h) State law of reciprocal deflection.  
i) Write the formula to account for temperatures stresses in a cable.  
j) State carry over theorems.  

PART-A  

Q.2  
a) Calculate indeterminacy in following structures:  

\[ \text{i)} \quad \text{[diagram]} \quad 5 \]

\[ \text{ii)} \quad \text{[diagram]} \quad 5 \]

b) What is a free body diagram? How it is useful in the analysis? Explain.  

Q.3  
a) Derive an expression for central deflection of a simply supported beam of span 'l' and carrying uniformly distributed load 'w' along the full length of span using strain energy method.  

b) The bend ABC shown in figure below carries a concentrated vertical load 'P' at A. Find the vertical and horizontal deflection of A. Assume uniform flexural rigidity.  

P. T. O.
Q.4  a) Draw the BMD and SFD for a fixed beam AB of span 'l' and carrying a point load 'w' kN/m along the full length of span using slope deflection method.  
b) What are the assumptions made in slope and deflection method? Explain in detail.  

PART-B

Q.5  a) Analyse the portal frame shown in the figure below.

b) Find stiffness of a propped cantilever as a basic proposition of moment distribution method.

Q.6  a) A two-hinged semicircular arch of radius R carries a concentrated load W at the crown shown that the horizontal thrust at each support is W/π. Assume uniform flexural rigidity.  
b) Explain methods used to calculate horizontal thrust in two-hinged arches.

Q.7  a) A cable carrying a load of 10 kN/m of horizontal span is stretched between supports 100 m apart. The supports are at the same level and the central dip is 8 m. Find the greatest and the least tension in the cable.  
b) Draw a neat sketch of a suspension bridge. Name different components and write the function of each component.
End Semester Examination, May 2014
B.Tech. (Integrated) – Sixth Semester
MEDICAL ELECTRONICS (EC-I-601)

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

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

Q.1 a) Differentiate between electric and bioelectric signal.
    b) What are the various organs involved in nervous system?
    c) Define medical electronics.
    d) Name various electrodes used for EEG.
    e) Explain mitochondria.
    f) What is Orthosis?
    g) Draw heart.
    h) What is a transducer?
    i) Explain principle of X-Ray machine.
    j) Define axon and dendrite.
    2x10

PART-A

Q.2 Explain EEG with its block diagram. Write application areas of EEG.
    20

Q.3 a) Explain respiratory system in detail.
    b) What is body temperature? Write about it.
    10

Q.4 a) Name the various diagnostic devices used in medical field. Explain any two.
    b) Draw the block diagram of a defibrillator and explain its all components.
    10

PART-B

Q.5 a) What is the use of a microprocessor in patient monitoring system?
    b) Write about heart rate measurement system in detail.
    10

Q.6 Explain origin of bioelectric signals with a diagram.
    20

Q.7 a) Differentiate between micro and gross current shock.
    b) What are the various safety aspects of medical devices?
    10
End Semester Examination, May 2014
B.Tech. (Integrated) – Sixth Semester
DIGITAL AND DATA COMMUNICATION (EC-I-602)

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

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

Q.1  a) List the advantages of parallel transmission over serial transmission.
     b) Define quantization error.
     c) What is companding?
     d) What type of services is provided by ISDN?
     e) Define ADSL.
     f) Explain the term: Handover in wireless communication.
     g) What is a DCE? Explain with an example.
     h) Compose TDMA and CDMA.
     i) Draw NRZ-I, Manchester encoding for 110010 pattern.
     j) Explain the term VOD.  2x10

**PART-A**

Q.2  a) Explain in detail various types of data transmission media.  10
     b) Draw a block diagram of digital communication system. Discuss its merits as compared to an analog communication system.  10

Q.3  a) Compare DPCM with PCM system.  10
     b) Explain various types of data encoding schemes.  10

Q.4  a) Explain the block diagram of a MODEM.  5
     b) List various applications of a MODEM.  5
     c) Write short notes on:
        i) UART
        ii) USART  5x2

**PART-B**

Q.5  a) Explain ISDN in detail with its classifications.  10
     b) Discuss various types of topologies used in LAN.  10

Q.6  a) Explain GSM standard in detail.  10
     b) Write short notes on:
        i) TDMA
        ii) WLL
        iii) Cell splitting
        iv) Frequency reuse.  2½x4

Q.7  a) Explain the principle of operation of a FAX system.  8
     b) What are the applications of a FAX system?  6
     c) Mention various features of a FAX system.  6
End Semester Examination, May 2014
B. Tech. (Integrated) – Sixth Semester
MICROCONTROLLERS AND PLCs (EC-I-603)

Time: 3 hrs
Max Marks: 100
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Show the contents of A, R1, and CY flag after execution of following programming:

CLR   C
MOV   A, # 4CH
SUB   A, # 6EH
JNC   NEXT
CMP   A
INC   A
NEXT  MOV   R1, A

b) What are various special functions registers in 8051 microcontroller?
c) Explain PSW and IP registers for 8051 microcontroller.
d) Give memory structure of PLCs.
e) Write a program for 8051 microcontroller to multiply two 8-bit numbers.
f) What are various Interrupts of 8051 microcontroller?
g) What is the difference between Timer and Counter of 8051 microcontroller?
h) Explain TCON register of 8051 microcontroller.
i) Which of the following register in bit-addressable? Show various bits of that register:

   TMD
   SP
   IE

j) What is Interrupt priority? Which Interrupt has the highest priority in an 8051 microcontroller?

PART-A

Q.2  a) Draw and explain the architecture of an 8051 microcontroller.  
     b) Explain memory organization of an 8051 microcontroller.  

Q.3  a) Explain following Instructions for an 8051 microcontroller:

   CPL
   MOV
   DIV
   ADD

b) Explain various Addressing Modes for an 8051 microcontroller.

Q.4  a) Write a program to subtract two 16-bits numbers 3146 H and 92E7 H. Store the result in memory location SOH and SIH.

     b) What are various Assembler directions for an 8051 microcontroller? Explain.

PART-B

Q.5  Interface 8 K Rom and 16 K Ram with an 8051 microcontroller. Draw the interfacing diagram. Also write memory map.

Q.6  a) Draw and explain the architecture of PLCs with details of all the parts.

     b) What do you mean by program SCAN and PLCs?

Q.7  a) What are advantages of PLCs as compared to electromechanical relay system?

     b) What is ladder diagram programming? Write a program to control the water level in the tank.
End Semester Examination, May 2014
B.Tech. (Integrated) – Sixth Semester
ELECTRICAL MACHINES (EE-I-601)

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

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

Q.1 a) What do you mean by power factor?
   b) Explain active power.
   c) DC compound motor has both _____ and ______.
   d) What is the use of commutator in a DC machine?
   e) Give the applications of a servomotor.
   f) Give the comparison of servomotors with conventional motors.
   g) Discuss why single phase induction motors do not have a starting torque?
   h) Write down the back EMF equation of a DC motor.
   i) Will induction motor runs at synchronous speed?
   j) Why a core type transformer is better than a shell type transformer? 2x10

PART-A

Q.2 a) Derive relationship between line current and phase current for delta connection. 10
   b) How the power factor of a 3-phase balanced load can be determined by using two-Wattmeter method? 10

Q.3 a) Explain instrument transformers. Explain their types in detail. 10
   b) Discuss in detail the losses in a transformer. 10

Q.4 a) Draw torque-slip characteristics of an induction motor and explain them. 10
   b) Why there is a need for a starter in a DC motor? Explain 3-point starter in detail. 10

PART-B

Q.5 a) Compare synchronous motor and an induction motor. 5
   b) State the applications of a synchronous motor. 5
   c) Explain the construction of a synchronous motor in detail. 10

Q.6 a) Explain the principle and construction of a single phase induction motor. 10
   b) Explain universal motor in detail. 10

Q.7 a) Explain single-stack and multi-stack variable reluctance stepper motors. 10
   b) Explain a DC type of servomotor along with its torque-speed characteristics. 10
End Semester Examination, May 2014
B.Tech. (Integrated) – Sixth Semester
INSTRUMENTATION (EE-I-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) Distinguish between direct and indirect method of measurement.
    b) What is the difference between active and passive transducers?
    c) What is the importance of measurement?
    d) What are transducers and inverse transducers? Give examples.
    e) What is a load cell?
    f) What is a piezo resistive material? Give example.
    g) Define Seeback effect.
    h) Define a data acquisition system.
    i) Differentiate between precision and accuracy.
    j) A platinum thermometer has a resistance of 100 Ω at 25°C. Find its resistance at 65°C if the platinum has a resistance temperature coefficient of 0.00392 °C. 2x10

PART-A

Q.2 a) What are the basic blocks of a generalized instrumentation system? Draw the block diagram and explain their functions.
    b) What is signal conditioning? Explain DC signal conditioning and draw a block diagram.

Q.3 a) Give an overview of inductive transducer and explain their principle of operation.
    b) Describe the mode of operation of piezo-electric transducers. Also explain the properties of material used in it.

Q.4 a) What is a wire bound strain gauge? Explain its construction. Also derive an expression for gauge factor.
    b) Explain principle, construction and working of an LVDT.

PART-B

Q.5 a) What is the application of electrodynamometer? Explain its construction and working.
    b) Explain the working of strain gauge type of torque transducer. Also discuss its advantages and disadvantages.

Q.6 a) What is pH value? Describe the working of a pH meter.
    b) What is the basic principle for flow measurement? Explain the working and theory of ultrasonic flow transducer.

Q.7 a) Describe the construction and working of a resistance thermometer.
    b) What is a thermocouple? Explain its principle construction and working.
End Semester Examination, May 2014
B.Tech. (Integrated) – Sixth Semester
ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT (HM-I-601)

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

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

Q.1 Answer the following:
a) What are the key traits of an entrepreneur?
b) Discuss the role of SFCs in promoting entrepreneurship.
c) Discuss meaning and importance of market survey.
d) Explain major incentives for employees at work.
e) What is Factory Act?
f) Explain importance of environmental protection.
g) What is meant by job satisfaction?
h) What are DICs?
i) Explain importance of marketing in a business organization.
j) Explain key components of inventory management in a small industry. 2x10

PART-A

Q.2 ‘Entrepreneurship’ is a viable career option for young engineers. Do you agree? Justify your answer with reasons. 20

Q.3 What are ‘public sector banks’? What is their role in financing entrepreneurs? 20

Q.4 Why is it important to write a formal ‘project report’ before starting a business? What are the key elements of a ‘project report’? What do we mean by the statement that “The business project is technically feasible and economically viable”? 20

PART-B

Q.5 Why is it important for an entrepreneur to be an efficient manager? What are the key functions of management? 20

Q.6 Which are the important legal aspects that an entrepreneur should know/comply while carrying out business? Explain briefly. 20

Q.7 What do we mean by “Industrial relations” in the context of business and entrepreneurship? What are the methods/rules to maintain and promote harmonious industrial relations? 20
End Semester Examination, May 2014
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 Attempt any ten:
   a) Incoming inspection  
   b) Plug gauge
   c) Tolerance  
   d) Max material condition
   e) Feeler gauge  
   f) Wavelength standard
   g) Comparator  
   h) Errors in measurement
   i) Interchangeability  
   j) Clearance fit
   k) Try square

   PART-A

   Q.2 a) Draw a neat sketch of a vernier caliper and explain its working principle. Explain the mathematical derivation for finding least count. 10
   b) Explain the procedure for alignment list of a lathe. 10

   Q.3 a) Describe sampling inspection and 100% inspection. Explain briefly various stages of inspection. 10
   b) Explain in detail national, international and company standard. 10

   Q.4 a) Write a short note on measurement of geometric parameters such a straightness, flatness and parallelism. 10
   b) Describe working principle and application of dial indicator with a neat sketch. 10

   PART-B

   Q.5 a) Define mean, mode, standard deviation, normal distribution, binomial distribution and Poisson’s distribution with examples. 12
   b) Write a short note on acceptance sampling. 8

   Q.6 a) Explain in detail family of ISO 9000 standards. In addition explain various clauses of ISO 9001:2008. 10
   b) Write a short note on concept of TQM. 10

   Q.7 a) Explain the application of $\bar{X}$ and R chart, P chart, C chart. 8
   b) Draw the $np$ chart for data given below and also comment on the result:

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12
End Semester Examination, May 2014  
B. Tech. (Integrated) - Sixth Semester  
AUTOMOBILE ENGINEERING (M-I-602)  

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

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

Q.1 Explain:  
  a) Fluid coupling  
  b) Toe-in  
  c) Toe-out  
  d) Semi centrifugal clutch  
  e) Alternator  
  f) Castor  
  g) King pin inclination  
  h) Steering ratio  
  i) Free wheel device  
  j) Odometer  

  PART-A  
  2x10

Q.2 a) What are the functions of a chassis frame and the stresses or loads on the chassis?  
  10  
  b) Compare front wheel drive with rear wheel drive.  
  10

Q.3 a) Explain the necessity of transmission in detail.  
  10  
  b) Explain the construction and working of sliding mesh gear box with a neat sketch.  
  10

Q.4 a) Explain rack and pinion steering gear with a sketch.  
  10  
  b) What is wheel alignment? How is it done?  
  10

  PART-B

Q.5 a) Explain construction and working of disc brakes.  
  10  
  b) Describe the working of air-braking system by a neat diagram.  
  10

Q.6 a) Explain the working of telescopic shock absorber with the help of a neat and labeled sketch.  
  10  
  b) Draw a neat sketch of rear leaf spring and explain the importance of each part.  
  10

Q.7 a) Explain the construction and working of lead acid battery.  
  10  
  b) Explain speedometer with a neat sketch.  
  5  
  c) Explain air conditioning in an automobile  
  5
End Semester Examination, May 2014  
B. Tech. (Integrated) – Sixth Semester  
INSTALLATION, TESTING AND MAINTENANCE (M-I-603)  

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

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

Q.1 Write short notes on any four:  
a) Overhauling of machine parts.  
b) Breakdown maintenance.  
c) Meaning of maintenance.  
d) Role of inspection in maintenance.  
e) Replacement decision for machine parts.  
5x4

PART-A

Q.2 a) Explain any five economical aspects of maintenance and repair process in detail.  
10  
b) What do you mean by fits? Explain different types of fits in detail.  
10

Q.3 Explain the significance of vibration isolation while positioning the machine on the ground. Also describe the various methods used for vibration isolation purpose.  
20

Q.4 a) Define the term: accuracy of machine parts.  
5  
b) What do you mean by inspection? Explain the procedure for inspection of machine parts/equipment performance.  
10  
c) Write a short note on repair of machine parts.  
5

PART-B

Q.5 a) Describe in brief the maintenance planning procedure for a machine equipment.  
10  
b) Write short notes on:  
   i) Availability of equipment.  
   ii) Maintainability of equipment.  
5x2

Q.6 a) Name any four parts which require frequent maintenance. Also write down the reasons for the frequent failure of the parts.  
10  
b) Explain the role of history cards in decision making for repair or replacement.  
10

Q.7 a) What do you mean by maintenance of machine parts? Explain any four types of maintenance strategies in detail.  
15  
b) Write a short note on maintenance schedule and its significance in machine parts life cycle.  
5
End Semester Examination, May 2014
B. Tech. (Integrated) - Sixth Semester
INDUSTRIAL MANAGEMENT (M-I-604)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

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

Q.1 Explain in brief any ten:
   a) Management
   b) Motivation
   c) Industrial accidents
   d) Industrial pollution
   e) Economic order quality (EOQ)
   f) Material requirement planning (MRP)
   g) Working capital
   h) Material handling
   i) Indirect taxes
   j) Collective bargaining
   k) ABC analysis

   2x10

PART-A

Q.2 a) Explain the term organization and give various types of organization structures. 10
   b) Explain the term job satisfaction and job enrichment. 10

Q.3 a) What do you mean by industrial relations and industrial disputes? 10
   b) Explain the concept of workers participation and collective bargaining. 10

Q.4 a) Explain the term leadership and types of leadership styles. 10
   b) Explain Maslow's theory of motivation for workers. 10

PART-B

Q.5 a) What are main provisions of the Factory Act of 1948? 10
   b) Explain direct and indirect taxes. 10

Q.6 a) Explain the term industrial safety and various measures of industrial safety. 10
   b) Explain the various types of industrial pollutions and their prevention. 10

Q.7 Explain the concept of inventory control and various types of inventory control techniques. 20
End Semester Examination, May 2014
M.Sc. (Biotechnology) – First Semester
MICROBIAL PHYSIOLOGY AND GENETICS (BT-S-102A)

Time: 3 hrs
Max Marks: 60

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 advantages do solid media offer for the culture of microorganisms?
   b) What is the mode of action of lysozyme on cell wall?
   c) What is pseudomurein?
   d) How do protozoa move?
   e) Differentiate between specialized transduction and generalized transduction.
   f) What is the significance of Ames test? 2x6

UNIT-I

Q.2 a) What is a pure culture and how it can be obtained?
   b) Discuss the principle behind the sterilization using heat. 6

Q.3 Discuss the contributions of the following in the development of microbiology:
   a) Leeuwenhoek
   b) Pasteur
   c) Robert Koch 4x3

UNIT-II

Q.4 Briefly describe the endospore formation. What might account for its heat resistance?
   How does an endospore differ from a vegetative cell? 12

Q.5 a) Define growth. Describe the four phases of a growth curve in a closed system and discuss the causes of each.
   b) What is meant by a synchronous culture? 8 + 4

UNIT-III

Q.6 a) Explain how it is possible to use the interrupted mating procedure to determine the relative order of genes on a chromosome.
   b) Strains that are Hfr can spontaneously become F+ and vice versa. Explain. 8 + 4

Q.7 Discuss the events that occur during lytic and lysogenic life cycle of lambda phage. 12
End Semester Examination, May 2014
M.Sc. (Biotechnology) – Second Semester
GENETIC ENGINEERING AND APPLICATIONS (BT-S-201)

Time: 3 hrs

Max Marks: 60

No. of pages: 1

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

Q.1 Briefly discuss:
   a) How can we determine the temperature of annealing process of a primer?
   b) What features affect the strength of a bacterial promoter?
   c) During gene cloning, how can we prevent re-circularization of a linear plasmid.
   d) What are the features of gene structure that present a mammalian gene from being directly expressed in prokaryote?
   e) How is it possible to determine number of introns in a gene?
   f) What is the role of terminal deoxynucleotidyl transferase and reverse transcriptase in genetic engineering? 2x6

UNIT-I

Q.2 a) What is the significant role of restriction enzymes and ligases in genetic engineering? 6
   b) Describe the principle of gene amplification using the technique of polymerase chain reaction. How did the discovery of thermophilic bacteria simplify the use of PCR? 6

Q.3 Explain briefly:
   a) Automated sequencing of gene. 5
   b) Guidelines of genetic engineering. 4
   c) Detection and separation of the DNA fragments. 3

UNIT-II

Q.4 a) How is lambda phage tailored into a cloning vector? 8
   b) How can we screen the recombinant DNA when pUC 18 is used as a vector? 4

Q.5 a) What are the possible options to study interactions between two proteins and between a protein and RNA? 8
   b) What are the various steps involved in the formation of a CDNA library? 4

UNIT-III

Q.6 a) "Agro bacterium tumefactions is the nature’s smallest genetic engineer". Comment. 7
   b) How has bacteria phage T7 been used in expressing foreign genes in E coli and what desirable features does this regulatory system possess? 5

Q.7 What is gene therapy? Explain the different approaches to this therapy along with its limitations. 12
End Semester Examination, May 2014
M. Sc. (Biotechnology) - Second Semester
BIOPROCESS TECHNOLOGY (BT-S-202)

Time: 3 hrs  Max Marks: 60
No. of pages: 1

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

Q.1 a) Justify the following statement 'Bioprocess technology puts biotechnology to work'.
   c) What do you understand by containment?
   d) Define residence time distribution in bioreactors.
   e) Compare defined and complex microbial growth media.
   f) What is the need of sterilization in microbiology? 2x6

UNIT-I

Q.2 a) Describe the different interdisciplinary subjects that contribute to the field of bioprocess technology. 6
   b) Summarize the steps involved in performing material balance of a bioprocess. 6

Q.3 a) Compare ideal batch and continuous stirred tank reactors.
   b) Define:
      i) Generation time.
      ii) Lag phase.
      iii) Deceleration phase. 6

UNIT-II

Q.4 a) How is homogeneous mixing of reactor contents achieved in bubble column and air-lift reactor? 6
   b) Discuss the different types of impellers used in bioreactors. 6

Q.5 a) Describe the different types of probes used in bioreactors.
   b) Describe the construction, working advantages and limitations of a packed bed reactor. 6

UNIT-III

Q.6 Write short notes on:
   a) Nutrient quality degradation during sterilization.
   b) GMP in bioprocess industries. 6x2

Q.7 a) What is k_a? How is it measured?
   b) Explain the factors that affect rate of diffusion. How would you increase the rate? 7
End Semester Examination, May 2014
M. Sc. (Biotechnology) - Second Semester
IMMUNOLOGY (BT-S-203)

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 the following:
   a) What are the differences between antigens, immunogens and haptens?
   b) How does IgG differ from IgM?
   c) What is meant by MHC restriction?
   d) What is the role of the humoral response in generating immunity against influenza?
   e) Which type of hypersensitive reaction can be induced by pollens and certain foods in sensitive individuals?
   f) How does monoclonal antibody differ from polyclonal antibodies? 2x6

UNIT-I

Q.2 a) How do cells of the innate immune system contribute to activation of adaptive immune responses? 6
   b) Discuss the structure and function of thymus. 6

Q.3 Discuss the main mechanisms that generate immunoglobulin diversity. 12

UNIT-II

Q.4 Explain the difference in antigen presentation by MHC class I and MHC class II molecules. 12

Q.5 Describe how a native T cell is activated. What is meant by co-stimulation? 12

UNIT-III

Q.6 a) What do you understand by the term: Hypersensitivity? Explain IgE mediated hypersensitivity? 7
   b) Explain antibody dependent cell mediated cytotoxicity. 5

Q.7 a) Briefly describe the mechanisms that come into play to eliminate the infecting virus. 6
   b) Discuss any two autoimmune diseases that are mediated by direct cellular damage. 6
End Semester Examination, May 2014
M.Sc. (Biotechnology) – Second Semester
BIOINFORMATICS AND COMPUTATIONAL BIOLOGY (BT-S-204)

Time: 3 hrs
Max Marks: 60
No. of pages: 1

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

Q.1 Briefly answer:
   a) What do ddNTPs do in DNA sequencing?
   b) In database searches, what is the role of PSI blast.
   c) Highlight the important tools used in sequence alignment.
   d) How Genbank file format is different from NBRF format?
   e) How pseudogene is different from transposons?
   f) Illustrate steps used in gene finding. 2x6

UNIT-I

Q.2 a) Discuss the history of sequence analysis program. 4
   b) Using appropriate example discuss how WAN is different from MAN. 8

Q.3 a) What do you mean by automated chain termination? 4
   b) Discuss any two DNA sequencing methods. 8

UNIT-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. 12

Q.5 a) When a Global MSA is performed, what are the observations one can make from these sequences? 4
   b) How multiple sequence alignment is related with phylogenetic prediction? Explain with a suitable example. 8

UNIT-III

Q.6 a) Discuss different steps involved in genome analysis. 8
   b) How comparative genome analysis help in information extraction? 4

Q.7 a) Briefly describe the steps followed in homology modelling. 8
   b) What do you mean by “native state” of protein? 4
End Semester Examination, May 2014
M. Sc. (Biotechnology) - Second Semester
HUMAN GENOME (BT-S-205A)

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

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) Explain differences between sex linked and limited traits. 2
   b) Explain amniocentesis. 3
   c) Explain specific susceptible/resistant. 3
   d) Explain pedigree analysis. 4

UNIT-I

Q.2 Discuss how human genome project started, its propagation, aims and significance? 12
Q.3 What is gene tracking and explain its various approaches? 12

UNIT-II

Q.4 Short notes on:
   a) Karyotyping. 3x4
   b) STR linkage mapping. 3
   c) Monoclonal antibodies in disease diagnosis. 3

Q.5 a) Describe the role of DNA/RNA probes in disease diagnosis. 6
   b) Explain various methods of detection of genetic disorders. 6

UNIT-III

Q.6 What is gene therapy? Discuss its types and significance in disorders of cardiovascular system. 12
Q.7 What one should do when he gets to know that his family members carry defective gene? 12
End Semester Examination, May 2014
M.Sc. (Biotechnology) – Second Semester
BIOETHICS, BIOSAFETY AND IPR (BT-S-205D)

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) Enlist ethical issues in biotechnology.
b) What do you understand by public acceptance and ownership in biotechnology?
c) What are biological weapons?
d) Mention any five general biosafety practices in laboratory.
e) In which field inventions cannot be patented?
f) How is copyright different from a patent? 2x6

UNIT-I

Q.2  a) What is your social responsibility towards biodiversity?
b) What measures can be taken for biodiversity conservation and sustainable environment? 6

Q.3  a) Discuss the impact of globalization in biotechnology.
b) How does technology transfer help in advancement of biotechnology? 6

UNIT-II

Q.4  What is Cartagena protocol on biosafety? Give its salient features. 12

Q.5  a) Discuss the controversies and regulatory affairs associated with recombinant organisms.
b) What is ‘Transgene escape’? 8

UNIT-III

Q.6  a) What are patent claims?
b) Describe the composition of patent.
c) How is a patent filed? 4

Q.7  a) How does a patent take care of plant breeder’s rights?
b) Discuss the strategy of protecting plants giving the examples of Rice and Neem. 6
End Semester Examination, May 2014  
M. Tech. (Biotechnology) - First Semester  
BIOSENSORS AND BIOCHIPS (BT-M-104 / 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. Write its advantages and disadvantages.  
b) What are the features of an ideal biosensor?  
c) Describe acoustic sensors.  
d) What is a biochip? Write its advantages and disadvantages.  
e) Differentiate between mono and bi enzyme electrodes.  

PART-I

Q.2 Discuss classification of biosensor based on transducer and then describe its various components in detail.  

Q.3 Describe working principle of optical and piezoelectric biosensors. Write their advantages and disadvantages.

PART-II

Q.4 Discuss different methods and material require for the immobilization of biomaterial in biosensor application.  

Q.5 "Tissue or cell based biosensors have better shelf life". Justify the statement with examples and explanation.

PART-III

Q.6 What are the different working principles of blood glucose estimation? Give merits for management of glucose at home.  

Q.7 Discuss any three methods of biosensors fabrication.
End Semester Examination, May 2014
M. Tech. (Biotechnology) - First Semester
BIOSEPARATION TECHNOLOGY (BT-M-105)

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) Name some basic separation techniques and discuss briefly their applications.
b) What do you know about solvent extraction?
c) Briefly explain the principle and applications of lyophilization.
d) What are bioconversion products?
e) Give a general scheme of downstream processing of bioproducts. 3x5

PART-I

Q.2 a) What are intracellular products? Give examples. 3
b) Discuss the significance of cell disruption techniques in downstream processing. 4
c) Give a detailed account of ultrasonication technique. 8

Q.3 Give a detailed account of membrane based purification techniques for biomolecules. 15

PART-II

Q.4 Draw a comparison between the following:
a) GLC and HPLC.
b) Ion exchange chromatography and reverse phase chromatography.
c) Paper chromatography and thin-layer chromatography. 5x3

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

PART-III

Q.6 Write short notes on any three:
a) Affinity extraction.
b) Drying.
c) Crystallization.
d) Purification of secondary metabolites. 5x3

Q.7 a) Discuss in detail the purification of a steroid molecule. 10
b) Briefly explain the chemical aspects of purification of biomolecules. 5
End Semester Examination, May 2014  
M. Tech. (Biotechnology) - Second Semester  
ADVANCED ANIMAL BIOTECHNOLOGY (BT-M-201)

Time: 3 hrs  
Max Marks: 75

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

Q.1  
a) Enlist the enzymes used in primary cell culture. Discuss their key properties.
b) Why corneal transplants are rarely rejected?
c) Discuss the medical circumstances that may warrant embryo cryopreservation in humans.
d) Explain the therapeutic applications of antisense oligonucleotides.
e) Why are experimental animals quarantined on procurement? 3x5

PART-I

Q.2  
a) What are the features incorporated in animal cell bioreactors and media in order to prevent shear damage to the animal cells? 5
b) Describe the methods practiced for obtaining, identifying and isolating stem cells. 5

c) What are the prerequisites for success of primary cell culture? 5

Q.3  
a) Give a detailed account of the different components of animal cell culture media and their significance. 10
b) Compare histotyptic and organotyptic cultures. 5

PART-II

Q.4  
a) What are the desirable features of a cloning vector? Briefly explain the characteristics of any one animal vector. 5
b) Desirable the various ART (assisted reproduction technology) methods available for treatment of infertility. 5

c) E. Coli has been preferred host for expression of heterologous proteins for decades. Give reasons. 5

Q.5  
Write short notes on:
a) Tissue engineering.
b) Karyotyping.
c) Production of knockout mice. 5x3

PART-III

Q.6  
a) Explain the design and maintenance of animal house. 8
b) How are animal models useful in cancer research? 7

Q.7  
a) What are the provisions of Prevention of Cruelty to Animal Act? 5
b) Give the Draize test used for testing for eye irritant. 5

c) What are the potential errors possible while extrapolating the toxicology results obtained from the experimental animals to human subjects? 5
End Semester Examination, May 2014
M. Tech. (Biotechnology) - Second Semester
ADVANCED PLANT BIOTECHNOLOGY (BT-M-202)

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) Significance of triploids.
   b) In vitro production of alkaloids.
   c) Use of plant growth hormone in embryo culture.
   d) In vitro gene banks.
   e) Role of micro RNA in gene silencing. 3x5

   PART-I

Q.2 a) Describe the most suitable bioreactor design for plant cell culture. 7
   b) Explain the sequential steps of in vitro pollination and fertilization. 8

Q.3 Write short notes on:
   a) Cybridization and its use
   b) Virus indexing.
   c) Somaclonal variations. 5x3

   PART-II

Q.4 a) Describe the process of Agrobacterium mediated genetic transformation. 8
   b) How are plant tissue cultures elicited to produce secondary metabolites? 7

Q.5 Elaborate the process of mass propagation of plants giving its significance. 15

   PART-III

Q.6 a) Describe various modes of conservation of germplasm. 8
   b) Mention recent developments in immunotherapy and production of antibodies. 7

Q.7 Discuss with examples the techniques of genetic improvement of crop plants for:
   a) Salt tolerance. 7½x2
   b) Protein content.
End Semester Examination, May 2014
M. Tech. (Biotechnology) - Second Semester
FOOD MICROBIOLOGY (BT-M-221A)

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 Answer briefly:
   a) What is microbiological spoilage?
   b) What is the aw value? How does it affect the spoilage of food?
   c) What physiological types of bacteria are most likely to be present when canned food spoils?
   d) What are mycotoxins?
   e) Why is food additives used? 3x5

   PART-I

Q.2 Explain the historical development in food spoilage and food poisoning. Describe the main routes of food contamination. 15

Q.3 Explain some current rapid methods for pathogen detection and identification. 15

   PART-II

Q.4 List some microorganisms responsible for spoilage of fruits and vegetables. Explain the physico-chemical changes caused by microorganisms during spoiling of food. 15

Q.5 List extrinsic and intrinsic factors affecting the growth of microorganisms in foods. 15

   PART-III

Q.6 a) Write short notes on any two:
   i) Antioxidants.
   ii) Flavoring agents.
   iii) Food enzymes. 5x2
   b) List some major food borne infections. 5

Q.7 What are food additives? Write a detailed account on polysaccharides and other miscellaneous food additives. 15
End Semester Examination, May 2014  
M. Tech. (Biotechnology) - Second Semester  
FOOD PROCESS TECHNOLOGY (BT-M-222A)

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 Answer briefly:  
   a) What is minimum temperature for growth of food borne pathogen Clostridium botulinum?  
   b) What does TDT reflects? And how do we determine the TDT of cells or spores?  
   c) Explain production of marmalades.  
   d) What is the function of pectin in jam and jelly production? Name some fruits having high amount of pectin.  
   e) What do F and Z value of food reflect?  

   PART-I

Q.2 What are the general principles of food preservation? Explain the high temperature and canning process of food preservation.  

Q.3 a) Which are the foods that are normally preserved by preservatives? Enlist the food additives recommended for various foods.  
   b) Explain the preservation of food by low temperature storage. Name some food borne pathogens which have low temperature optima.  

   PART-II

Q.4 What do you understand by fortification of wheat flour? Explain drying and milling process of wheat.  

Q.5 Explain production and preservation of fruit and vegetables product viz. jams, jelly, pickles.  

   PART-III

Q.6 a) Enlighten the chemical changes which occur during the process of cheese production from milk.  
   b) Enlist the name of some fermented milk products. Discuss the production of kefir, koumiss and acidophilus milk.  

Q.7 Give the quality analysis of fish. Explain the processing of fish meal and fish liver oil.
End Semester Examination, May 2014
M. Tech. (Biotechnology) - Second Semester
ENTREPRENEURSHIP OPPORTUNITIES IN FOOD INDUSTRY
(BT-M-223A)

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 Answer briefly:
   a) Differentiate between an entrepreneur and a manager.
   b) What is compulsory license?
   c) Explain significance of marketing.
   d) Explain food safety and labeling requirements.
   e) Explain trading on equity.
   f) Explain pre-feasibility studies.

   PART-I

Q.2 Explain the process of entrepreneurship development.

Q.3 Write different classifications of food industries and discuss current scenario of biscuit industry in India.

   PART-II

Q.4 a) What are non-patentable objects in India?
    b) Define a trade mark. Discuss non-registrable trademarks.

Q.5 a) What do you mean by a balanced capital structure? Why should a company aim at a balanced capital structure?
    b) What are the goals of financial management?
    c) Discuss sources of finance in pulp and juice industry.

   PART-III

Q.6 Define a project report. "Project report is the most crucial document for starting a new venture". Justify the statement.

Q.7 What is the significance of a market feasibility report? Write techno-economic feasibility report for setting up a mushroom plant in the Department of Biotechnology, MRIU.
End Semester Examination, May 2014
M. Tech. (CSE) - First Semester
ADVANCED ANALYSIS AND DESIGN OF ALGORITHMS (CS-M-101)

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

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

Q.1 a) State master theorem and using it determine the time complexity of the recursive algorithm:
   \[ T(n) = 13T\left(\frac{n}{8}\right) + n^2. \]

b) Explain insert sort and give its algorithm. Find the time complexity of this sort in the worst case.
   5

c) Explain the count sort as linear time sort and use this to sort the following numbers in ascending order: 3, 2, 1, 3, 6, 4, 3, 5, 2, 6, 4, 5.
   5

Q.2 a) Explain what is binary search tree and how it is created. Give algorithm and explain the steps for searching a given number.
   7

b) Explain binomial heap and give data structure of its nodes. Create a binomial heap with 13 nodes and use the heap to sort numbers: 8, 12, 6, 25, 35, 18, 27, 10, 16, 4, 15, 20, 14.
   8

Q.3 a) Define red-black tree. Explain how and when rotations are used to keep red-black property of the tree. Give examples.

b) Explain minimum cost spanning tree and give Prim’s algorithm for it. Using this algorithm obtain the minimum cost spanning tree in the following graph.

![Diagram of a graph]

8

Q.4 a) Explain the method of matrix-chain multiplication and give its algorithm. Find the minimum number of scalar multiplications required to multiply the following matrices:
   \[ A_1 \ A_2 \ A_3 \ A_4 \ A_5 \]
   Where the order of these matrices are, respectively
   \[ A_1 : 2 \times 5, \ A_2 : 5 \times 10, \ A_3 : 10 \times 4, \ A_4 : 4 \times 20, \ A_5 : 20 \times 5. \]

b) Explain greedy algorithms. Use this method to develop Huffman codes for alphabets. Determine Huffman codes for the following alphabets along with their frequency:
   A : 40, B : 25, C : 32, D : 20, E : 15, F : 8, G : 10

7

P. T. O
Q.5 a) Explain dynamic programming method for optimal search tree. Develop the optimal search tree for the following data:

<table>
<thead>
<tr>
<th>i</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p_i )</td>
<td></td>
<td>.12</td>
<td>.15</td>
<td>.18</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>( q_i )</td>
<td>.05</td>
<td>.02</td>
<td>.06</td>
<td>.05</td>
<td>.03</td>
<td>.04</td>
</tr>
</tbody>
</table>

b) Explain how knapsack 0/1 problem can be solved using backtracking principle. Give its algorithm and explain the steps to solve the problem, where profit set is \( p = \{0, 28, 35, 40\} \) and weights \( w = \{5, 7, 5, 8\} \) and maximum capacity is \( m = 16 \).

Q.6 a) Explain backtracking principle to obtain optimum solution to decision problems. Describe how solution space is generated and solution found. Illustrate the process by taking 4-Queen problem.

b) Explain FIFO branch and bound problem and describe the state space and bound function. Illustrate this by taking up any puzzle problem.

Q.7 a) Describe the computation model of PRAM and explain its functioning. Give different forms of PRAM systems. Illustrate the working of PRAM system with examples.

b) Describe n-processor CRCW system. Give algorithm for computing AND operation on n-bits by the system and show that it can be done in \( O(1) \) time.

Q.8 a) Explain what are non-deterministic algorithms and what extra instructions it has. Give non-deterministic sort algorithm to sort a given set of numbers and show that it can be done in \( O(n) \) time.

b) Define satisfiability problem for evaluating a conjunctive normal form (CNF) expression. Give non-deterministic algorithm for it and explain the steps.
End Semester Examination, May 2014
M. Tech. (CSE) - First Semester
ADVANCED COMPUTER NETWORKS (CS-M-102)

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

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

Q.1  a) Explain the difference between pure aloha and slotted aloha.  5
     b) Explain the types of network devices in detail.  5
     c) Compare TCP/IP and OSI reference model.  5

Q.2  a) Explain the difference between fast ethernet and gigabit ethernet. Also discuss
     their layered protocol architecture.  10
     b) Discuss frame format of MAC layer.  5

Q.3  a) Can one set up a gateway to the internet that translates IP addresses, so that he
     does not have to change all our interval address to an official network?  5
     b) What is difference between subnet and supernet? Discuss with an example.  5
     c) Discuss IPv6 in detail.  5

Q.4  a) Compare TCP vs UDP vs SCTP.  5
     b) What is the cell structure of an ATM and how the switching of cell occurs?  5
     c) Discuss congestion control in ATM.  5

Q.5  a) Briefly explain the protocols that are used in application layer.  8
     b) Differentiate between GPRS and CDMA and explain which of them is better and
        why?  7

Q.6  a) Why does connect() succeed even before my server did an accept()?  5
     b) When can one replace his cell phone with a VOIP phone?  5
     c) How does VOIP work?  5

Q.7  a) Discuss ATM signaling and its architecture in detail.  8
     b) What is LAN evaluation? Explain.  7

Q.8  a) Why does GSM use TDMA, as opposed to CDMA?  7
     b) Compare IPv4 and IPv6 protocol architecture and packet format.  8
End Semester Examination, May 2014
M. Tech. (CSE) - First Semester
ADVANCED MATHEMATICAL TECHNIQUES (CS-M-104)

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

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

Q.1  a) Show that a fuzzy set A defined on real line R is convex if and only if:
\[ A(\lambda x_1 + (1-\lambda)x_2) \geq \min\{ A(x_1), A(x_2) \} \]
for all \( x_1, x_2 \in R \) and all \( \lambda \in [0,1] \)
5

b) Define \( \alpha \)-cut of a fuzzy set. Show that:
\[ \alpha( A \cup B) = \alpha A \cup \alpha B \]
5

c) Show that: \[ C(\alpha) = \frac{1-\alpha}{1+\alpha \lambda}, \lambda > 0 \]
Satisfy all the axioms of complementation.
5

Q.2  a) State the types of fuzzy propositions. Explain how these are expressed to develop a fuzzy system. Illustrate with an example.
5

b) Explain how fuzzy logic expressions are formulated and deductions made. Give an example.
5

c) Define fuzziness of a fuzzy set. Calculate the fuzziness of the fuzzy set:
\[ A(x) = \begin{cases} 
0 & \text{if } x < 1 \text{ or } x > 20 \\
\frac{(x-1)}{5} & \text{if } 1 \leq x < 6 \\
\frac{(20-x)}{14} & \text{if } 6 \leq x \leq 20 
\end{cases} \]
5

Q.3  a) Define slack and surplus variables in a linear programming problem.
5
b) A manufacturer must produce a certain product in sufficient quantity to meet contracted sales in the next four months. The production facilities available for this product are limited, but big different amount in the respective months. The unit cost of production also varies according to the facilities and personnel available. The product may be produced in one month and then held for sale in a later month but an estimated storage cost of Rs. 1 per unit per month. No storage cost is incurred for goods sold in the same month in which they are produced. There is presently no inventory of this product and none is desired at the end of four month. Given the data in the following table, formulate the above problem as LP problem:

<table>
<thead>
<tr>
<th>Month</th>
<th>Contracted Sales</th>
<th>Maximum Production</th>
<th>Unit cost of production</th>
<th>Unit storage cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>40</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>50</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>30</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>50</td>
<td>17</td>
<td>1</td>
</tr>
</tbody>
</table>

10

Q.4  a) Solve the following LP problem using simplex method:
Maximize \( z = 3x_1 + 2x_1 + 5x_3 \)
Subjected to:
\[ x_1 + 2x_2 + x_3 \leq 430 \]
\[ 3x_1 + 2x_2 \leq 460 \]
\[ x_1 + 4x_2 + x_3 \leq 420 \]
and \( x_1, x_2, x_3 \geq 0 \)
7½

P. T. O.
b) Solve the dynamic problem:
Max \[ z = 3x_1 + 4x_2 \]
Subjected to
\[ 2x_1 + x_2 \leq 40 \]
\[ 2x_1 + 5x_2 \leq 180 \]
and \[ x_1, x_2 \geq 0 \]

Q.5  
**a)** In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the interarrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate:

i) Expected queue size (line length) 

ii) Probability that the queue size exceeds 10

**b)** A road transport company has one reservation clerk on duty at a time. He handles information of bus schedules and makes reservations. Customers arrive at a rate of 8 per hour and the clerk can, on an average, service 12 customers per hour. After stating your assumptions, answer the following:

i) What is the average number of customers waiting for the service of the clerk?

ii) What is the average time a customer has to wait before being served?

iii) The management is contemplating to install a computer system for handling information and reservations. This is expected to reduce the service time from 5 to 3 minutes. The additional cost of having the new system works out of Rs.50 per day. If the cost of goodwill of having to wait is estimated to be 12 paise, per minute spent waiting, before being served should the company install the computer system? Assume on 8 hours working day.

Q.6  
**a)** A bakery keeps stock of a popular brand of cake. Previous experience shows the daily demand pattern for the item with associated probability, as given below:

<table>
<thead>
<tr>
<th>Daily demand (number)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.01</td>
<td>0.20</td>
<td>0.15</td>
<td>0.50</td>
<td>0.12</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Use the following sequence of random numbers to simulate the demand for next 10 days.

Random Numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

Also estimate the daily average demand for the cakes on the basis of the simulated data.

**b)** Describe the job scheduling problem. There are 7 jobs which have to be processed first at machine X and then on machine Y:

<table>
<thead>
<tr>
<th>Job No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine X time (Hrs.)</td>
<td>3</td>
<td>12</td>
<td>9</td>
<td>7</td>
<td>15</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Machine Y time (Hrs.)</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>3</td>
<td>10</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

Find the sequence in which jobs should be scheduled for minimum idle time of machines. Hence find the idle time of machines.

Q.7  
**a)** Explain the following in terms of PERT / CPM:

i) Earliest time

ii) Latest time

iii) Total activity time

iv) Critical path

v) Event stack
b) An architect has been awarded a contract to prepare plans for an urban renewal project. The job consists of the following activities and their estimated times:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Immediate predecessors</th>
<th>Time (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Prepare preliminary sketches</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>Outline specification</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>Prepare drawings</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>Write specifications</td>
<td>A, B</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
<td>Run off prints</td>
<td>C, D</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>Have specification</td>
<td>B, D</td>
<td>3</td>
</tr>
<tr>
<td>G</td>
<td>Assemble bid packages</td>
<td>E, F</td>
<td>1</td>
</tr>
</tbody>
</table>

i) Draw the network diagram of activities for the project.

ii) Indicate the critical path, and calculate the total float and free float for each activity.

\[7\frac{1}{2}\]
End Semester Examination, May 2014
M. Tech. (CSE) - First Semester
ADVANCED OPERATING SYSTEMS (CS-M-103)

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

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

Q. 1  a) Discuss the various types of advanced operating systems. Explain their basic architecture.  
       b) What are various design issues of IPC?  

Q. 2  Explain briefly how the following issues are handled in RPC:
       a) RPC protocol
       b) Acknowledgements
       c) Critical path
       d) Timer
       e) Copying of data  

Q. 3  a) What is a thread package? Discuss their design issues.
       b) Discuss the graph-theoretic deterministic algorithm using suitable examples.

Q. 4  a) Explain the sequential and causal consistency models. Quote suitable example to explain the concept.
       b) Explain why systems having distributed shared memory using caching prefers to use write-invalidate in place of write update?

Q. 5  a) Explain the following:
       i) Cristian algorithm
       ii) Berkeley algorithm  
       b) Discuss various scenarios where a distributed algorithm is preferred over centralized algorithm for implementing mutual exclusion.

Q. 6  a) What do you mean by resource security? Why is it required?
       b) Discuss the access matrix model in detail.

Q. 7  a) Explain how distributed deadlock detection scheme differs from centralized deadlock detection scheme.
       b) Discuss various conditions of deadlock. Explain how distributed deadlock prevention system works.

Q. 8  Write short notes on:
       a) Buffering
       b) Exception handling
       c) Replacement strategy
       d) Event ordering
       e) Distributed computer environment  

End Semester Examination, May 2014
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) Draw event trace diagram for issue and return of books from library. 7
    b) Define aggregation. Explain types of aggregation with the help of a suitable example. 8

Q.2 a) Draw class diagram by taking the following objects: city, airport, pilot, airline, seat, plane, flight, passenger etc. Add other objects if required. 10
    b) Explain the difference between extend and include relationship by taking a suitable example. 5

Q.3 a) Explain basic components of UML by taking suitable examples. 7
    b) Explain the steps for modeling a use case diagram. Draw use case diagram for modeling purchasing goods from super market. 8

Q.4 a) Explain the differentiation between collaboration diagram and sequence diagram with the help of an example. 8
    b) Explain how structural relationships can be modeled using class diagrams by taking an appropriate example? 7

Q.5 a) Explain multiple inheritance. Discuss different workarounds for multiple inheritance. 7
    b) Differentiate between a state and an event. Draw state diagram showing change in the state of telephone line while establishing a connection. 8

Q.6 a) Define use case. Draw use case diagram for modeling credit card validation system. 8
    b) Define components. Explain different types of components. 7

Q.7 Prepare object model, dynamic model and functional model for ATM banking system. 15

Q.8 Write short notes on:
    a) Abstraction. 5x3
    b) Homomorphism.
    c) Realization.
End Semester Examination, May 2014
M. Tech. (Structural Engineering) - Second Semester
THEORY OF ELASTICITY AND PLASTICITY (C-MS-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 Answer in brief:
   a) Write down assumptions for linear elasticity.
   b) Define principal stress and principal strain.
   c) What are advantages of finite element method?
   d) What do you understand by isotropic hardening?
   e) Explain elastic torsion.
      3x5

Q. 2 a) Derive an equation for principal stresses in two dimensions.
   b) The state of stress at a point is given by the following arrays of terms:
      \[
      \begin{bmatrix}
      9 & 6 & 3 \\
      5 & 4 & 2 \\
      4 & 3 & 5 \\
      \end{bmatrix}
      \text{MPa}
      \]
      Determine principle stresses and principal directions.
      7½x2

Q. 3 A rectangular bar of metal of cross section 30 mm x 25 mm is subjected to an axial tensile force 200 kN. Calculate normal, shear and resultant stresses on a plane whose normal has the following direction cosines.
   a) \( l = m = \frac{1}{\sqrt{2}} \) and \( n = 0 \).
   b) \( l = m = n = \frac{1}{\sqrt{3}} \).
      15

Q. 4 For the spring assemblage with arbitrarily numbered nodes shown in the figure. Obtain:
   a) Global stiffness matrix.
   b) The displacement of nodes 3 and 4.
   c) The force in each spring.
   A force of 4000 N is applied in node 4 in X-direction. The spring constants are given in the figure.
      5x3

Q. 5 Explain in detail Tersca and Mises criteria with derivation.
      15

Q. 6 Define all in detail:
   a) Isotropic hardening.
   b) Anisotropic hardening.
      7½x2

Q. 7 Derive an expression for elasto-plastic deformation of solids with large strain.
      15
End Semester Examination, May 2014  
M. Tech. (Structural Engineering) - Second Semester  
FINITE ELEMENT METHOD (C-MS-202)  

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

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

Q.1  
Briefly explain the following:  
a) Plane stress problem.  
b) Quadrilateral element.  
c) Tetrahedron element.  
d) Interfacial modeling.  
e) Discrete crack.  
f) Element by element lumping.  
g) Irregular meshes.  
h) Concept of time curve.  
i) Isotropic hardening.  
j) Heat energy in control volume.  

Q.2  
a) \( \nu^i \) consist of all linear combinations of a given function denoted by \( N^i : \tilde{\Omega} \rightarrow \tilde{R} \),  
where \( i = 1, 2, 3, \ldots, n. \)  
By this we mean that if \( w^h \in \nu^h \), then there exists constant \( C^i, A = 1, 2, 3, \ldots, n. \)  
such that \( w^h = \sum_{i=1}^{n} C^i N^i = C^1 N_1 + C^2 N_2 + \ldots + C^n N_n \)  
Where \( N^i \) are referred to as shape, basis or interpolation functions. Find out \( Kd = F \) based on Galerkin equation yields, where \( K \) = stiffness matrix, \( F \) = force vector and \( d \) = displacement vector.  

b) Show relationship of shape functions for natural co-ordinates and displacement as shown in figure:

\[
\begin{align*}
\frac{\partial x}{\partial \xi} & = \frac{1}{h} \left( \frac{1}{2} \right) \\
\frac{\partial y}{\partial \eta} & = \frac{1}{h} \left( -\frac{1}{2} \right)
\end{align*}
\]

i) \( x = \sum_{i=1}^{n} h \xi_i \)  
ii) \( u = \sum_{i=1}^{n} h \xi_i \)  

Q.3  
a) Show the equation of compatibility of plane strain problem.  
\[
\left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) (\sigma_x + \sigma_y) = -\frac{1}{1-\nu} \left( \frac{\partial F_x}{\partial x} + \frac{\partial F_y}{\partial y} \right)
\]

b) Find out shape function of bilinear four node quadrilateral element as shown in the figure:

\[
\begin{align*}
\frac{\partial x}{\partial \xi} & = \frac{1}{h} \left( \frac{1}{2} \right) \\
\frac{\partial y}{\partial \eta} & = \frac{1}{h} \left( -\frac{1}{2} \right)
\end{align*}
\]
Q.4  a) Explain element aspect ratio and compare elements with good and bad aspect ratio.
    b) Explain higher order element in 1D for shape functions as shown in figure.
       i) 2 node (linear) element.
       ii) Local co-ordinate system.
       iii) 3 node-quadratic element.
       iv) 4 node-cubic element.
    c) Explain Ph-adaptive collection method with the help of a graph and their convergence.

Q.5  a) Explain geometrically non-linear finite element analysis of a single bar as shown in the figure:

Show: \[ \frac{E A_0}{2 L_0} (v^2 + 3kh^2 + 2h^4) = p \]

b) Show kinematic admissible set of virtual displacement \( \delta d \) then:
   \[ \int B' \delta d = F \]
   For Non linear algebraic equation \( R(d) = F \).

Q.6  Show weighted residual equation:
   \[ \int (n_r \delta d) dv + \int (n_C v) \delta d^2 - \int \left( \int \tau_x dv + \int \tau_y ds + \int \tau_z ds \right) dx + \int \left( \int \alpha_x ds + \int \alpha_y ds + \int \alpha_z ds \right) dx = 0 \]
   \( n(x) = 0 \) for \( x \in s_i \)

Q.7  Derive equation with the help of a figure and parameters as shown in the figure:
   \( C^* + (k - 2)(C^* - C) - 1 = 0 \)
   And plot of nonlinear /normal mode (NNM) and generalize treatment.

If normal mode \( y = CV \).
End Semester Examination, May 2014  
M. Tech. (SE) - Second Semester  
SEISMIC ANALYSIS AND DESIGN OF STRUCTURES (C-MS 203)

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

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

Q.1  
a) Explain the interior of earth based upon P and S waves velocity variations with a neat sketch.  
b) Explain the elastic rebound theory of the earthquakes.  

Q.2  
a) Discuss how the soil and the structure interact during an earthquake?  
b) What are the seismic considerations for the shallow foundations?  

Q.3  
a) What are the physical properties included for a single degree of freedom (SDOF) of linearly elastic structural system subjected to dynamic loads?  
b) Explain the dynamic response of single-storey structure under:  
i) Horizontal force.  
ii) Ground motion; also find the effective earthquake force on it.

Q.4  
a) State the assumptions made in the analysis and the steps involved in the design of an earthquake-resistant structure.  
b) List the various isolating devices and explain any one in detail.

Q.5  
a) State the reasons for the poor performances of masonry buildings in seismic areas.  
b) Strong bricks and weak mortar are recommended for masonry buildings. Why?  
c) How can an old masonry wall be strengthened by pre-stressing? Draw neat sketches to support your answer.

Q.6  
a) What are the principles of earthquake resistant design of RCC members?  
b) How can you achieve ductility in RC buildings? Explain.  
c) Explain the general requirements in the design steps of cantilever shear walls.

Q.7  
Write short notes on:  
a) Measurement of earthquakes.  
b) Dissipating devices.  
c) Strengthening of RCC structures.  

5x3
End Semester Examination, May 2014
M. Tech. (Industrial Engineering) - Second Semester
MECHANICS OF COMPOSITE STRUCTURES (C-MS-206)

Time: 3 hrs

Max Marks: 75
No. of pages: 1

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

Q.1 a) What are the advantages associated with steel concrete composite construction? 8
    b) What are the composite columns? 7

Q.2 What do you understand by "no interaction" as applicable to composite beams? Give the mathematical expressions. 15

Q.3 List the various types of shear connectors and explain each in detail. 15

Q.4 Design a simply supported composite beam with 10 m span shown (dotted line) in the figure given below. The thickness of slab is 125 mm. The floor is to carry an imposed load of 3.0 kN/m², partition load of 1.5 kN/m² and a floor finish load of 0.5 kN/m².

Q.5 A composite floor slab is supported on three span-continuous composite beams spaced at 3 m centers. The effective length of each span being 7.5 m. The thickness of composite slab is 130 mm. The floor has to carry an imposed load of 3.5 kN/m², partition load of 1.0 kN/m² and a floor finish load of 0.5 kN/m². Design the continuous beam:

Q.6 a) Write down the main structural and other benefits of using composite floors with profiled steel decking. 8
    b) Write the service ability criteria for the composite slab. 7

Q.7 Write the design steps for column with axial load. 15
End Semester Examination, May 2014
M. Tech. (CSE) - Second Semester
ADVANCED COMPUTER ARCHITECTURE (CS-M-201)

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) Differentiate between different types of program flow mechanism used. 8
     b) Analyze the data dependencies among the following statements in a given
        program:
        S1: (A+B) x (A-B)  
        S2: (C+D) / (C-D)  
        S3: Z ← X + Y  
        S4: A ← E x F  
        S5: Y ← E - Z  
        S6: B ← (X - F) x A  
        Draw a dependence graph to show all the dependencies. 7

Q.2  a) Differentiate between types of multiprocessors. 5
     b) Explain superscalar and VLIW processor in detail. 5
     c) Differentiate between RISC and CISC processor in detail. 5

Q.3  a) Consider the following reservation table for a four stage pipeline with a clock cycle T=20 ns.

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   i) What are the forbidden latencies and initial collision vector?
   ii) Draw the state transition diagram for scheduling the pipeline.
   iii) Determine the MAL Associated with shortest greedy cycle.
   iv) Determine the pipeline throughput corresponding to the MAL and given T. 8
     b) Explain Linear and Non linear pipelines in detail with an example. 7

Q.4  a) What is Cache Coherence problem? Also give the possible solution to the problem. 8
     b) Compare and contrast store and forward and wormhole routing mechanism. 7

Q.5  Compare the following four cache memory organizations:
     a) Direct mapping cache.
     b) Fully associative cache.
     c) Set-associative cache.
     d) Sector mapping cache. 15

Q.6  a) Write notes on:
     i) C-Access memory organization.
     ii) S-Access memory organization.
     b) Explain different vector instruction types in detail. 8

P. T. O.
Q.7  a) Discuss Future bus + Snoopy bus protocol for shared memory multiprocessor.
     b) Discuss the classification of parallel architecture.

Q.8  Explain the following terms:
     a) Deadlocks in communication channel.
     b) Multilevel cache coherence.
     c) Crossbar switch and multiport memory.
End Semester Examination, May 2014
M. Tech. (CSE) - Second Semester
NETWORK ADMINISTRATION AND SECURITY (CS-M-202)

Time: 3 hrs

Max Marks: 75

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

Q.1 a) Consider two identical hosts connected to the network. Decide which one is better protected and why, based on the list of protections installed between the attacker and the host.
   i) Attacker > filtering > router > firewall > personal firewall > host1.
   ii) Attacker > firewall > host IDS > host 2.  4

b) Discuss the steps involved in developing a security system for an organization.  7

c) What are vulnerability types? Explain software and hardware vulnerabilities.  4

Q.2 a) What do you mean by Rogue Device Detection? What should you do to detect a Rogue device if you run a large network?  6

b) Discuss design considerations of 802.19, STP and 802.1X, L2 protocols.  9

Q.3 a) Explain basic two-tier e-mail design with the help of a neat diagram.  7

b) What are network security platform options? Explain.  8

Q.4 a) What is VPN? Give the types of IPSEC VPNs? Explain.  5

b) Discuss IPsec modes of operation and security options.  5

c) Discuss design options concerning the topology of IPsec connections.  5

Q.5 a) Discuss the protocol capabilities of any two:
   i) Telnet / secure shell.
   ii) HTTP / HTTPS.
   iii) SNMP.

b) What are network security management tools? Explain.  8

Q.6 a) Explain various forensic analysis techniques.  9

b) Explain how to track a fake e-mail?  6

Q.7 a) What is an ICMP? What are its functions?  5

b) What are ICMP design considerations?  5

c) Discuss network security technologies.  5

Q.8 a) Discuss intrusion and detection systems.  5

b) Internet and network forensics.  5

c) Network security devices.  5
End Semester: Examination, May 2014
M. Tech. (CSE) - Second Semester
ADVANCED DATABASE MANAGEMENT SYSTEMS (CS-M-203)

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

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

Q.1  a) What do you mean by functional dependency and fully functional dependency? Explain with a suitable example. 8
     b) How a relational-algebra expression can be transformed into equivalent expressions using equivalence rules? Explain with the help of a suitable example. 7

Q.2  a) What are shared and exclusive locks in transmission management? Discuss two phase locking protocol. 8
     b) Define deadlock. Explain various techniques to handle deadlocks. 7

Q.3  a) Compare the deferred and immediate modification versions of the lag-based recovery schemes, in terms of ease of implementation and overhead cost. 7
     b) Explain the purpose of the checkpoint mechanism. How often should check point be performed? 8

Q.4  a) How does the concept of an object in the object-oriented model differ from the concept of an entity in the entity-relationship model? 7
     b) Consider the insurance database of figure-1, where the primary keys are underlined.

   Person (SS#, name, address)
   Car (license, year, model)
   Accident (date, driver, damage-amount)
   Own (SS#, license)
   Log (license, date, driver)

   "Figure-1 Insurance database"

   Construct the following SQL queries for this relational database.
   i) Find the total no. of people whose cars were involved in accidents in 1989.
   ii) Find the no. of accidents in which the cars belonging to "John Smith" were involved.
   iii) Add a new customer to the database.
   iv) Delete the Mazda belonging to "John Smith". 8

Q.5  a) Discuss the relative advantages of centralized and distributed databases. 7
     b) Explain how the following differ: fragmentation transparency, replication transparency, location transparency, when it is useful to have replication or fragmentation of data? 8

Q.6  a) What is pipelined parallelism? Describe the benefits and drawbacks of using pipelined parallelism. 8
     b) Discuss interquery parallelism, intraquery parallelism and intraoperation parallelism. 7

Q.7  a) Explain oracle server structure and its architectural components in detail. 8
     b) Discuss database performance tuning issues and its diagnostic and tuning tools in detail. 7

Q.8  Write short notes on:
     a) Query processing and optimization.
     b) Concurrency control.
     c) Oracle database and instance. 5x3
End Semester Examination, May 2014  
M. Tech. (CSE) - Second Semester  
ARTIFICIAL INTELLIGENCE (CS-M-204)

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

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

Q.1  
a) Define Intelligent Agent. Explain general structure of a learning agent.  
b) Explain general structure of a Prolog program by taking suitable example.  
c) Discuss design of model based reflex agent.  

Q.2  
a) Define state space. Explain state space formulation for an AI problem.  
b) Define heuristics. Explain heuristics function.  
c) Explain A* search technique. Explain the algorithm and discuss underestimation and overestimation problems.

Q.3  
a) Define knowledge. Explain various issues in knowledge representation.  
b) Explain the difference between forward and backward reasoning.  
c) Explain Semantic networks. Draw the semantic network for the following statement: Every dog bites the mail carrier.

Q.4  
Convert the following statements into wff in predicate logic. Prove that Marcus was not loyal to Caesar by resolution:  
a) Marcus was a man.  
b) Marcus was a Pompeian.  
c) All men are mortal.  
d) All Pompeian were Roman.  
e) Caesar was a ruler.  
f) All Romans were either loyal to Caesar or hated him.  
g) Everyone is loyal to someone.  
h) People only try to assassinate rulers they are not loyal to.  
i) Marcus tried to assassinate Caesar.

Q.5  
a) Differentiate between supervised and un-supervised learning techniques.  
b) Explain the problems in hill climbing algorithm.  
c) What is learning? What are various learning techniques? Explain any one learning technique.

Q.6  
a) Explain rule based method for uncertain reasoning.  
b) Discuss best first search algorithm.  
c) Explain the concept of Bayesian network for representing uncertain knowledge.

Q.7  
a) Give architecture of an expert system. Explain its various components.  
b) Explain minimax algorithm for game playing by taking suitable example.

Q.8  
Write short note on any three:  
a) Dempster-shafer theory.  
b) Alpha-beta pruning.  
c) Constraint Satisfaction.  
d) Bayes’ Theorm.

5x3
End Semester Examination, May 2014
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) What are the different applications of mobile communication?  
    b) What type of signals are used for mobile and wireless communication? How does the propagation of signal effects the signal quality?

Q. 2 a) Differentiate between ALOHA, CSMA, DAMA and PRMA.  
    b) Explain the GSM architecture in detail.

Q. 3 a) What do you understand by tunnelling and encapsulation. What are the different types of encapsulation techniques?  
    b) What are the different routing techniques in adhoc networks?

Q. 4 a) What is digital video broadcasting?  
    b) What are the security issues with Bluetooth. Explain how security is achieved in Bluetooth?

Q. 5 a) What are the problems of traditional TCP in mobile environment?  
    b) What do you understand by indirect TCP?

Q. 6 a) What is M-TCP? Compare selective retransmission and transaction oriented TCP.  
    b) Compare LEO, MEO and GEO.

Q. 7 a) How a mobile finds an agent when it travels to a foreign network?  
    b) What is mobile IP? What are its goals?

Q. 8 Explain the following **any three:**
    a) WWW  
    b) HTML  
    c) DHCP  
    d) IPV6

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5x3
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End Semester Examination, May 2014
M. Tech. (CSE) - Third Semester
SOFTWARE ENGINEERING AND TESTING (CS-M-301)

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

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

Q.1  a) What do you mean by software requirement analysis and specifications?  
     b) Explain how to estimate the cost and staff requirements for a project?  

Q.2  a) What do you mean by quality assurance? Explain software quality assurance plan.  
     b) Explain product and process quality metrics.  

Q.3  a) Explain different stages of STLC.  
     b) Differentiate between functional testing and structural testing using examples.  
     c) What is a test case? Explain giving examples.  

Q.4  a) What do you understand by static testing? Explain technical reviews, inspection and structural walk through in detail.  
     b) Differentiate between unit testing and integration testing.  

Q.5  a) A program takes as input a string (5-20 characters) and a single character and checks whether that single character is present in the string or not. Design test cases for this program using BVC, robust and worst case testing methods.  
     b) Explain mutation testing.  

Q.6  a) Explain OOA and OOD testing models.  
     b) What are cause effect graphs? Explain.  

Q.7  Consider the following program: 
    int check_prime(int n)  
    {  
        int srt, d;
        srt=sqrt(n);
        d=2;
        While (d<=srt)  
        {  
            If (n%d==0) 
                break;
            d++;
        }  
        If (d>srt) 
            return(1);
        else 
            return(0);
    }  
    a) Draw its DD graph.  
    b) Compute cyclomatic complexity using all the methods.  
    c) Write independent paths.  

Q.8  Write short notes on:  
     a) Cohesion and coupling.  
     b) CMM.  
     c) Graph metrics.  

     5x3
End Semester Examination, May 2014
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) Describe business intelligence framework.  10
     b) Differentiate between casual users and power users.  5

Q.2  a) What is unstructured data? Discuss the best practices for managing the growth of unstructured data. 10
     b) Explain OEM (Object exchange model) with the help of an example.  5

Q.3  a) Discuss the following OLAP operations on multidimensional data:
     i) Slice
     ii) Dice
     iii) Roll-up
     iv) Drill-down
     iv) Pivot  10
     b) How is OLTP different from ERP?  5

Q.4  a) What is data profiling? When and how is data profiling conducted? List some data profiling tools available in the market?  7
     b) What is “single” version of truth”? Explain with an example.  8

Q.5  a) What are the salient features of conceptual model? Explain.  7
     b) Compare and contrast the various types of slow changing dimensions. Use an example to explain your answer.  8

Q.6  a) Explain the attributes of a good metric.  10
     b) What is a balanced scorecard? Explain.  5

Q.7  a) What is data warehouse? Why is there a need for a data warehouse? Explain.  10
     b) Explain schema and instance integration with an example.  5
End Semester Examination, May 2014
M. Tech. (Comm. Sys.) - First Semester
OPTICAL COMMUNICATIONS (EC-M-C-105)

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

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

Q.1 a) How are optical fibres classified? What is a conical fibre? Where is it used? 8
   b) What is acceptance angle? Derive an expression for it and show its relation with
      numerical aperture. 7

Q.2 a) Explain the terms attenuation and dispersion in the case of an optical fibre. How
does hydroxylion play a major role in absorption? 8
   b) The refractive index difference between the core and cladding in an optical fiber is
      1 % (0.001). Estimate the NA when core index is 1.47. Further calculate the
      critical angle at the core-cladding interface within the fibre. 7

Q.3 a) Explain the phenomenon of inter symbol interference, its causes, its effect on the
OPC planning and design. 8
   b) What do you understand by macro bending losses and the critical radius? How do
      you reduce the same? 7

Q.4 a) Explain the working principle of:
   i) LED using the hole-ion theory. 8
   ii) Setero junction LED with an applied forward bias.
   b) How many types of structures of LED are commonly used? Explain working of a
      planer LED. 7

Q.5 a) How do lasers function? Explain in detail with hole-ion and energy levels concepts.
   b) With the aid of a suitable diagram, discuss the principle of operation of a
      distributed feedback laser and a quantum well laser. 7

Q.6 a) What do you understand by the use of equalizer, preamplifier and AGC in an
optical receiver using avalanche photo diode (APD).
   b) Explain subcarrier modulation technique in an analog system of a fibre. 7

Q.7 a) Compare the synchronous, asynchronous and self-synchronous demodulation
   techniques in coherent receivers.
   b) Explain how homodyne and heterodyne detection takes place in a coherent
      receiver? 8

Q.8 Write short notes on:
   a) Optical time division multiplexing.
   b) SNR for APD.
   c) Skew rays and their utility. 5x3
End Semester Examination, May 2014
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) Find the DTFT of the following discrete signals:
   i) \( x[n] = a \cdot u(n) \)
   ii) \( x[n] = \left( \frac{1}{2} \right)^n u(n + 3) \)
   
   b) Find circular convolution between:
      \( x_1(n) = [1, 2, 3, 4] \) and \( x_2(n) = [1, 1, 2, 2] \)
      
   \( \text{Total} = 10 \)

Q.2  a) Calculate IDFT of \( x(k) = [4, (i - j), -2, (1 + j)] \) using twiddle factor matrix.
    b) A four point sequence \( x(n) = [1, 1, 2, 3] \) has DFT \( X(k) \) for \( 0 \leq k \leq 3 \) without performing DFT or IDFT. Find signal values which have DFT \( X(k-1) \).
    
   \( \text{Total} = 15 \)

Q.3  a) Find direct form I and II structure of \( H(z) = \frac{0.28z^2 + 0.39z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2} \).
    b) Find Ladder structure for \( H(z) = \frac{2 + 8z^1 + 6z^2}{1 + 8z^{-1} + 12z^{-2}} \).
    
   \( \text{Total} = 16 \)

Q.4  a) What is frequency warping?
    b) Explain design of digital filters using window technique using an example.
    
   \( \text{Total} = 15 \)

Q.5  a) Analyze the structure and determine input output relations:
    b) Explain Nyquist Digital filter bank.
    
   \( \text{Total} = 15 \)

Q.6  a) Explain basic sample rate alteration device.
    b) Derive equation for two channels QMF Bank.
    
   \( \text{Total} = 15 \)

Q.7  Explain in detail the architecture of DSP processor.

Q.8  a) Given \( H_s(s) = \frac{3}{(s + 2)(s + 3)} \). Design digital filter using bilinear transformation
    \( T = 0.1s \).
    b) Derive an expression for impulse invariant method to design IIR filter.
    
   \( \text{Total} = 15 \)
End Semester Examination, May 2014
M. Tech. (Comm. Sys.) - Second Semester
WIRELESS AND MOBILE COMMUNICATION (EC-M-C-202)

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

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

Q.1 a) Explain how would one improve the coverage and capacity of the cellular system. Explain various mechanisms. 10
   b) Define frequency sense and co-channel sense ratio. What is the relation between signal to interference ratio and co-channel re-use ratio? 5

Q.2 a) What is handoff? What are different types of handoff techniques and strategies? 7
   b) If signal to interference ratio of 15 dB is required for satisfactory performance. What is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a) $n = 4$ (b) $n = 3$? Assume that there are six co-channel cells in the first tier and are equidistant from the mobile. 8

Q.3 a) What are large scale propagation models? Explain free space propagation model. 10
   b) Explain log distance path loss model. 5

Q.4 a) List various factors influencing small scale fading. 6
   b) What is Doppler spread and coherence time? 4
   c) What is the need of diversity techniques? List different types of diversity techniques. 5

Q.5 a) Explain the working principle of direct sequence spread spectrum technique. 10
   b) Calculate the capacity of cellular CDMA system assuming the voice activity factor $\alpha = \frac{3}{4}$. 5

Q.6 a) Explain the signal processing in GSM system along with a neat block diagram. 10
   b) List various mechanisms of traditional TCP. 5

Q.7 a) Explain with the help of various entities, packet delivery to and from the mobile node. 8
   b) What is tunneling and encapsulation? Explain IP-in-IP encapsulation. 7

Q.8 Write short notes on any three: 5x3
   a) Okumura model for signal prediction.
   b) Snooping TCP.
   c) 4G-LTE.
   d) GPRS.
   e) Types of small scale fading.
End Semester Examination, May 2014
M. Tech. (Comm. Sys.) - Second Semester
NEURAL NETWORKS AND FUZZY LOGICS (EC-M-C-206)

Time: 3 hrs
Note: Attempt any FIVE questions in all. Each question carries equal marks.

Max Marks: 75
No. of pages: 1

Q.1 a) Explain the basic building blocks of artificial neural networks.
    b) State a few activation functions which are used in single layer and multilayer net
to calculate the output.

Q.2 a) Generate the McCulloch-Pitts neuron model for AND gate and NOR gate.
    b) What is the delta learning rule? Explain in brief.

Q.3 a) What do you mean by Hebbian learning rule?
    b) Explain the competitive learning rule.

Q.4 What do you mean by single layer perceptron? Explain its architecture and algorithm
in detail.

Q.5 a) Compare the feed forward and feedback networks in detail with an example.
    b) Explain the discrete Hopfield network with its architecture.

Q.6 Give the multilayered feed forward architecture and explain its training algorithm in
detail.

Q.7 a) What do you mean by traditional sets and explain the composition and
defuzzification?
    b) Explain the application of NN in control system.

Q.8 Write short notes on any three:
    a) RBF net.
    b) McCulloch-Pitts Neuron Model.
    c) Neuro-fuzzy system.
    d) Fuzzification.

5x3
End Semester Examination, May 2014
M. Tech. (Comm. Sys.) - Second Semester
ADVANCED MOBILE COMPUTING (EC-M-C-222A)

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

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

Q.1 Discuss the various challenges and issues in mobile computing.

Q.2 What do you understand by IP-micro mobility? Discuss briefly the architecture of cellular IP and Hawaii along with their merits and demerits.

Q.3 a) What do you understand by mobile IP?
    b) With the help of a diagram discuss snooping TCP, and its advantages and disadvantages.
    c) Explain transmission/timeout freezing enhancement to TCP.

Q.4 a) What do you understand by distributed file system? Explain the architecture and salient features of CODA file system.
    b) Explain three states of client in CODA files system.

Q.5 a) With the help of a diagram, discuss the functions of various components of digital audio broadcasting transmission system.
    b) Explain Kangaroo and Joey transaction model.

Q.6 Discuss destination sequence distance vector and dynamic source routing algorithms, and their relative merits and demerits.

Q.7 a) Discuss the main features of traditional TCP. Why TCP is called user friendly protocol? Does it provide reliable or unreliable communication?
    b) What are the fundamental differences between wired networks and adhoc wireless networks relating to routing?

Q.8 Write short note on any two:
   a) HMIPv6
   b) Team transaction.
   c) Digital video broad casting.
   d) Security in the MANETS.

\[ 7 \frac{1}{2} \times 2 \]
Q.1  a) Explain basic difference between an active and a passive satellite communication system. Describe merits and demerits of each type. Give examples of each type.  
     b) Enumerate frequency bands allocated for satellite communication. Briefly explain how these bands are allocated.

Q.2  a) What is station keeping of a satellite? Explain the significance and also the methods to achieve it. What are N-S and E-W station keepings?  
     b) A satellite is moving in an elliptical orbit, with the major axis equal to 42,000 km. If perigee distance is 8,000 km, find the apogee distance and eccentricity.

Q.3  a) What are orbital parameters required to determine satellite in an orbit? Name and explain them.  
     b) What do you understand by satellite visibility? Explain with reference to a geostationary satellite.

Q.4  a) Briefly explain atmospheric absorption, cloud attenuation, tropospheric scintillations and low angle fading in satellite communication.  
     b) In satellite communication, how is prediction of rain attenuation carried out? Explain.

Q.5  a) What are factors that affect the uplink design and downlink design in geostationary satellite communication system? Discuss.  
     b) Derive general link equations. Find out expressions for C/N and G/T ratios. What is the significance of these ratios on satellite link design?

Q.6  a) What is CDMA? In what way it is superior to TDMA? Explain how its advantages are exploited in applications?  
     b) What is 'SPADE' system? Briefly show its configuration and explain its functioning in satellite communication.

Q.7  a) What are point errors, point ahead angle, acquisition, tracking and pointing in optical satellite communication system?  
     b) What are various laser sources used in optical satellite communication systems? Briefly explain.

Q.8  Write short notes on any two:  
     a) VSAT.  
     b) SDMA.  
     c) Modulation techniques in optical satellite communication.  
     d) Modeling rain absorption.
End Semester Examination, May 2014
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 a) List out the characteristics of adaptive systems.  
   b) Explain and prove orthogonality principle.
   
Q.2 a) Derive Weiner Hoff equation.
   b) Explain echo cancellation.
   
Q.3 What are methods of searching the performance surface? Give the gradient search algorithm and prove that its solution is given by: 
   \[ w_t = w^* + (1 - 2\mu \lambda)' (w_0 - w^*) \]
   
Q.4 a) Give the derivation of LMS algorithm.
   b) Explain misadjustment is a case of LMS algorithm.
   
Q.5 Prove that RLS algorithm is given by the solution: 
   \[ w^*(n) = w^*(n-1) + k(n) e^*(n) \]
   
Q.6 a) Show how gradient search is done by the method of steepest descent.
   b) Explain smoothing in adaptive filters.
   
Q.7 a) Explain lattice filtering for RLS filter.
   b) What is adaptive linear equalization?

Q.8 Write short notes on:
   a) Stability and rate of convergence.
   b) State space model.
   c) Excess mean square error.

   5x3
End Semester Examination, May 2014  
M. Tech. (Comm. Sys.) - Third Semester  
RADAR SYSTEMS (EC-M-C-321)

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) With help of a block diagram, explain the working of MTI. What are its limitations?  
7½
b) What do you understand by blind speed? What are its disadvantages? Briefly describe the methods to reduce the adverse effects on account of blind speeds.  
7½

Q.2 a) What do you understand by tracking radar? List various types of radars that can provide tracks. Explain briefly angle tracking.  
7½
b) With the help of a block diagram, explain the working of amplitude comparison monopulse-one-angle tracking radar.  
7½

Q.3 a) What are different RF power sources used in a radar and give brief summary details of these sources?  
7½
b) Draw representation diagram of the main parts of the three-cavity Klystron and explain their functioning.  
7½

Q.4 a) Why are solid state RF power sources preferred? List the various ways the solid state devices can be employed in a radar. Explain briefly composition of a T/R module that may be used for an active-aperture phased array radar.  
8
b) List various types of mixers used in super heterodyne receiver. Discuss briefly single ended mixer and balanced-mixer with the help of diagrams. What are the advantages of a balanced mixer?  
7

Q.5 a) Why are electronically steerable phased arrays of interest in a radar?  
5
b) What are various types of diode-phase-shifters? Discuss them briefly and give comparison of these phase shifters.  
10

Q.6 a) What do you understand by frequency-scan arrays? Explain the working of series fed frequency scan linear array and its beam steering by change of frequency.  
10
b) List various forms of frequency scanned phased arrays that scan in single angle coordinates. Explain briefly:  
   i) Multiple beam frequency scanning.  
   ii) Multiple frequency-frequency scanning.  
5

Q.7 a) What do you understand by noise matched filter receiver? Derive an expression for matched filter impulse response.  
12
b) Sketch input signal, frequency response function at the output of matched filter and envelop of matched filter output.  
3
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - First Semester
ANALOG IC DESIGN (EC-M-VE-103)

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

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

Q.1  a) Explain the basic operation of differential pair in common mode. Show how output varies with respect to input? 10
     b) In the circuit shown, M2 is twice wide as M1. Calculate small signal gain if the biasing value of V M1 and V M2 are equal.

Q.2  a) Explain the operation of Widlar current mirror with its circuit and show its importance. 8
     b) Explain the operation of cascode current mirror with the help of a circuit diagram. 7

Q.3  a) Draw the circuit diagram of two stage op-amp and derive an expression for overall gain. 10
     b) Write the applications of op-amp and also define slew rate. 5

Q.4  a) Explain MOS folded cascode op-amp with its circuit diagram and derive an expression for gain. 12
     b) Differentiate bipolar and MOSFET op-amp. 3

Q.5  a) What is source follower? Draw the small signal model of source follower and calculate its gain. 10
     b) Explain following parameters of VCO:
        i) Centre frequency
        ii) Tuning range 5

Q.6  a) What is the function of phase detector in PLL? Explain any two phase detectors. 8
     b) Draw the block diagram of charge pump and explain its working. 7

Q.7  Why the flash type ADC gives fast output? Explain its working with a block diagram. 15

Q.8  Write short notes on any two:
     a) Switched capacitor circuit.
     b) R-2R D/A convertor.
     c) Temperature independent biasing. 7½x2
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - First Semester
EMBEDDED SYSTEMS DESIGN (EC-M-VE-104)

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

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

Q.1  
a) What is interrupt latency? How it helps in removing shared data problem? 8
b) Explain different types of embedded systems with suitable examples. How Round-Robin scheduling mechanism is different from Round-Robin with interrupt function architecture? 7

Q.2  
a) What are semaphores? How semaphores are related to shared data problems? 7
b) What is task and its various states? How memory management is done in RTOS environment? 8

Q.3  
a) Discuss basic design of RTOS system. What are the various interrupt routines in an RTOS environment? 7
b) What is general purpose processor architecture? Discuss data path and control unit in detail with the help of a diagram. 8

Q.4  
a) Design a custom single purpose processor design for a task of computing GCD (Greatest Common Divisor) of two numbers. Draw a black box view, come up with a state diagram and state table, minimize the logic and draw the final circuit. 10
b) Explain application specific instruction set processor (ASIP) in detail. 5

Q.5  
a) What is RT level custom single purpose processor design? Explain with an example of your choice. Draw problem specification and FSMD for the design. 8
b) What are the parameters which are accounted for the development environment of an embedded system? 7

Q.6  
a) What is memory write ability and storage permanence? Briefly discuss all the memory types associated with embedded systems. 8
b) Discuss the basic DRAM architecture. How basic DRAM differs from other types of DRAM? Draw a comparison between all of them? 7

Q.7  
a) Discuss the basic model for a finite state machine with a suitable example. Also draw datapath model for FSMD. 7
b) What are HCFSM and state charts languages? Compare them with program state machine model (PSM) with the help of a diagram and a suitable example. 8

Q.8  Write short notes on any three:
a) Arbitration mechanism.
b) Pulse width modulators (PWM).
c) Wireless protocols.
d) Concurrent process model.
e) IP cores. 5x3
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - First Semester
DIGITAL IC DESIGN (EC-M-VE-105)

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

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

Q.1  a) Explain the structure and operation of enhancement type n-MOSFET. 7
     b) What is channel length modulation in a MOSFET? 4
     c) Calculate the power dissipated by a CMOS inverter which drives a 10 pF load. Given \( f = 1 \, MHz \) and \( V_{DD} = 10V \). 4

Q.2  a) Prove that for a CMOS inverter \( \left( \frac{W}{L} \right)_p = 2.5 \left( \frac{W}{L} \right)_n \). 7
     b) Explain body effect in detail. 5
     c) What is noise margin? 3

Q.3  a) Draw the layout diagram of a two-input CMOS NAND gate. 5
     b) Explain pass transistor logic. Design a 2:1 multiplexer using pass transistor logic. 7
     c) Design the following function using CMOS:
        \[ F = \frac{AB + C}{A + B + D} \] 3

Q.4  a) Explain the CMOS implementation of SR latch in detail. 8
     b) Design a CMOS Schmitt trigger and explain its operation. 7

Q.5  a) Discuss the read and write operation of 6T SRAM cell in detail. 10
     b) A 4 m-bit memory chip is partitioned into 32 blocks, with each block having 1024 rows and 128 columns. Give the number of bits required for the row address, column address and block address. 5

Q.6  a) What is BICMOS? Design a BICMOS inverter and explain its operation. 8
     b) In a particular dynamic memory chip \( C_g = 30f \, F \), \( C_i = 10pF \), \( V_{DD} = 5V \), \( V_r \) (including the body effect) = 1.5V. Find the output readout voltage for a stored 1 and a stored 0. 7

Q.7  Write short notes on:
     a) Multiplier
     b) Leakage power dissipation
     c) Domino logic 5x3
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Second Semester
REAL TIME OPERATING SYSTEMS (EC-M-VE-201A)

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 embedded system? What are the constraints of an embedded system design? 5
b) What is an interrupt? 5
c) Explain in brief about context switching. 5

Q.2 a) What are real time systems? Discuss its types and applications in detail. 10
b) Differentiate between round robin and function queue software architectures. 5

Q.3 a) What is shared data problem? Discuss various methods to eliminate shared data problem in detail. 10
b) What are the situations which lead to priority inversion problems? 5

Q.4 a) What is scheduling? Explain commonly used approaches to real time scheduling in detail. 10
b) How does a task differ from a thread? 5

Q.5 a) Discuss the concept of inter process communication (IPC) in detail. 10
b) Explain various operating system services. 5

Q.6 a) Explain the following µC/OS-II commands:
   i) OSTaskCreate()
   ii)OSTaskChangePrio()
   iii)OSTimeDly()
   iv)BSP_IntDisAll()
   v) OSStart() 2x5
   b) Explain various resource parameters of a job. 5

Q.7 Explain the case study of an embedded system for a smart card in detail. 15

Q.8 Write short notes on any two:
a) Dynamic versus static systems.
b) Precedence constraints of a job.
c) RTUS Vx Works. 7½x2
End Semester Examination, May 2014  
M. Tech. (VLSI & ES) - Second Semester  
ADVANCED DIGITAL SYSTEM DESIGN (EC-M-VE-202)

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

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

Q.1  
a) What is the need of CAD tool in digital system design?  
b) Write down the role of VHDL in digital design. Also list the capabilities of VHDL.

Q.2  
a) Explain different types of modeling styles in VHDL with examples.  
b) Explain:  
   i) Data object.  
   ii) Data type.  
   iii) Process statement.

Q.3  
a) Discuss different types of operators in VHDL with examples. Also elaborate operator overloading.  
b) Write down VHDL code of synchronous D flip-flop.

Q.4  
a) Explain the following with an example:  
   i) Case statement.  
   ii) For loop.  
   iii) Generate statement.  
b) Write structural modeling of 4:1 multiplexer in VHDL.

Q.5  
a) Explain the following:  
   i) Component declaration.  
   ii) Generics.  
   iii) Subprogram.  
b) Write behavioural model of 4 bit binary to gray code converter in VHDL.

Q.6  
a) Write VHDL modeling of decade counters.  
b) Write behaviour model of 16 bit ALU which can perform a different operation.

Q.7  
a) CPLD.  
b) FPGA.

Q.8  
Implement the following using PAL and PLA:  
a) 1 bit comparator.  
b) 1 bit full adder.
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Second Semester
ADVANCED DIGITAL SYSTEM DESIGN (EC-M-VE-202A)

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 different styles of modeling with the help of an example. 10
   b) What is operator overloading? 5

Q.2 a) Explain the generic, why is it used and write a code for an input AND gate using
generic. 8
   b) What is the difference between sequential and concurrent statements? 7

Q.3 a) Differentiate between functions and procedure in VHDL. 8
   b) Explain subprogram overloading with the help of an example. 7

Q.4 a) Write a program in VHDL for mealy FSM for the state transition table given below:

<table>
<thead>
<tr>
<th>Present State</th>
<th>Input A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST₀</td>
<td>0</td>
</tr>
<tr>
<td>ST₁</td>
<td>1</td>
</tr>
<tr>
<td>ST₂</td>
<td>0</td>
</tr>
<tr>
<td>ST₃</td>
<td>0</td>
</tr>
</tbody>
</table>

   b) Differentiate between Mealy and Moore finite state machines. 10

Q.5 a) Write a VHDL code to implement micro-computer. 10
   b) Write a program using VHDL for 4:1 MUX. 5

Q.6 a) What is the difference between PAL and PLA? Also construct a 3-bits addressable
       ROM for following functions:

       \begin{align*}
       h₀ &= \sum (0, 2, 5, 6) \\
       h₁ &= \sum (0, 2, 4, 6, 7) \\
       h₂ &= \sum (0, 2, 4, 7) \\
       h₃ &= \sum (1, 2, 3, 5, 7)
       \end{align*}

   b) Write a program using VHDL for JK flip-flop. 5

Q.7 Write short notes on any two:
   a) FPGA
   b) Types of operator
   c) Entity and architecture declaration 7½x2
End Semester Examination, May 2014  
M. Tech. (VLSI & ES) - Second Semester  
LOW POWER VLSI DESIGN (EC-M-VE-203)

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

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

<table>
<thead>
<tr>
<th>Q.</th>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
</table>
| Q.1 | a) Find out an expression for dynamic power dissipation in CMOS circuit.  
b) Discuss the impact of transistor sizing and oxide thickness on delay and delay energy product. | 7  
8 |
| Q.2 | a) Discuss various sources of leakage current in CMOS circuits.  
b) Describe the technological innovations that have enhanced the performance of integrated circuits. | 8  
7 |
| Q.3 | Discuss data correlation and its impact on bit switching frequency in DSP systems.  
Also explain how is power analyzed in data path modules of DSP systems. | 15 |
| Q.4 | a) Find out the relationship between static probability and frequency.  
b) Describe any two techniques for switching activity reduction. | 7  
8 |
| Q.5 | a) Compute the expression for output static probability of \( y = ab + c \) using Shannon's decomposition method.  
Also find the output transition density and output static probability given:  
i) Input static probability.  
\( P(a)=0.2, P(b)=0.3, P(c)=0.4 \)  
ii) Transition density.  
\( D(a)=1, D(b)=2, D(c)=3 \)  
b) What is pre-computation logic technique? | 12  
3 |
| Q.6 | a) What is state machine encoding? How does it help in designing power efficient system? Explain with example.  
b) How does the parallel architecture of a processor help in reducing power dissipation? | 10  
5 |
| Q.7 | a) Discuss the design flow in VLSI for digital IC's.  
b) Discuss any three techniques for power reduction in clock networks. | 7  
8 |
| Q.8 | Write short notes on:  
a) Internal switching energy at gate level logic simulation.  
b) Flow graph transformation. | \( \frac{7}{2} \times 2 \)  
2
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Second Semester
DIGITAL SIGNAL PROCESSORS AND APPLICATION SPECIFIC INSTRUCTION SET PROCESSOR ARCHITECTURE (EC-M-VE-204)

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

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

Q.1  
   a) Calculate the DFT of a sequence \( x(n) = \{1, 2, 1, 0\} \) and check the validity of your answer by calculating its IDFT.  
   b) Discuss the computation efficiency of FFT over DFT.

Q.2  
   a) Draw the flow graph of an 8-point decimation in frequency algorithm and also mention different expression.
   b) Determine the 4-point DFT of sequence \( x(n) = \{1, 0, 2, 1\} \) using decimation in time FFT algorithm.

Q.3  
   a) Briefly explain the quantitative description of retiming.
   b) What are the drawbacks of pipelining? Define the terms: critical path, cutset and feed forward cutset.

Q.4  
   With the help of an example state the difference in parallel processing and pipelining.

Q.5  
   a) Write a Matlab program for calculating 8-point DFT.
   b) What is systolic/array architecture?

Q.6  
   Define the term: architecture and give a detail description on digital signal processor architecture.

Q.7  
   Obtain the direct form-I and direct form-II realization for the following system
   \( y(n) = x(n) - x(n-1) + 2x(n-2) - 3x(n-4) \).

Q.8  
   Write short notes on:
   a) Decimation filters Vs interpolation filters.
   b) ASIP design flow.
End Semester Examination, May 2014  
M. Tech. (VLSI & ES) - Second Semester  
DIGITAL SIGNAL PROCESSORS AND APPLICATION SPECIFIC  
INSTRUCTION SET PROCESSOR ARCHITECTURE (EC-M-VE-204A)  

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) Given \( x(n) = \{0,1,2,3,4,5,6,7\} \). Find \( x(k) \) using DIT FFT algorithm.  
b) Explain different properties of DFT.  

10  
5  

Q.2  
Explain the internal architecture of a DSP processor.  

15  

Q.3  
a) What are the different addressing modes of a DSP processors?  
b) Differentiate between fixed points versus floating point operations.  

6  
9  

Q.4  
a) Explain parallelism and pipelining with suitable example.  
b) Differentiate between DSP and general purpose processors.  

9  
6  

Q.5  
a) What is meant by retrieving? What is its need in VLSI processors?  
b) Unfold the DFG in the figure given below using unfolding factors 2 and 3.  
c) Explain different applications of unfolding.  

5  
5  

Q.6  
a) What is meant by folding transformation? Explain significance of folding in a multirate system.  
b) Explain circular convolution property with a suitable example.  

9  
6  

Q.7  
Discuss:  
a) Decimation filters.  
b) Interpolation filters.  
c) Differentiate between FIR and IIR filters.  

5x3  

Q.8  
Write short notes on:  
a) ASIP design flow and trade-off.  
b) Performance issue of ASIP.  
c) Hardware-software boundary of ASIP.  

5x3
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Second Semester
RF MICROELECTRONICS (EC-M-VE-223)

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

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

Q.1  
a) What are the various challenges of RF communication? 7
b) Explain the operation of PIN diode with its diagram. 8

Q.2  
a) Explain the operation of MESFET with its diagram. Write its advantages and disadvantages. 8
b) How is zeroe used to increase the bandwidth of the RF amplifier? 7

Q.3  
a) What is a resonator? Explain its type. 7
b) Realize 2nd order low pass Chebyshev filter. 8

Q.4  
a) Show how the parasitic capacitances affect the performance of a tuned amplifier? 8
b) Derive an expression for optimum gain per stage of cascaded amplifier. 7

Q.5  
a) Define various types of noises present in a MOSFET. 5
b) Derive expressions for intrinsic MOSFET two-port noise parameters. 10

Q.6  
a) Explain the noise properties of PLL. 8
b) What is application of a loop filter and a charge pump in PLL? 7

Q.7  
a) What is a tuned oscillator? Explain the working of a Colpits oscillator. 8
b) Non-linearity is used as mixer. Explain it. 7

Q.8  Write short notes on any two:
   a) HEMT. 7½ x 2
   b) Shunt series amplifier.
   c) Phase detector.
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Third Semester
VLSI TEST AND TESTABILITY (EC-M-VE-301)

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

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

Q.1  a) Why do we need testing in digital circuits? Explain different types of logical faults
     generated in digital circuits.  
     b) Explain software testing and test evaluation.  

Q.2  Write PODEM algorithm to generate test vector for the circuit shown in the figure.

Q.3  a) Explain serial and parallel signature analysis.  
     b) What do you understand by compact testing?  

Q.4  a) Explain theory of boundary scans testing. Where is it used?  
     b) What is path sensitization?  

Q.5  a) Why do we require fault simulation? Explain parallel and concurrent fault
     simulation.  
     b) What is the difference between online and offline BTST?  

Q.6  a) Explain input and output comparisons.  
     b) What is the difference between a function fault and a delay fault?  

Q.7  a) Explain theory of structured method.  
     b) How pseudo-random techniques are used for test vector generation and response
     compression?  

Q.8  Write short notes on any two:
     a) PLA testing.  
     b) DFT.  
     c) Boundary scan.  

\[ \text{7}\frac{1}{2} \times 2 \]
End Semester Examination, May 2014
M. Tech. (VLSI & ES) - Third Semester
VLSI TECHNOLOGY (EC-M-VE-323)

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

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

Q.1 a) Discuss the transport phenomenon and temperature gradients involved in Czochralski growth technique.
     b) Discuss various sources of containments and their effects on the wafer. How are they removed?
     8 7

Q.2 a) Illustrate the mechanism involved in silicon vapor phase epitaxy and also explain the reaction kinetics involved.
     b) Discuss the masking properties of SiO₂.
     10 5

Q.3 a) What are the thin oxides? Discuss the kinetics for their growth process. Also list the considerations to be taken into account.
     b) How does the crystallographic orientation affect the oxidation rate?
     10 5

Q.4 a) Discuss the mechanism involved in projection printing of optical lithography.
     b) Compare x-ray lithography with optical and electron beam lithography.
     12 3

Q.5 a) Explain AC plasma excitation process.
     b) Discuss various oxidation techniques in brief with their applications.
     6 9

Q.6 a) Give the generic assembly sequence for plastic and ceramic packages.
     b) Explain eutectic and epoxy die banding techniques.
     5 10

Q.7 Explain the process of metallization with its phenomenon and the system used for the deposition.
     15

Q.8 Write short notes on:
     a) Vector scan.
     b) Fick’s law of diffusion.
     8 7
End Semester Examination, May 2014
M. Tech. (P.S.E.D) - Second Semester
OPTIMAL POWER SYSTEM OPERATION (EE-M-201)

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

Note: Attempt any FIVE questions in all. Choose two parts from each question. Each question carries equal marks.

Q.1 a) Develop the co-ordination equation for economic dispatch for all thermal system when losses are to be coordinated.
   b) Develop the flow-chart for the solution of co-ordination equation.
   c) The operating characteristics of three thermal units are given below:
      \[ F_1 = 0.08 P_1^2 + 30 P_1 + 100 \text{ Rs/} \text{hr} \quad 50 \leq P_1 \leq 250 \]
      \[ F_2 = 0.10 P_2^2 + 32 P_2 + 125 \text{ Rs/} \text{hr} \quad 50 \leq P_2 \leq 250 \]
      \[ F_3 = 0.12 P_3^2 + 35 P_3 + 150 \text{ Rs/} \text{hr} \quad 50 \leq P_3 \leq 200 \]
      Determine the economic schedule for a load of 500 MW.
   
   \[ \text{7}\frac{1}{2}\times 2 \]

Q.2 a) Develop the solution for economic dispatch using Newton Raphson technique for all thermal system.
   b) The fuel input for two thermal units are given as:
      \[ F_1 = 0.009 P_1^2 + 15.33 P_1 + 200 \text{ Rs/} \text{hr} \quad 10 \leq P_1 \leq 100 \]
      \[ F_2 = 0.008 P_2^2 + 10.83 P_2 + 240 \text{ Rs/} \text{hr} \quad 10 \leq P_2 \leq 100 \]
      The power loss equation is \( P_L = 0.00 P_1^2 + 0.00 P_2^2 \text{ MW} \).
      Determine the economic schedule for 150 MW.
   c) Develop the expression for transmission line loss formula using classical method. State the assumptions made.
   
   \[ \text{7}\frac{1}{2}\times 2 \]

Q.3 a) Explain the concept of unit commitment using dynamic programming method with a suitable example.
   b) Explain the optimal power flow problem based on Newton method or Gradient method.
   c) Develop the flow chart for the solution of optimal load flow studies.
   
   \[ \text{7}\frac{1}{2}\times 2 \]

Q.4 a) Explain the short range hydrothermal scheduling problem. Develop the flow chart for the same.
   b) Develop the economic schedule for the following hydrothermal system for a load of 600 MW:
      \[ F_1 = 0.01 P_1^2 + 0.1 P_1 + 100 \text{ Rs/} \text{hr} \quad 50 \leq P_1 \leq 200 \]
      \[ q_2 = 0.05 P_2^2 + 40 P_2 + 140 \text{ m}^3/\text{hr} \quad 10 \leq P_2 \leq 150 \]
      The availability of water for 24 hr duration is 20000 m\(^3\)/day.
   c) Develop the Newton Raphson technique for short range fixed-head hydrothermal scheduling.
   
   \[ \text{7}\frac{1}{2}\times 2 \]

Q.5 a) Explain the concept of economy interchange using the following data:
   Plant 1
   \[ F_1 = 0.00156 P_1^2 + 7.92 P_1 + 560 \text{ Rs/} \text{hr} \quad 150 \leq P_1 \leq 600 \]
   \[ F_2 = 0.00194 P_2^2 + 7.85 P_2 + 300 \text{ Rs/} \text{hr} \quad 100 \leq P_2 \leq 400 \]
   \[ F_3 = 0.00482 P_3^2 + 7.97 P_3 + 100 \text{ Rs/} \text{hr} \quad 50 \leq P_3 \leq 200 \]

   \[ P. T. O. \]
Q.6 a) Explain the concept of multi-objective economic dispatch using weightings method.
b) Solve for the i) minimum cost and ii) minimum emission using the following data:
   i) Cost characteristics are:
      \[ F_1 = 0.0020P_1^2 + 8.43P_1 + 100 \text{ Rs/hr} \quad 100 \leq P_1 \leq 500 \]
      \[ F_2 = 0.0040P_2^2 + 6.43P_2 + 200 \text{ Rs/hr} \quad 100 \leq P_2 \leq 300 \]
      \[ F_3 = 0.0050P_3^2 + 7.40P_3 + 100 \text{ Rs/hr} \quad 100 \leq P_3 \leq 200 \]
   ii) The emission characteristics for the above unit are:
      \[ E_1 = 0.0063P_1^2 - 0.38P_1 + 100 \text{ kg/hr} \]
      \[ E_2 = 0.0064P_2^2 - 0.80P_2 + 100 \text{ kg/hr} \]
      \[ E_3 = 0.0032P_3^2 - 0.95P_3 + 100 \text{ kg/hr} \]
   Assume a total load of 700 MW.
c) Develop the hydrothermal scheduling with controlled emission economic dispatch.

Q.7 a) Explain the power flow through a transmission link and prove that
   \[ P_s = \frac{|V_x| |V_s|}{|X|} \sin \delta \]
   \[ Q_s = \frac{|V_x| |V_s|}{|X|} \cos \delta - \frac{|V_x|^2}{|X|} \]
   Where symbols have their usual meaning.
b) Explain the objective of AGC with schematic diagram.
c) Discuss the general mechanism of coordinating load frequency control and economic dispatch.

Q.8 a) Explain the power pool concept is economic dispatch with a suitable example.
b) Develop the mathematical model for AGC of two area system.
c) Write short notes on:
   i) Capacity interchange.
   ii) Diversity interchange.
   iii) Energy banking.
End Semester Examination, May 2014
M. Tech. (P.S.E.D.) - Second Semester
INTELLIGENT TECHNIQUES AND APPLICATIONS (EE-M-202)

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

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

Q.1 Describe various searching techniques. What are problems associated with these techniques? 15

Q.2 a) A fuzzy control system for the braking of a motor car is to be designed. The inputs are vehicle speed \( V \) and a measure if distance \( D \). The output is the braking force \( B \). The variable ranges are as given below:

<table>
<thead>
<tr>
<th>Input</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle speed (( V )) (km/hr)</td>
<td>Distance (( D )) (m)</td>
<td>Braking force (( B ))</td>
</tr>
<tr>
<td>0-40 PS</td>
<td>0-35 PS</td>
<td>40-45 PS</td>
</tr>
<tr>
<td>20-60 PM</td>
<td>15-45 PM</td>
<td>0-100 PM</td>
</tr>
<tr>
<td>40-80 PL</td>
<td>35-55 PL</td>
<td>50-120 PL</td>
</tr>
</tbody>
</table>

PS-Positive small
PM-Positive medium
PL-Positive large

The rules are:
(i) If \((D = PS)\) and \((V = PM)\), then \((B = PL)\)
(ii) If \((D = PM)\) and \((V = PL)\), then \((B = PM)\)

Explain the crisp input=55 km/hr and D=27 m, how this controller generates its output. 10

b) What are linguistic variable in a fuzzy system? 5

Q.3 a) Draw and explain a multi-layer feed forward network. 5
   b) Explain supervised learning in ANN. 10

Q.4 a) Explain how GA can be used to design and tune a fuzzy system. 10
   b) How is selection done in GA? 5

Q.5 Describe the algorithm for neuro-genetic system explaining the various steps involved in it. 15

Q.6 Explain how AI can be incorporated in at least two power system applications. 15

Q.7 a) With the help of a diagram explain the architecture of an FKBC. 8
   b) Explain two membership functions. 7

Q.8 Write short notes on any two:
   a) Encoding. 7
   b) Defuzzification. 7
   c) RBF network. 2

7½x2
End Semester Examination, May 2014
M. Tech. (P.S.E.D.) - Second Semester
POWER QUALITY AND FACTS DEVICES (EE-M-203)

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

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

Q.1  a) Why power quality is required for power system? Classify the disturbances and issues along with effects. 7½
     b) What are FACTS controllers? Describe all FACT controllers in brief. 7½

Q.2  a) What are the effects of harmonics on power system equipment and condition? 7½
     b) Explain the design of active filter for harmonic mitigation. 7½

Q.3  Explain the working of the following:
     a) Harmonic analyzer.
     b) Transient disturbance analyzer.
     c) True RMS meter. 5×3

Q.4  a) Differentiate between Fourier transform, Fourier series and wavelet transform. 7½
     b) Explain Fourier transform with an example for harmonics in voltage and current. 7½

Q.5  a) Explain how STATCOM controls the flow of active and reactive power independently? 7½
     b) Explain the principle of operation of TCSC. 7½

Q.6  a) Explain principle of operation and steady state model of static phase shifter. 7½
     b) Explain power current configuration of SPS application. 7½

Q.7  Explain basic operating characteristic and control of UPFC. 15

Q.8  a) Differentiate between voltage sag and voltage swell. 5
     b) Define the following terms: SAIDI, CAIDI, SAIFI, CAIFI and MAIFI. 5
     c) What are the advantages of using FACTS devices? 5
End Semester Examination, May 2014
M. Tech. (P.S.E.D.) - Second Semester
SOLID STATE CONTROLS OF ELECTRICAL DRIVES (EE-M-204)

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

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

Q.1  
a) What are various types of braking in DC drive? Explain in detail.
   b) Derive an equivalent circuit and expression for maximum torque for three phase
      induction motor.
   7½

Q.2  
What are the various control techniques of chopper fed DC drives?
   15

Q.3  
The speed of separately excited DC motor is controlled by single phase full wave
converter, its field circuit is also controlled by full converter and field current is set to
maximum value. The AC supply voltage to the armature and field converter in one
4.40 V 60 Hz. The armature resistance is Ra=0.25 Ω.
Rf=175 Ω and motor voltage constant Kv=1.4 V/A rad/s. The viscous friction and no
load losses are negligible. The inductances of armature and field circuit are sufficient
to make the armature and field current continuous and ripple free. If delay angle of
armature converter is 60º and Ia=45 A, determine:
   a) Torque developed by motor.
   b) Speed.
   c) Input pf of drive.
   5x3

Q.4  
What is the various method of speed control of induction motor? Explain and do
analysis of V/F control with its block diagram.
   15

Q.5  
Explain vector control of an induction motor drive.
   15

Q.6  
Explain closed loop control of converter:
   a) Fed DC drives with block diagram and transfer function.
   b) Compare VSI and CSI.
   10

Q.7  
a) Describe how microprocessor is used for speed control of drives.
   b) Discuss phase locked loop control system.
   7½

Q.8  
Write short notes on any three:
   a) Stability.
   b) Static Kramer drive.
   c) Adaptive control.
   d) Cycloconverter fed induction motor drive.
   5x3
End Semester Examination, May 2014
M. Tech. (P.S.E.D.) - Second Semester
DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS (EE-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) Find the Fourier transform of \( x(t) = e^{-\alpha t} \).

\[ \text{5 marks} \]

b) Define linearity and time reversal properties of Fourier transform.

\[ \text{4 marks} \]

c) Find the Fourier series expansion of full wave rectified sine wave.

\[ \text{6 marks} \]

Q.2
a) Test linearity, time invariance and causality of the systems given below:
   i) \( y(n) = 5 \cdot \sin[x(n)] \)
   ii) \( y(n) = n \cdot x(n) \)
   iii) \( y(n) = A \cdot x(n) + B \)
   iv) \( y(n) = x^2(n) \)

\[ \text{8 marks} \]

b) Find the impulse response of the system \( y(n) - y(n-1) = x(n) + x(n-1) \). Also find the output response for unit step input.

\[ \text{7 marks} \]

Q.3
a) What is meant by region of convergence? List all its properties?

\[ \text{5 marks} \]

b) Find the Z.T. of \( x(n) = [a]^n \cdot u(n-1) \).

\[ \text{6 marks} \]

c) Find inverse Z.T. of \( x(z) = \frac{1 + z^{-1}}{1 - z^{-3} + 0.5z^{-2}} \).

\[ \text{4 marks} \]

Q.4
a) Plot the following discrete time sequence:
   i) \( x(n) = u[-n+2] \)
   ii) \( x(n) = u[n] - 4[u - 2] \)
   iii) \( x(n) = \delta(n+2) - \delta(n) + \delta(n-1) \)

\[ \text{6 marks} \]

b) What is the significance of sampling theorem? Prove using expressions.

\[ \text{9 marks} \]

Q.5
a) Given \( x(n) = [4, 3, 2, 1, 2, 3, 4] \). Find DFT using DIT FFT algorithm.

\[ \text{10 marks} \]

b) Find circular convolution between \( x_1(n) = [1, 2, 2] \) and \( x_2(n) = [1, 2, 3] \).

\[ \text{5 marks} \]

Q.6
a) A low pass filter has the desired response given by:

\[
H_e(e^{j\omega}) = \begin{cases} e^{-\alpha \omega} & -\pi/2 \leq \omega \leq \pi/2 \\ 0 & \text{otherwise} \end{cases}
\]

Find frequency response \( H(e^{j\omega}) \) for \( M = 3 \) using rectangular window.

\[ \text{10 marks} \]

b) Derive impulse invariant method to design IIR digital filter.

\[ \text{5 marks} \]

Q.7
a) Explain TMS 320 C DSP processor.

\[ \text{8 marks} \]

b) Explain interpolation and decimation.

\[ \text{7 marks} \]

Q.8
a) List advantages of a DSP system.

\[ \text{7 marks} \]

b) Explain harmonic analysis using DSP.

\[ \text{8 marks} \]
End Semester Examination, May 2014
M. Tech. (Industrial Engineering) - First Semester
ADVANCED MATHEMATICAL TECHNIQUES (MA-M-101)

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

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

Q.1  a) Define vector space. Find a basis for the subspace $V_0$ of $R_3$ of all solutions of:
     $x_1 + x_2 + x_3 = 0$, where $x = (x_1, x_2, x_3) \in R^3$.
     8
     b) Show that the set:
        $V = \{(x, y, z) \mid x, y, z \text{ in } R \text{ and } x + 2y + z = 0\}$.
        7

Q.2  a) Find the condition of $r$ and $s$ such that the vector $s(r, 2, s), (r+1,2,1)$ and $(3, s, 1)$
     are linear dependent.
     7
     b) Calculate $\eta(T)$ for the linear transformation $T : E^3 \rightarrow E^2$ defined by:
        $T((a, b, c)) = (a + 2b + c, -a + 3b + c)$ find a basis for KerT.
        8

Q.3  Use simplex method to solve the following LPP:
     Maximize $Z = 3x_1 + 5x_2 + 4x_3$
     Subjected to
        $2x_1 + 3x_2 \leq 8$
        $2x_2 + 5x_3 \leq 10$
        $3x_1 + 2x_2 + 4x_3 \leq 15$
        $x_1, x_2, x_3 \geq 0$
        15

Q.4  Define dynamic programming problem. Use dynamic programming problem to solve:
     max $\{x_1, x_2, x_3\}$
     Subjected to:
        $x_1 + x_2 + x_3 = 5$ ;
        $x_1, x_2, x_3 \geq 0$
        15

Q.5  a) Assume that on the average one telephone number out of fifteen called between
     2 P.M. and 3 P.M. on week days is busy. What is the probability that if 6 randomly
     selected telephone numbers are called?
        i) Not more than 3. 7
        ii) At least 3 of them.

b) The odds that a book will be favorably reviewed by 3 independent critics are 5 to
   2, 4 to 3 and 3 to 4, respectively. What is the probability that of the 3 reviews a
   majority will be favorable?
   8

Q.6  a) Suppose X has a binomial distribution B (6, $\frac{1}{2}$). Show that X=3 is the most likely
     outcome.
     7
     b) In a normal distributions 31% of the items are under 45 and 8% are over 64. Find
     the mean and standard deviation of the distribution.
     8

P.T.O.
Q.7 A bar with insulated sides is initially at a temperature $0^\circ C$ throughout. The end $x = 0$ is kept at $0^\circ C$ and heat is suddenly applied at the end $x = l$ so that $\frac{\partial u}{\partial x} = A$ for $x = l$ where $A$ is a constant. Find the temperature function $u(x, t)$.

Q.8 For the spring system with arbitrarily numbered nodes and elements, as shown in the figure below, find the global stiffness matrix.
Q.1 The sample mean $\bar{x}$ is the best estimator of the population mean $\mu$. A medical company produces disposable syringes. Each syringe is wrapped in a sterile package and then jumbled-packed in a large corrugated carton. Jumble packing causes the cartons to contain differing number of syringe per carton. Because the syringes are sold on a per unit basis, company needs an estimate of the number of syringes per carton for billing purposes. A sample of 35 cartons at random was taken and recorded the number of syringes in each carton shown below:

<table>
<thead>
<tr>
<th>Result of Sample of 35 cartons</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 103 112 102 98 97 93</td>
</tr>
<tr>
<td>105 100 97 107 93 94 97</td>
</tr>
<tr>
<td>97 100 110 106 110 103 99</td>
</tr>
<tr>
<td>93 98 106 100 112 105 100</td>
</tr>
<tr>
<td>114 97 110 102 98 112 99</td>
</tr>
</tbody>
</table>

Calculate sample variance and standard deviation for syringes per carton.

Q.2 For the following cases, specify which probability distribution to use in a hypothesis test:

a) $H_0 : \mu = 27$, $H_1 : \mu \neq 27$, $\bar{x} = 33$, $\sigma^2 = 4$, $n = 25$

b) $H_0 : \mu = 98.6$, $H_1 : \mu > 98.6$, $\bar{x} = 99.1$, $\sigma^2 = 1.5$, $n = 50$

c) $H_0 : \mu = 3.5$, $H_1 : \mu < 3.5$, $\bar{x} = 2.8$, $\sigma^2 = 0.6$, $n = 18$

d) $H_0 : \mu = 382$, $H_1 : \mu \neq 382$, $\bar{x} = 363$, $\sigma = 68$, $n = 12$

e) $H_0 : \mu = 57$, $H_1 : \mu < 57$, $\bar{x} = 65$, $\sigma^2 = 12$, $n = 42$

15

Q.3 A study compared the effects of four 1-month point of purchase promotion of sales: The unit sales for five stores using all four promotions in different months are as follows:

- Free sample: 78 87 81 89 85
- One pack gift: 94 91 87 90 88
- Paisas off: 73 78 69 83 76
- Refind by mail: 79 83 78 69 81

a) Compute the mean unit sales for each promotion then determine the grand mean.
b) Estimate the population variance using the between – column variance.
c) Estimate the population variance using the within column variance computed from the variance within the samples.
d) Calculate the F ratio at the 0.01 level of significance. Do the promotions produce different effects on scale?

15

Q.4 Cost accountants often estimate overhead based on the level of production. The standard manufacturing company have collected information on overhead expenses

P. T. O.
and units produced at different plants, and want to estimate a regression equation to predict future overhead.

Overhead: 191 170 272 155 280 173 234 116 153 178
Units: 40 42 53 35 56 39 48 30 37 40

a) Develop the regression equation for the cost accountants.
b) Predict overhead when 50 units are produced.
c) Calculate the standard error of estimate.

Q.5 a) Explain simple graphical techniques of forecasting and use of univariable graphics and histograms.
   b) Explain multivariate graphics tools used in forecasting.

Q.6 Explain application, specifying and estimating models used for employment forecasting.

Q.7 Explain in detail the stochastic trends and forecasting.
End Semester Examination, May 2014
M. Tech. (Industrial Engineering) - Second Semester
FLEXIBLE MANUFACTURING SYSTEM (M-IE-203)

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

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

Q.1 Describe different type of flexible manufacturing system based kinds of operation and number of machines. 15

Q.2 What is distributed data processing and define its benefits and drawbacks in detail? 15

Q.3 Define different methodologies used for data transferring during tool management. 15

Q.4 Define the following terms used in group technology: bottleneck machine, group tooling, machine-component chart, and product flow analysis. 15

Q.5 Following are the data of AGV system:
- Vehicle velocity: 45 m/min
- Average distance traveled/ delivery: 135 m
- Pickup time: 45 sec
- Drop off time: 45 sec
- Average distance traveling empty: 90 m
- Traffic factor: 0.9

Determine the number of vehicle required to satisfy the delivery demand if the delivery demand is 40 deliveries per hour. 15

Q.6 What are the main functions of an FMS host computer describe in detail? 15

Q.7 Write short notes on:
   a) The DCLASS coding system. 7½
   b) Communication protocols. 7½
End Semester Examination, May 2014  
M. Tech. (Industrial Engineering) - Second Semester  
PROJECT MANAGEMENT (M-IE-204)  

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) Define project management. Explain its scope.  
b) What are characteristics of a project?  
c) What are main objectives of project planning?  

Q.2  
a) What do you understand by 'project control'? What are the requirements of a good control system?  
b) Explain some of the control systems in project management.

Q.3  
a) What do you understand by project organization?  
b) Explain work breakdown structure (WBS).  
c) How would you integrate WBS with organization breakdown structure (OBS)?

Q.4  
a) Explain various 'floats' in the project networks.  
b) Explain the use of different floats in management decision making.

Q.5  
a) Define critical path methods (CPM).  
b) Find the project duration by CPM. Activities and duration in days are given:

Q.6  
a) Explain PERT and expected time in terms of three time estimates.  
b) Find the probability of completing the project in 22 days by using the PERT, from the following network. The three time estimates the given on the activities (use table for normal distribution function).

P. T. O.
Normal Distribution Function

<table>
<thead>
<tr>
<th>Normal deviate (+)</th>
<th>Probability (%)</th>
<th>Normal deviate (+)</th>
<th>Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50.0</td>
<td>0</td>
<td>50.0</td>
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<td>-0.1</td>
<td>46.0</td>
<td>+0.1</td>
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<td>99.9</td>
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</tbody>
</table>

Q.7 Find the optimum time and cost from the following data for the project:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Normal</th>
<th>Crash</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time (days)</td>
<td>Cost (₹)</td>
</tr>
<tr>
<td>1-2</td>
<td>3</td>
<td>360</td>
</tr>
<tr>
<td>2-3</td>
<td>6</td>
<td>1440</td>
</tr>
<tr>
<td>2-4</td>
<td>9</td>
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<td>400</td>
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<td>1600</td>
</tr>
<tr>
<td>5-6</td>
<td>3</td>
<td>480</td>
</tr>
</tbody>
</table>

The indirect cost works out to ₹ 160 per day.
<table>
<thead>
<tr>
<th>Normal deviate (+)</th>
<th>Probability (%)</th>
<th>Normal deviate (+)</th>
<th>Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-0.1</td>
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End Semester Examination, May 2014  
M. Tech. (Industrial Engineering) - Second Semester  
QUALITY CONTROL TECHNIQUES (M-IE-205)

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:  
a) PDCA cycle.  
b) QFD process.  
c) Orthogonal arrays.  
d) Robust design.  
e) Continuous process improvement.  
3x5

Q.2 a) Discuss the philosophies of various quality Gurus in the field of quality.  
b) What is quality? Explain dimensions and cost of quality.  
8  
7

Q.3 a) Define control charts for attributes and variables. Draw control chart selection tree.  
b) Control charts for \( \bar{X} \) and \( R \) are kept on the weight in kilograms of a colour pigment for a batch process. After 25 subgroups with a subgroup size of 4, \( \sum \bar{X} = 52.08 \text{kg} \) (11.48/\( \bar{X} \)), \( \sum R = 11.82 \text{kg} \) (26.1/\( R \)). Assuming the process is in a state of control, compute the \( \bar{X} \) and \( R \) chart central line and control limits for the next production period.  
7  
8

Q.4 Explain the following terms:  
a) Signal to noise ratio.  
b) Taguchi loss functions.  
c) Parametric and tolerance design.  
5x3

Q.5 a) What is total quality management? Explain in detail the eight Key elements, an organization should concentrate, while successfully implementing TQM.  
b) Explain basic concepts on DMAIC problem solving techniques.  
10  
5

Q.6 a) List out seven basic tools of quality. Explain any four in detail.  
b) Explain in detail Taguchi principle and methods.  
9  
6

15
Q.1 Find the optimum integer solution to the following LPP:
Max \( z = x_1 + x_2 \)
Subject to: \( 3x_1 + 2x_2 \leq 5 \)
\( x_2 \leq 2 \)
\( x_1, x_2 \geq 0 \) and are integers.

Q.2 Verify whether the following function is convex or concave and find maxima and minima solution point:
\( f(x) = 4x_1^2 + 3x_2^2 - 6x_1x_2 + x_1 + x_2 - \frac{x_1}{2} - 2x_2 + 15 \)

Q.3 Solve the following quadratic programming problem by using Wolf's method:
Maximize \( z = 2x_1 + x_2 - x_1^2 \)
Subject to: \( 2x_1 + 3x_2 \leq 6 \)
\( 2x_1 + x_2 \leq 4 \)
\( x_1, x_2 \geq 0 \)

Q.4 a) What are essential characteristics of dynamic programming?
b) What do you mean by non-linear programming?
c) Write a short note on CPM.

Q.5 The owner of a chain of four grocery stores has purchased six crates of fresh apples. The following table gives the estimated profits at each store, when it is allocated various number of boxes:

<table>
<thead>
<tr>
<th>No of boxes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
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<td>7</td>
<td>10</td>
<td>8</td>
<td>4</td>
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</tbody>
</table>

The owner does not wish to split crates between stores but is willing to make zero allocation. Find the optimum allocations of six crates so as to maximize the profits.

Q.6 Write short notes on the following terms:
a) Optimistic time.
b) Pessimistic time.
c) Most likely time.

P. T. O.
Six jobs are processed on two machines A and B. The time required to perform these operations (in minutes) for each job is given in table below:

<table>
<thead>
<tr>
<th>Job</th>
<th>A</th>
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<tbody>
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a) Determine the optimum sequence.

a) Also find the total processing time and idle time for machines A and B.
End Semester Examination, May 2014  
M. Tech. (Industrial Engineering) - Second Semester  
HUMAN RELATIONS (M-IE-222)

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 HRD and discuss various dimensions of HRD. What are the contributions of HRD sub-system to develop these dimensions?  
15

Q.2 What do you understand by performance appraisal? Discuss the various factors affecting performance appraisal.  
15

Q.3 a) Differentiate between "training" and "development". What are the various attributes of learning?  
b) Explain the elements in the "process of learning" that needs to be taken into account while facilitating learning.  
7 1/2

Q.4 How can one achieve organizational effectiveness in the Indian organizational context?  
15

Q.5 Explain the needs and importance of career planning and development.  
15

Q.6 Write short notes on:  
a) Manufacturing sectors: trends in HRD.  
b) Service sectors: trends in HRD.  
7 1/2

Q.7 Write short notes on:  
a) Personnel management versus human resource management.  
b) Appraisal methods.  
7 1/2