INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
COMPLEX ANALYSIS AND PROBABILITY DISTRIBUTIONS
(Electronics & Communication Engineering)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Prove that the function f (z) = |z| is continuous everywhere but no where differentiable. **[7M]**

   (b) Show that the function defined by f(z)= $\begin{cases} \frac{xy^2(x+iy)}{x^2+y^4}, z \neq 0 \\ 0, z = 0 \end{cases}$ is not analytic function even though

   Cauchy Riemann equations are satisfied at origin. **[7M]**

2. (a) Find a, b, c if f(z) = x + ay -i (ax +by) is differentiable at every point. **[7M]**

   (b) If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2$ **[7M]**

UNIT – II

3. (a) Verify Cauchy's theorem for the integral of z taken over the boundary of the rectangle with vertices -1 ,1,1+i ,-1+i. **[7M]**

   (b) Determine the value of line integral to $\int_c \frac{z^3 e^{-z}}{(z-1)^3}$ dz where c is $|z - 1| = \frac{1}{2}$ using Cauchy's Integral formula. **[7M]**

4. (a) Determine the value of line integral to $\int_c \left(y^2 + z^2 \right) dx + \left(z^2 + x^2 \right) dy + \left(x^2 + y^2 \right) dz$ from $(0,0,0)$ to (1,1,1) where C is the curve x= t, y = t2, z = t3 in the parametric form. **[7M]**

   (b) Use Cauchy's integral formula to evaluate $\int_c \frac{e^z}{(z^2+\pi^2)^2} dz$ where C is the circle $|z| = 4$. **[7M]**

UNIT – III

5. (a)) Determine the poles and the residue of the function $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$. **[7M]**

   (b) Show that $\int_0^{2\pi} \frac{d\theta}{4\cos^2\theta+\sin^2\theta} = \pi$ using Cauchy's residue theorem. **[7M]**

6. (a) Calculate the value of $\oint_c \frac{4-3z}{(z-2)(z-1)z}$ dz where c is the circle $|z| = 1.5$ using Cauchy's residue theorem. **[7M]**

   (b) Determine the Bi-linear transformation which carries the points from $(1, i, -1) \, to \, (0, 1, \infty)$ **[7M]**

UNIT – IV

7. (a) Let X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once. Determine the **[7M]**
    i. Discrete probability distribution
    ii. Expectation
    iii. Variance.

   (b) Let X be a Random Variable which can take on the values 1,2 and 3 with probabilities 1/3, 1/6 and 1/2. Calculate the 3rd moment about mean. **[7M]**

8. (a) The probability density function of a random variable x is $f(x) = \frac{1}{2} \exp\left[-\frac{x}{2}\right], \quad x > 0$ .Estimate the value of the probability of $1 < x < 2$. **[7M]**

   (b) A Random Variable has the probability function $p(x) = \frac{1}{2^x}$; x = 1, 2, 3…..n. Discuss its moment generating function. **[7M]**

UNIT – V

9. (a) It has been found that 2% of the tools produced by a certain machine are defective. Estimate the probability that in a shipment of 400 such tools, **[7M]**
    i. 3% or more
    ii. 2% are less will prove defective.

   (b) Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents is **[7M]**
    i. at least one
    ii. at most one.

10. (a) The probability that a man hitting a target is 1/3. If he fires 5 times, Determine the Probability that he fires **[7M]**
    i. At the most 5 times
    ii. At least 2 times.

   (b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Estimate the mean and variance of the distribution. **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
COMPLEX ANALYSIS AND PROBABILITY DISTRIBUTIONS
(Electronics & Communication Engineering)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Justify whether every differentiable function is continuous or not. Give an example **[7M]**

    (b) Determine the Cauchy-Riemann equations in polar form. **[7M]**

2. (a) Define Limit, Continuity and Differentiability of a complex function f(z). **[7M]**

    (b) Find an analytic function whose real part is u $= \frac{\sin 2x}{\cos h2y - \cos 2x}$ **[7M]**

UNIT – II

3. (a) Determine the value of $\int_c \bar{z} dz$ from z= o to 2i and then from 2i to z = 4+2i. **[7M]**

    (b) Determine the value of to $\int_c \frac{e^{2z}}{(z+1)^4}$ dz where c is $|z-1| = 3$ using Cauchy's general integral formulae **[7M]**

4. (a) Verify Cauchy's theorem for the function $f(z) = 3z^2 + 3z - 2$ if c is the unit circle **[7M]**

    (b) Evaluate $\int_c \frac{z-1}{(z+1)^2(z-2)} dz$ where $c : |z - i| = 2$ using Cauchy's integral formulae. **[7M]**

UNIT – III

5. (a)) Obtain Laurent's series expansion of f(z) $= \frac{z^2-4}{z^2+5z+4}$ valid in 1< z < 2. **[7M]**

    (b) Using Cauchy's residue theorem, prove that $\int_0^{2\pi} \frac{1+4\cos\theta}{17+8\cos\theta} d\theta = 0$ **[7M]**

6. (a) Find the residue of $\frac{z^2}{(z-a)(z-b)(z-c)}$ $at \ z = \infty$ **[7M]**

    (b) Determine the bilinear transformation that maps the points (1-2i,2+i,2+3i) into the points (2+i,1+3i,4).

    [7M]

UNIT – IV

7. (a) Explain probability distribution for discrete and continuous Random variable. **[7M]**

   (b) The first four moments of a distribution about the value 4 of the variables are 1,4,10 and 45. Show that mean = 5, Variance = 3 and $\mu_3 = 0$. **[7M]**

8. (a) A continuous random variable has the probability density function **[7M]**
$$f(x) = \begin{cases} kxe^{-\lambda x}, for\ x \geq 0, \lambda > 0 \\ 0,\ otherwise \end{cases}$$
Determine
   i. k
   ii. Mean
   iii. Variance

   (b) Obtain the MGF of a random variable X having the probability density function **[7M]**
$$f(x) = \begin{cases} x, 0 \leq x < 1 \\ 2 - x, 1 \leq x < 2 \\ 0, elsewhere \end{cases}$$

UNIT – V

9. (a) Given p(x=2) = 9p(x =4) + 90 p(x=46) for a Poisson variate x Compute the value of p(x 1). **[7M]**

   (b) If the masses of 300 students are normally distributed with mean 68 kg and standard deviation 3 kg how many number of students have masses: **[7M]**
   i. greater than 72 kg
   ii. less than or equal to 64 kg
   iii. between 65 and 71 kg inclusive.

10. (a) If X is a normal variate, Determine the area A. **[7M]**
   i. to the left of z = -1.78
   ii. to the right of z = -1.45
   iii. corresponding to -0.8z1.53
   iv. to the left of z = -2.52 and the right of 1.83. Show the above by graphs.

   (b) Discuss about the mean and variance of a Binomial Distribution. **[7M]**

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS
(Common to AE/ME/CE)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Find the real root of the equation $x\log_{10}x = 1.2$ by Regula-Falsi method upto 3 decimal places. **[7M]**

   (b) Given that $\sin 45^0 = 0.7071, \sin 50^0 = 0.7660, \sin 55^0 = 0.8192$ and $sin 60^0 = 0.8660$, find $\sin 52^0$ using Newton interpolation formula. Estimate the error. **[7M]**

2. (a) Find by Newton-Raphson method correct to 4 places of decimals of the equation $3x - cosx - 1 = 0$. **[7M]**

   (b) Given $u_1 = 22, u_2 = 30, u_4 = 82, u_7 = 106, u_8 = 206$ then find u_8 by Lagrange's interpolation formulae. **[7M]**

UNIT – II

3. (a) Derive the Normal Equations of the second degree parabola $y = ax^2 + bx + c$ by the method of least squares. **[7M]**

   (b) Solve $y' = x + y$, given y(1) = 0 to find y(1.1) and y(1.2) by Taylor's series method. **[7M]**

4. (a) Using the principle of least squares fit an equation of the form $y = ae^{bx}(a > 0)$ to the following data **[7M]**

X	1	2	3	4
Y	1.65	2.70	4.50	7.35

   (b) Given $y' = x + siny$ y(0) = 1. Compute y(0.2) and y(0.4) by Euler's modified method. **[7M]**

UNIT – III

5. (a) Evaluate $\int_0^{\log 2} \int_0^x \int_0^{x+logy} e^{x+y+z}dzdydx$. **[7M]**

   (b) Find the area of the loop of the curve $r = a\left(1 + cos\theta\right).$ **[7M]**

6. (a) By changing the order of integration, evaluate $\int_0^1 \int_1^{12-x} xydxdy.$ **[7M]**

   (b) Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$ **[7M]**

UNIT – IV

7. (a) Prove that $divcurl\ \bar{f} = 0$ **[7M]**

    (b) Evaluate $\int \overline{F}.\overline{n}\,ds$ where $\overline{F} = z\bar{i} + x\bar{i} - 3y^2z\bar{k}$ and S is the surface $x^2 + y^2 = 16$ included in the first octant between z=0 and z=5. **[7M]**

8. (a) Find the constants a, b, c so that the vector $\overline{A} = (x + 2y + az)\,\bar{i} + (bx - 3y - z)\,\bar{j} + (4x + cy + 2z)\,\bar{k}$ is irrotational . Also find ϕ such that $\overline{A} = \nabla\phi$ **[7M]**

    (b) Verify Green's theorem for $\int_c [(xy + y^2)\,dx + x^2dy]$ where c is bounded by $y = x$ and $y = x^2$. **[7M]**

UNIT – V

9. (a) Show that $\left|\frac{1}{2}\right. = \sqrt{\pi}$ **[7M]**

    (b) Prove the relation x $J'_n(x) = nJ_n\ (x) - xJ_{(n+1)}(x)$. **[7M]**

10. (a) Solve in series the equation $\frac{d^2y}{dx^2} - xy = 0$ about x=0 **[7M]**

    (b) State and Prove Generating function of Bessel's. **[7M]**

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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS
(Common to AE/ME/CE)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Find the real root of the equation $e^x = 3x$ by Bisection method up to 3 decimal places. **[7M]**

   (b) Fit the polynomial to the data given below using Newton Forward Interpolation formula. **[7M]**

X	1	3	5	7	9
Y	3	14	19	23	28

2. (a) Find by Newton-Raphson method correct to 4 places of decimals of the equation $x^4 - 11x + 8 = 0$. **[7M]**

   (b) Find f(1.30) by Lagrange's interpolation formulae to the following data. **[7M]**

X	0	1.2	2.4	3.7
Y	3.14	2.68	1.37	-1.18

UNIT – II

3. (a) Derive the Normal Equations of the straight line y=ax+b by the method of least squares **[7M]**

   (b) Solve $y' = xy$, given y (1) = 0 to find y(0.4) by Euler's method. **[7M]**

4. (a) Using the principle of least squares fit an equation of the form $y = ab^x$ to the following data **[7M]**

X	2	3	4	5	6
Y	144	172.8	207.4	248.8	298.5

   (b) Find y (0.2), given that $\frac{dy}{dx} = x + y, y(0) = 1$ by Runge - Kutta method. **[7M]**

UNIT – III

5. (a) Evaluate $\iint\limits_{R} xy\,dx\,dy$ where R is the region bounded by the line x+2y=2 , lying in first quadrant.

   [7M]

   (b) Find the area of the loop of the curve $r = a\,(1 + cos\theta)$. and outside the circle r=a. **[7M]**

6. (a) By changing the order of integration, evaluate $\int\limits_{0}^{a}\int\limits_{x^2/a}^{2a-x} xy^2\,dy\,dx$ **[7M]**

   (b) Find the volume common to the cylinders $x^2 + y^2 =4$, y+z=4 and z=0 **[7M]**

UNIT – IV

7. (a) Prove that $curl\,grad\,\phi = 0$ **[7M]**

   (b) Evaluate $\int \bar{F}.\bar{n}\,ds$ where $\overline{F} = yz\bar{i} + 2y^2\bar{j} + xz^2\bar{k}$ and S is the surface of the cylinder $x^2 + y^2 = 9$ contained in the first octant between z=0 and z=2. **[7M]**

8. (a) Show that the vector $\left(x^2 - yz\right)\bar{i} + \left(y^2 - zx\right)\bar{j} + \left(z^2 - xy\right)\bar{k}$ is irrotational . Also find the scalar potential ϕ **[7M]**

   (b) Verify Stokes theorem for $\overline{F} = (y - z + 2)\bar{i} + (yz + 4)\bar{j} - xz\bar{k}$ where S is the surface of the cube x=0,y=0,z=0,x=2,y=2,z=2 above the xy-plane. **[7M]**

UNIT – V

9. (a) Evaluate **[7M]**

   i. $\int\limits_{0}^{\infty} x^6 e^{-4x^2}\,dx$

   ii. $\int\limits_{0}^{\infty} x^8 e^{-2x}\,dx$

   (b) Prove the relation x J_n'(x)= -nJ_n (x) - x$J_{(n-1)}$(x). **[7M]**

10. (a) Solve in series the equation $\frac{d^2y}{dx^2} + xy = 0$ about x=0 **[7M]**

    (b) State and Prove orthogonality of Bessel's functions. **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – I

Four Year B.Tech II Semester End Examinations (Regular), January − 2017

Regulation: R16
COMPUTER PROGRAMMING
(Common to AE/CE/ME)

Time: 3 Hours   **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

Unit − I

1. (a) Identify the steps in creating and running a C program? [7M]

   (b) The straight line method of computing the yearly depreciation of the value of an item is given by

   Depreciation = (Purchase price – Salvage Value) / Year of service

   Write a C program to determine the salvage value of an item when the purchase price, years of service and the annual depreciation are given [7M]

2. (a) Identify the different symbols used in flowchart? Draw a flowchart for finding the sum of individual digits of a three digit number? [7M]

   (b) For a certain electrical circuit with an inductance L and resistance R, the damped natural frequency is given by

   $$Frequency = \sqrt{\frac{1}{LC} - \frac{R^2}{4C^2}}$$

   Write a C program to calculate the frequency of the electrical circuit? [7M]

Unit − II

3. (a) Compare and Contrast while and do while loop with example? [7M]

   (b) The following conditions are followed for a student to promote from I year I semester to I year II semester of B.Tech: [7M]

   i. Marks in Engineering Physics >= 60

   ii. Marks in Engineering Mathematics >= 50

   iii. Marks in Computer Programming >= 40

   iv. Total in all three subjects >= 200

   v. Total in Engineering Physics and Mathematics >= 150

   Given the marks in the three subjects, write a C program to check whether a student is promoted to I year II semester or not.

4. (a) List out any 4 string handling functions with example? [7M]

(b) Write a C program to read two matrices and find the multiplication of two matrices [7M]

$$\begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \end{array} \times \begin{array}{cc} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{array} = \begin{array}{cc} 58 & 64 \\ 139 & 154 \end{array}$$

Unit − III

5. (a) List out the different types of storage classes with valid example? [7M]

(b) Write a C program that uses functions to convert decimal number to binary number? $(15)_{10} = (1\ 1\ 1\ 1)_2$ [7M]

6. (a) Distinguish between the following: [7M]
   i. Actual and formal arguments
   ii. Scope and visibility of variables

(b) Write a C program to swap two numbers without using third variable by using parameter passing techniques [7M]
   i. Call by value
   ii. Call by reference

Unit − IV

7. (a) Explain about dynamic memory allocation functions with suitable example? [7M]

(b) Write the usage of the following: [7M]
   i. Unions
   ii. Bit fields
   iii. Enumerated types

8. (a) IARE maintains salary details of every employee by storing their name, department, basic pay, da, hra and cca. Write a C program to store this information in a nested structure and display the salary of an employee [7M]

(b) Write a C program to read two complex numbers and perform the following: [7M]
   i. Addition of two complex numbers
   ii. Subtraction of two complex numbers

Unit − V

9. (a) Explain the following file I/O functions with example: [7M]
   i. fopen()
   ii. fclose()
   iii. fread()
   iv. fwrite()

(b) Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exists, then add the information of n students to the end of existing content. [7M]

10. (a) Explain the following functions with suitable example: [7M]
    i. ftell()
    ii. fseek()
    iii. rewind()

(b) Write a C program to open a file names INVENTORY and store in it the following data [7M]

Item	Number	Price	Quantity
Printer	P100	7500	10
Scanner	S200	5500	5
Hard disk	H300	4500	8

Read the data from the INVENTORY file and display the inventory table with the value of each item.

[Hint: value = price * quantity and use fprintf() and fscanf() functions]

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MODEL QUESTION PAPER – II

Four Year B.Tech II Semester End Examinations (Regular), January − 2017
Regulation: R16
COMPUTER PROGRAMMING
(Common to AE/CE/ME)

Time: 3 Hours   **Max Marks: 70**

Answer any ONE question from each Unit
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Unit − I

1. (a) Explain various computing environments with neat diagrams.   [7M]

   (b) Explain various types of bitwise operators used in C language.   [7M]

2. (a) Explain the functional units of computer?   [7M]

   (b) Write an algorithm and draw flowchart for finding greatest among three given numbers.   [7M]

Unit − II

3. (a) Write a C Program to generate all perfect numbers between 1 and n, where n value is supplied by the user.   [7M]

   (b) Write a C program to print biggest of three numbers.   [7M]

4. (a) Write C Program to read two matrices and find multiplication of two matrices.   [7M]

   (b) Write a C program to sort the given array elements in ascending order.   [7M]

Unit − III

5. (a) List out the different types of storage classes with valid example?   [7M]

   (b) Explain different types of preprocessor directives?   [7M]

6. (a) Write a C Program to that uses both the recursive and non-recursive functions to generate the Fibonacci series numbers below 1000.   [7M]

   (b) List out the advantages of using pointers and explain generic (void) pointers with suitable example.
                                                                                        [7M]

Unit − IV

7. (a) Differentiate between a structure and union?   [7M]

   (b) Write the usage of the following   [7M]
       i. Bit fields
       ii. Enumerated types

8. (a) Explain the following with suitable examples.   [7M]
      i. typedef
      ii. Self referential structures

  (b) Write a C program to read two complex numbers and perform the following: [7M]
      i. Addition of two complex numbers
      ii. Subtraction of two complex numbers

Unit – V

9. (a) Describe types of files with an example.   [7M]

  (b) Write a C program to replace every 5th character of the data file, using fseek( ) command.   [7M]

10. (a) Write the syntax for opening a file with various modes and closing a file.   [7M]

   (b) Explain about file handling functions.   [7M]

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
DATA STRUCTURES
(Common to CSE / ECE / EEE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
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UNIT – I

1. (a) Write an algorithm to sort the elements of an array using quick sort technique and sort the following set of elements using quick sort: 25 40 -6 10 15 20 65 5?   **[7M]**

    (b) Write a C program to search a given element in an array using linear search technique?   **[7M]**

2. (a) Design the recursive method/formulas to compute the GCD of a given two numbers m and n. Write a C function to perform the above?   **[7M]**

    (b) Explain the working of Insertion sort on a set of integers?   **[7M]**

UNIT – II

3. (a) What is a queue? Explain different types of queues?   **[7M]**

    (b) Write a C program to find whether the given string is palindrome or not using a stack?   **[7M]**

4. (a) Explain double ended queue with one example?   **[7M]**

    (b) A Circular Queue has size of 5 and has three elements 10, 40 & 20 where F=2 and R=4. After inserting 50 and 60 what is the value of F and R. Trying to insert 30 at this stage what will happen? Delete two elements from the queue and insert 100. Show the sequence of steps with necessary diagram and with the value of F and R?   **[7M]**

UNIT – III

5. (a) What problem occurs when we insert a node to the front of a circular linked list? Suggest a possible solution for the same?   **[7M]**

    (b) Write a C routine to delete all the nodes whose information field contains the value x, from a singly linked list?   **[7M]**

6. (a) Implement a C program to maintain student information using single linked list (student name, semester, address, subjects) **[7M]**
   i. Add student to list
   ii. Delete a student
   iii. Display student information?

   (b) Write a C function to insert a node before a given key node in a doubly linked list? **[7M]**

UNIT – IV

7. (a) For the following graph, starting at vertex 'a', traverse the graph by depth-first search and construct the corresponding depth-first search tree. Give the order in which the vertices were reached for the first time and the order in which the vertices became dead ends **[7M]**
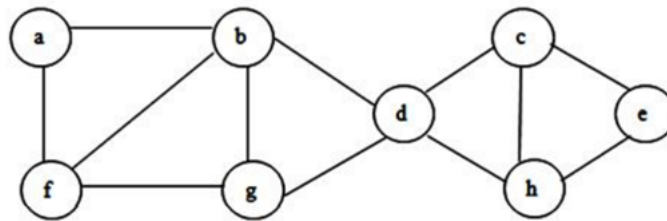
Figure 1

   (b) How does a binary search tree differ from a binary tree? Explain with example trees. Write an algorithm to insert a new node into a binary search tree? **[7M]**

8. (a) Insert the following numbers into a binary search tree in the order that they are given and draw the resulting tree. **[7M]**
   87,36,22,15, 56, 85, 48, 90, 72.
   Delete 48 and draw the resulting tree. Delete 15 and draw the resulting tree.

   (b) Write an algorithm which inputs a simple graph and outputs whether or not the graph is connected? **[7M]**

UNIT – V

9. (a) Given an input 4371,1323,6173,4199,4344,9679,1989,7759 and a hash function h(X)=X (mod 10), show the resulting: **[7M]**
   i. separate chaining table
   ii. open addressing hash table using linear probing

   (b) Construct an AVL tree with the following numbers:25,46,13,55,15,30,58,4,6. Insert 50, 10, 40 the constructed tree and rebalance the tree if necessary. **[7M]**

10. (a) Show the B-tree that results when insert in R,Y,F,X,A,M,C,D,E,T,H,V,L,W,G (in that order) balancing factor of t = 3. You need only draw the trees just before and after each split. **[7M]**

    (b) A hash table is to be created with room for 11 data items. Assuming linear probing is used. Allocate data with the following keys to the table (arriving in the order shown): 81, 20, 34, 42, 21, 45; **[7M]**

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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
DATA STRUCTURES
(Common to CSE / ECE / EEE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
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UNIT – I

1. (a) Write the classification of Data structures with an example for each type.   **[7M]**

   (b) Given an array of n distinct integers sorted in ascending order, write a recursive function that returns a Fixed Point in the array, if there is any Fixed Point present in the array, else returns -1. Fixed Point in an array is an index i such that arr[i] is equal to i. Note that integers in the given array can be negative. Examples: **[7M]**
   Input: arr[ ] = {-10, -5, 0, 3, 7}   Output: 3 // arr[3] == 3
   Input: arr[ ] = {0, 2, 5, 8, 17}   Output: 0 // arr[0] == 0
   Input: arr[ ] = {-10, -5, 3, 4, 7, 9}   Output: -1 // No Fixed Point

2. (a) What is direct and indirect recursion? Write algorithms to demonstrate them.   **[7M]**

   (b) Write an algorithm to sort the elements of an array using merge sort technique   **[7M]**

UNIT – II

3. (a) Discuss the advantages of circular queue over linear queue. Write an algorithm to insert and delete an element from circular queue   **[7M]**

   (b) Write a function to evaluate given post fix expression 234+*.   **[7M]**

4. (a) A queue is a abstract data type or collection in which the entities in the collection are kept in order and the principal operations on the collection are the addition of entities to the rear terminal position, known as enqueue, and removal of entities from the front terminal position, known as dequeue. Write a C program to implement the Queue data structures.   **[7M]**

   (b) What is a stack? Write any two application of stack?   **[7M]**

UNIT – III

5. (a) Write a C program to add two polynomials using linked lists.   **[7M]**

(b) Write an algorithm to perform each of the following operations on a Single Linked List **[7M]**
  i. Append an element to the end of a list
  ii. Delete every second element from the list
  iii. Concatenate two lists
  iv. Delete the last element from a list

6. (a) Given a linked list and two integers M and N. Traverse the linked list such that you retain M nodes and then delete next N nodes, continue the same till the end of the linked list. Write a c function for the same. **[7M]** Input: M = 2, N = 2
Linked List: 1->2->3->4->5->6->7->8
Output:
Linked List: 1->2->5->6
Input: M = 3, N = 2
Linked List: 1->2->3->4->5->6->7->8->9->10
Output:
Linked List: 1->2->3->6->7->8
Input: M = 1, N = 1
Linked List: 1->2->3->4->5->6->7->8->9->10
Output: Linked List: 1->3->5->7->9

(b) Write a C function to insert a node before a given key node in a doubly linked list. **[7M]**

UNIT – IV

7. (a) Explain the various operations on graphs with suitable examples **[7M]**

(b) Construct a Binary Search tree for the following elements 5, 15, 2, 25, 16, 7, 9, 3, 35, 30, 10. Delete 25 and reconstruct the tree **[7M]**

8. (a) Write functions to implement BFS Traversal on a graph represented by a adjacency matrix. Using the BFS function, label the components of a graph. **[7M]**

(b) The following are the postfix order and in-order traversal of binary search tree. Construct the binary search for the following: **[7M]**
Post : 5, 9, 8, 13, 17, 25, 20, 15, 10
In : 5, 8, 9, 10, 13, 15, 17, 20, 25

UNIT – V

9. (a) Insert the following numbers into a AVL tree in the order that they are given and draw the resulting tree. **[7M]**
87,36,22,15, 56, 85, 48, 90, 72.
Delete 48 and draw the resulting tree. Delete 15 and draw the resulting tree.

(b) Construct the hash table with the table size of 13 for the following values: **[7M]**
39, 48,61, 74,87 ,100,113.
Implement using open addressing and separate chaining with appropriate algorithms.

10. (a) Write a recursive algorithm for finding the height of a binary tree. The input to the algorithm is the node of a tree. Moreover, you may assume that each node has pointers to its left and right children. **[7M]**

(b) What is the difference between AVL tree and binary search tree? **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017

Regulation: IARE–R16

ELECTRICAL CIRCUITS

(Common to EEE and ECE)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT − I

1. (a) State Kirchhoff's laws.Make short notes on practical sources and ideal sources.   **[7M]**

     (b) Calculate equivalent resistance across A-B terminals   **[7M]**
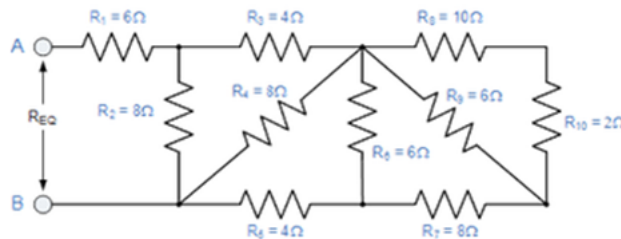
Figure 1

2. (a) Give the technique of source transformation and Discuss the classification of circuit elements

                                                                    [7M]

     (b) Find the supply voltage and equivalent resistance of the circuit?   **[7M]**

Figure 2

3. (a) Find the power absorbed by 6 ohms resistor using mesh analysis [**7M**]
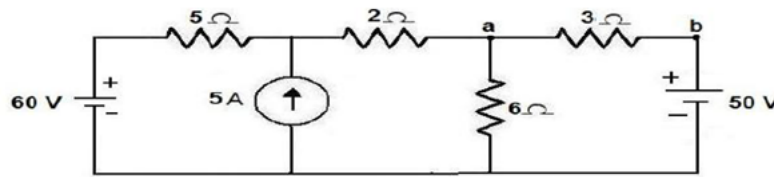
Figure 3

(b) Derive the star-delta transformations [**7M**]

4. (a) Find the equivalent resistance across A-B terminals by using star-delta transformation [**7M**]
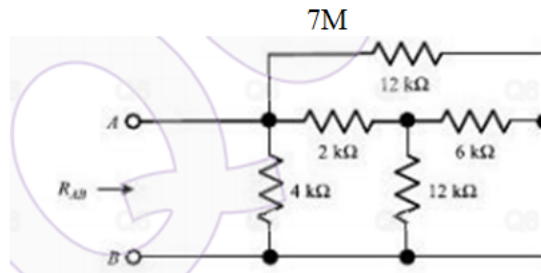
Figure 4

(b) Explain the procedure to draw the dual network and Draw the dual network for the below network [**7M**]
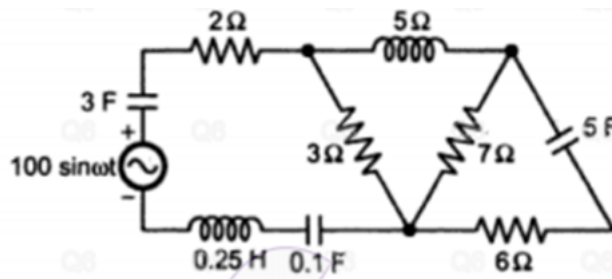
Figure 5

UNIT – III

5. (a) The voltage of a circuit is $v = 200 \sin(wt + 30^0)$ and the current is $i = 50 \sin(wt + 60^0)$. Calculate [**7M**]

   i. The average power, reactive power and apparent power.

   ii. The circuit elements if $w = 100\pi$ rad /sec.

(b) Find the RMS, average values and form factor of the following waveform [**7M**]
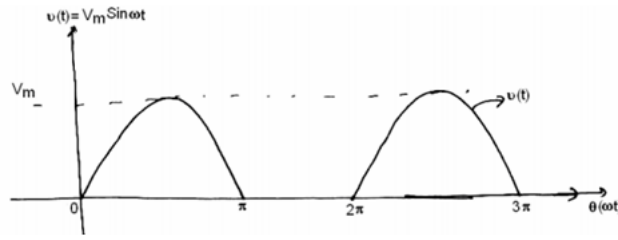
Figure 6

6. (a) Explain the concept of reactance and impedance offered by R,L,C parameters **[7M]**

   (b) A series circuit consisting of a 10Ω resistor, a 100μF capacitor and a 10 mH inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance and current in the circuit **[7M]**

UNIT – IV

7. (a) A series RLC circuit with 8 ohms resistance should be designed to have a band width of 50Hz determine value of L and so that the circuit resonates at 250Hz. **[7M]**

   (b) Derive the expression for bandwidth of series RLC circuit **[7M]**

8. (a) Derive the expression for co-efficient of coupling. **[7M]**

   (b) A series RLC circuit has Q = 75 and a pass band (between half power frequencies) of 160 Hz. Calculate the resonant frequency and the upper and lower frequencies of the pass. **[7M]**

UNIT – V

9. (a) State and explain superposition theorem **[7M]**

   (b) Using Thevenin's theorem find the equivalent circuit to the left of the terminals in the circuit shown , Find current i. **[7M]**
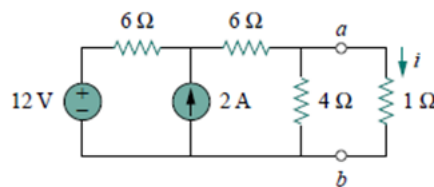
Figure 7

10. (a) State and explain maximum power transfer theorem. **[7M]**

    (b) In an circuit branch AB = 10 Ω, BC = 20 Ω, CD = 15 Ω, BD = 8 Ω and DA = 5 Ω and an source of 100V in series with 5 OHMS connected across A and C. verify the tellegen's theorem. **[7M]**

Question Paper Code: AEE002

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
ELECTRICAL CIRCUITS
(Common to EEE and ECE)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain in detail the volt-ampere relationship of R, L and C elements with neat Diagrams **[7M]**

    (b) Calculate the equivalent resistance for the given network.   **[7M]**
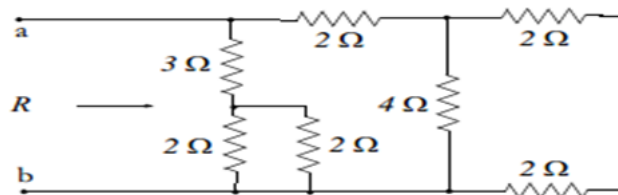
Figure 1

2. (a) Define junction, loop, circuit, network and branch .Calculate voltage across a-b terminals using source transformation technique.   **[7M]**
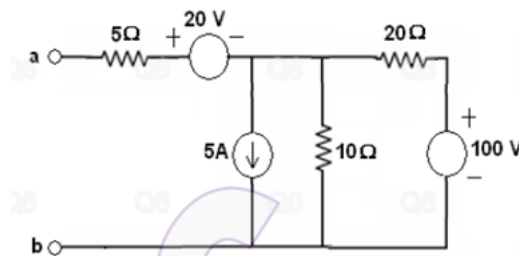
Figure 2

    (b) Explain series, parallel and series-parallel connections for resistive, inductive and capacitive circuits with neat examples.   **[7M]**

UNIT – II

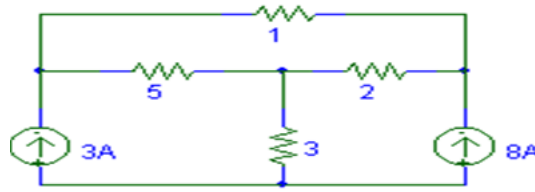3. (a) Determine the node voltages, current through each branch and the power absorbed by 5 ohms resistor. **[7M]**

Figure 3

(b) Explain the inspection method to write mesh and nodal equations for an network **[7M]**

4. (a) Calculate the voltage to be applied across AB in order to drive a current of 5A in the circuit by using star-delta transformation **[7M]**

Figure 4

(b) Define terms graph, oriented and non-oriented graph, planar and non- planar graph, tree and co-tree, branches and links, nodes and degree of the node **[7M]**

UNIT – III

5. (a) Explain the steady state analysis of series RLC circuit. **[7M]**

(b) In an ac circuit two parallel impedances are in connected across AB terminals, where AB terminals are fed by 150V , 0 degrees with series impedance of Z3. Calculate total impedance, power factor, source current and voltage drop across Z2 **[7M]**
Z1= $(1 + j)$ohms
Z2= $(3 + 5j)$ohms
Z3= $(2 + 5j)$ohms

6. (a) A series circuit consisting of a 10Ω resistor, a 100μF capacitor and a 10 mH inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance, current in the circuit, the power factor, complex power and power dissipated in the circuit . **[7M]**

(b) Explain the concept of active, reactive and apparent power and draw the power triangle (derive relevant expressions). **[7M]**

UNIT – IV

7. (a) Series resonance network consisting of a resistor of 30Ω, a capacitor of 2μF and an inductor of 20mH is connected across a sinusoidal supply voltage 100sin 50t . Determine : **[7M]**

      i. The resonant frequency,

      ii. The current at resonance,

      iii. The voltage across the inductor and capacitor at resonance

      iv. The quality factor

      v. The bandwidth of the circuit.

   (b) A series circuit consists of a resistance of 4Ω, an inductance of 500mH and a variable capacitance connected across a 100V,50Hz supply. Determine : **[7M]**

      i. The capacitance required to give series resonance.

      ii. The voltages generated across both the inductor and the capacitor under resonance.

8. (a) Explain the concept of series and composite magnetic circuit **[7M]**

   (b) An iron ring 10cm dia and $15cm^2$ in cross section is wound with 250 turns of wire for a flux density of 1.5 wb/cm^2 and permeability 500. Find the exciting current to the inductance, mmf, flux, reluctance and field intensity. **[7M]**

UNIT – V

9. (a) State and derive the condition for maximum power transfer in AC circuits **[7M]**

   (b) Verify Tellegen's theorem provide V_1 =8V, V_2=4V, V_4=2V, I_1 =4A, I_2 = 2A and I_3 =1A. **[7M]**
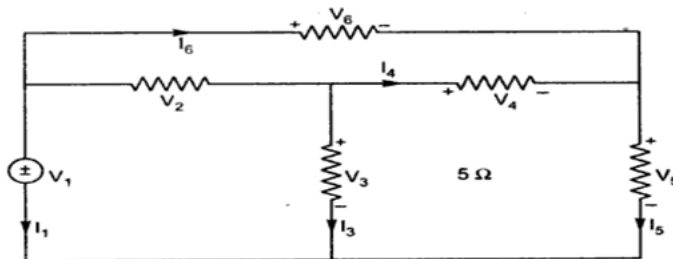

Figure 5

10. (a) State and Explain reciprocity theorem **[7M]**

   (b) Using Milliman's theorem determine the current throught RL in the circuit and the voltage drop($r_1 = r_2 = r_3 = 2Ω, R_L = 5Ω$) **[7M]**
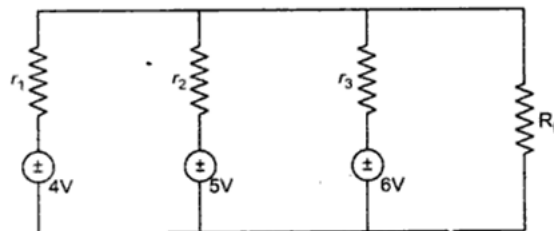

Figure 6

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
ENGINEERING MECHANICS
(Common to AE/ME/CE)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) An aeroplane is flying in horizontal direction of 540 km/hr and at a height of 2200m as shown in figure 1 When it is vertically above the point A on the ground, a body is dropped from it. The body strike the ground at point B. Calculate the distance AB ignoring air resistance. Also find velocity at B and time taken to reach B. **[7M]**
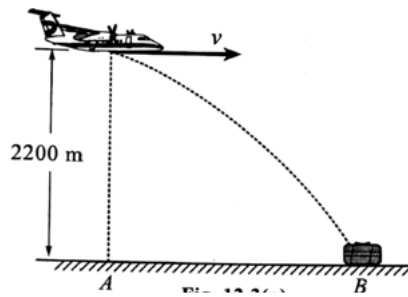

Figure 1

   (b) Derive all the three kinematic equations of linear motion having constant acceleration. **[7M]**

2. (a) A stone is dropped from the top of a tower. When it has travelled a distance of 10m, another stone is dropped from a point 38m below the top of the tower. If both the stones reach the ground at the same time, calculate **[7M]**
   i. The height of the tower and
   ii. The velocity of the stone when they reach the ground

   (b) A body A is projected vertically upwards from the top of a tower with a velocity of 40m/s, the tower being 180m high. After t seconds, another body B is allowed to fall from the same point. Both the bodies reach the ground simultaneously. Calculate t and the velocities of A and B on reaching the ground. **[7M]**

UNIT – II

3. (a) Two bodies of weight 40N and 25N are connected to the two ends of a light inextensible string, passing over a smooth pulley. The weight of 40N is placed on the horizontal surface while the weighty of 25N is hanging free in air. If the angle of the plane is 15o, determine **[7M]**

     i. The acceleration of the system

     ii. The tension in the string (take coefficient of friction as 0.2)

     iii. The distance moved by the weight 25N in 3s starting from rest.

(b) Two blocks A and B are connected by an inextensible string moving over a frictionless pulley as shown in the figure 2 given below. If the blocks are released from rest, determine the velocity of the system after the travel of 4s. Take the masses of blocks A and B as 20 and 60 kg respectively and coefficient of friction for all the contiguous surfaces as 0.3 **[7M]**
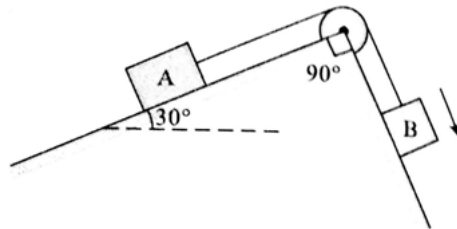

Figure 2

4. (a) A pulley whose axis passes through the centre 'O' carries a load as shown in figure 3 given below. Neglect the inertia of pulley and assuming that the cord is inextensible; determine the acceleration of the block A. How much weight should be added to or taken away from the block A if the acceleration of the block A is required to be g/3 downwards? **[7M]**
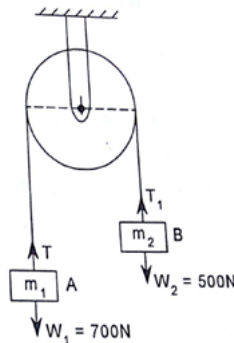

Figure 3

(b) A motor car of total mass 90Kg is travelling at constant speed of 45Kmph up an incline of 1 in 30 against frictional resistance of 0.1 N/Kg. Calculate the tractive effort required to maintain this constant speed. If the engine is suddenly switched off, what will be the time taken for the car to come to rest. **[7M]**

5. (a) Explain the impulse-momentum method. **[7M]**

    (b) Two blocks of weight 200 N and 300 N are placed on the planes and are connected by a cord passing over a frictionless pulley. If the coefficient of friction between the planes and blocks is 0.3 as shown in figure, find the distance the block WB attain the final velocity of the 4 m/s starting from rest. What is the tension in the cord? **[7M]**

Figure 4

6. (a) Write the applications of principle of virtual work. **[7M]**

    (b) Two uniform rods each of length 'l' and weight 'w' are connected . Using the method of virtual work determine θ_1 and θ_1 corresponding to the equilibrium of the bars. **[7M]**

UNIT – IV

7. (a) A block of mass 5kg resting a 30o inclined plane is released. The block after travelling a distance of 0.5m along inclined plane hits a spring of stiffness 15N/cm as shown in figure 5 given below. Find the maximum compression of spring. Assume coefficient of friction between block and the inclined plane as 0.2. **[7M]**
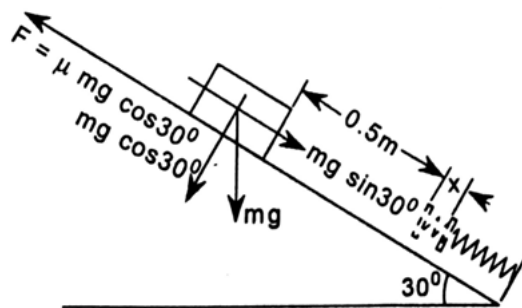

Figure 5

    (b) Derive the expression for bandwidth of series RLC circuit **[7M]**

8. (a) A fly wheel of 50KN and having a radius of gyration of 1m ,loss its speed from 400 rpm to 280 rpm in 2 minutes. Calculate **[7M]**
        i. Torque acting on it
        ii. Change in kinetic energy
        iii. Change in angular momentum

(b) Two blocks A and B are connected with inextensible string as shown in figure 6 given below. If the system is released from rest, determine the velocity of block A after if has moved 1.5m. Assume the coefficient of friction between block A and the plane is 0.25. Masses of block A and B are 200kg and 300kg respectively. **[7M]**
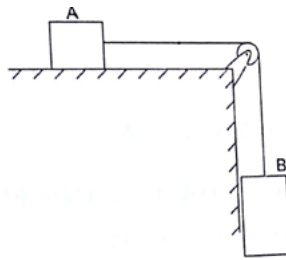

Figure 6

UNIT – V

9. (a) Derive an expression for the time period of a compound pendulum. **[7M]**

(b) A particle is moving with its acceleration directed to and proportional to its distance from a fixed point. When the distance of the particle from equilibrium position has values of 1.3m and 1.8m, the corresponding velocities are 5m/s and 2 m/s. Determine **[7M]**
   i. Amplitude and time period of oscillations
   ii. Maximum velocity and maximum acceleration

10. (a) Derive an expression for the time period of a torsional pendulum **[7M]**

(b) A vertical shaft 5mm in diameter and 1m in length has its upper end fixed to the ceiling. At the lower end it carries a rotor of diameter 200mm and weight 20N. The modulus of rigidity for the rotor is $0.85x10^5 N/mm^2$. Calculate the frequency of torsional vibration for the system. **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
ENGINEERING MECHANICS
(Common to AE/ME/CE)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) A body A is projected vertically upwards from the top of a tower with a velocity of 40m/s, the tower being 180m high. After t seconds, another body B is allowed to fall from the same point. Both the bodies reach the ground simultaneously. Calculate t and the velocities of A and B on reaching the ground. **[7M]**

    (b) Two stones are projected vertically upwards at the same instant. One of them ascends 80 meters higher than the other and returns to the earth 4 seconds later. Find **[7M]**
      i. The velocities of projection
      ii. The maximum heights reached by the stones

2. (a) A ball is thrown vertically upwards from 12m level in an elevator shaft with initial velocity 18m/s. At the same time an open platform elevator passes 5m level, moving upwards with a constant velocity 2m/s. Determine: **[7M]**
      i. When and where the ball will hit the elevator
      ii. The relative velocity of the ball with respect to the elevator, when the ball hits it

    (b) In the position shown in figure below, rod AB is horizontal and has angular velocity 1.8 rad/s in Clockwise sense. Determine angular velocities of BC and CD. **[7M]**

UNIT – II

3. (a) An elevator weighing 4900N is ascending with an acceleration of 3 m/s^2. During the ascent its operator whose weight is 686N is standing on the scales placed on the floor. What is the scale reading? What will be total tension in the cable of the elevator during this motion? **[7M]**
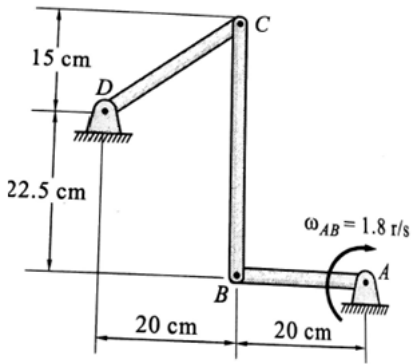
Figure 1

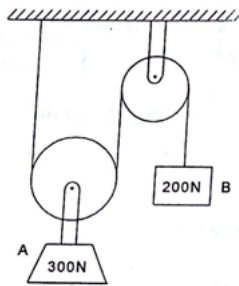(b) Find the velocity of block B shown in figure 2 given below, after 5 seconds starting from rest.
[7M]

Figure 2

4. (a) Considering the inertial and the frictional effect absent in the pulley system, determine the downward acceleration of mass m1 as shown in figure given below. Take $m_1 = 8Kg, m_2 = 12Kg, r_1 = 2r_2 = 20cm$
[7M]
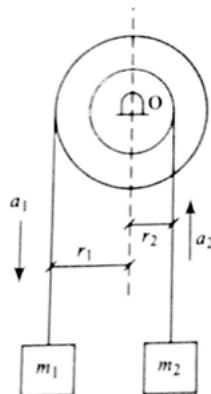

Figure 3

(b) Determine the tension in the inextensible string of the system shown the figure 4 below while $m_1 = 200Kg$ and $m_2 = 100Kg$. Consider the pulley as massless and coefficient of friction as 0.2.
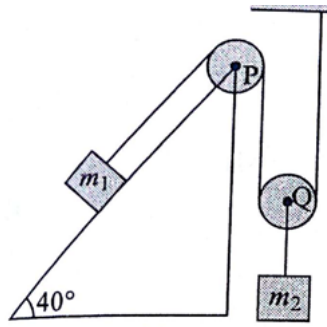[7M]

Figure 4

UNIT – III

5. (a) A body of mass 2Kg is moving at a speed of 0.5m/s to the right collides with a mass of 3.5Kg which is at rest. After collision, the 3.5Kg mass moves to right at a speed of 0.25m/s, determine the coefficient of restitution. **[7M]**

   (b) Two blocks W_1 and W_2 are resting on inclines AC and BC respectively. The blocks are connected with the inextensible cord passing over a smooth pulley as shown in the figure given below. The coefficient of friction on AC and BC are μ_1 and μ_2 respectively. By using the method of virtual work, determine the ratio of W_1 and W_2 for equilibrium. **[7M]**

Figure 5

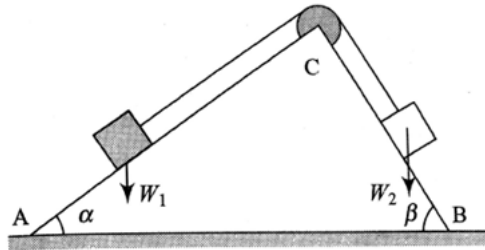6. (a) Two beams AB and CD are arranged and supported as shown in figure 6 given below. Using the principle of virtual work, determine the reaction at support E if a load of 1KN acts at 0.75m away. from support A **[7M]**
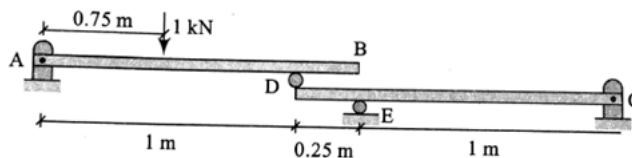

Figure 6

   (b) Using the principle of virtual work, determine the reactions at roller supports at A,B and F of the compound beam, as shown in the figure 7 given below **[7M]**
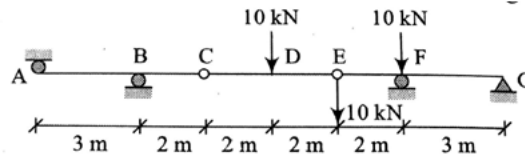
Figure 7

UNIT – IV

7. (a) Body A starts from rest in the position as show in figure 8 given below. Determine its velocity after it has moved 2.7m along the smooth surface. Body A weighs 1335N while body B weighs 890N. **[7M]**
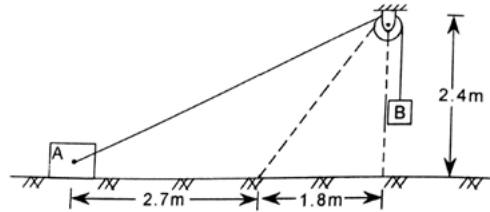
Figure 8

(b) Two blocks of A (200N) and B (240N) are connected as shown in figure 9given below. When the motion begins, the block B is 1m above the floor. Assuming the pulley to be frictionless and weightless, determine

i. The velocity of block A when the block B touches the floor **[7M]**

ii. How far the block A will move up the plane?
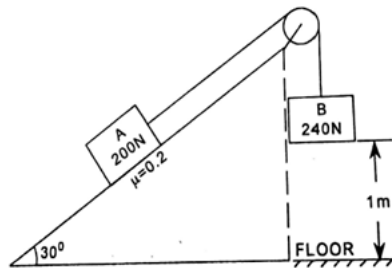
Figure 9

8. (a) An engine of mass 100tonne is going up an inclination of 1 in 100 while pulling a train of mass 200 tonnes. At an instant when this unit is moving with a speed of 32kmph, the acceleration amounts to $0.15\text{m}/s^2$. Frictional resistance in this path amounts to 40N per tonne. What can be the power exerted by this engine during the pull? **[7M]**

(b) A body weighing 20N is projected up to 20° inclined plane with a velocity of $12\text{m}/s^2$, coefficient Of friction is 0.15. Find **[7M]**

i. The maximum distance the body will move up the inclined plane.

ii. Velocity of the body when it returns to its original position

UNIT – V

9. (a) Determine the period of vibration of a weight P attached to springs of stiffness k1 and k2 in two different cases as shown in figure 10 given below. **[7M]**
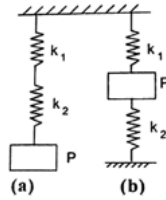
Figure 10

(b) A vertical shaft 5mm in diameter and 1m in length has its upper end fixed to the ceiling. At the lower end it carries a rotor of diameter 200mm and weight 20N. The modulus of rigidity for the rotor is 0.85x105 N/mm^2. Calculate the frequency of torsional vibration for the system. **[7M]**

10. (a) A body performing simple harmonic motion has a velocity 20m/s when the displacement is 40mm and 3m/s when the displacement is 120mm, the displacement measured from the mid-point. Calculate the frequency and amplitude of the motion. What is the acceleration when the displacement is 85mm. **[7M]**

(b) A conical pendulum rotates at 100 rev/min. The cord is 150mm long and the mass of bob1.35Kg. Find **[7M]**

   i. The amount of which the bob rises above its lowest position

  ii. The period

 iii. The tension in the cord.

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER – I

Four Year B.Tech II Semester End Examinations (Regular), December − 2017
Regulation: R16
ENGLISH FOR COMMUNICATION
(Common to CSE/IT/ECE)

Time: 3 Hours   **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

Unit − I

1. (a) What is meant by listening? How do you assess a person's listening skills? What are the different barriers of listening? [7M]

   (b) Who is an active listener? How does listening to dialogues differ from listening to conversation? Elaborate. [7M]

2. (a) How many types of listeners are there? Elaborate with examples. Listening is not the same as hearing. Explain. [7M]

   (b) Explain the different stages of Active listening? and how do the gender barriers effect your listening? [7M]

Unit − II

3. (a) Define a dialogue and Illustrate the various aspects in a dialogue elaborately with practical examples. [7M]

   (b) What is a role play? Explain different types of Role Plays with examples? Differentiate between role play and debate. [7M]

4. (a) What is functional English ? Write ten formal requests (Formal sentences where you request someone to give something to you) to get something from others? [7M]

   (b) What are Speaking Skills? Do you think one must need speaking skills in professional life? Explain in detail. [7M]

Unit − III

5. Define the following: [14M]

   (a) Reading skill

   (b) Intensive Reading

   (c) Extensive Reading

   (d) Skimming

   (e) Scanning

6. (a) What is reading comprehension? How do you comprehend a written text? [7M]

(b) What are the reasons for poor reading comprehension? [7M]

Unit – IV

7. What is coherence in paragraph writing? Illustrate briefly about techniques for paragraph development? [14M]

8. What is the difference between a Resume and Curriculum Vitae (CV) Draft a sample cover letter along with CV. [14M]

Unit – V

9. Explain the following with suitable examples [14M]

(a) Direct Speech and Indirect Speech

(b) Word formation

(c) Active Voice and Passive Voice

(d) Types of verbs

10. Write about the usage of the following: [14M]

(a) Articles

(b) Punctuation

(c) Will and shall

(d) Subject and verb agreement

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER – II

Four Year B.Tech II Semester End Examinations (Regular), January − 2017
Regulation: R16
ENGLISH FOR COMMUNICATION
(Common to CSE/IT/ECE)

Time: 3 Hours   **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

Unit – I

1. (a) Write the difference between listening and hearing. Who is a 'Superficial listener' and explain them with examples? [7M]

   (b) What are the tips to follow during active listening? Give an account of different types of listeners with examples. [7M]

2. (a) Explain about the variations in Indian pronunciation with examples. What is accent neutralization? [7M]

   (b) What are the ways to improve listening comprehension? Discuss the in detail. [7M]

Unit – II

3. (a) Define speaking and its significance. Narrate your favorite television program [7M]

   (b) Briefly describe various barriers of speaking. [7M]

4. (a) What are the functions of a dialogue? Narrate the celebration of your birthday? [7M]

   (b) What is an oral presentation? Explain the steps/principles to be followed in presenting a paper. [7M]

Unit – III

5. Write the importance of reading skill? What are the reasons for poor reading? Write in detail about the techniques of reading? [14M]

6. (a) Why reading skill is important? Define four main types of reading techniques? [7M]

   (b) Explain the techniques used in different situations? [7M]

Unit – IV

7. Explain the essentials of writing skill? Write the format of Curriculum vitae (CV). What is the difference between CV and a Resume? [14M]

8. What does unity refer to in a paragraph? Illustrate briefly about techniques used for paragraph development? [14M]

Unit – V

9. Explain the following with suitable examples: [14M]
   (a) Idioms
   (b) Direct Speech and Indirect Speech
   (c) Prepositions
   (d) Tenses

10. Fill up the blanks: [14M]
   (a) Fill up the blanks with suitable articles
       i. Please meet me at the train station in _____ hour from now.
       ii. Can you please go to _____ grocery store on Fifth Street and buy 2 cartons of milk?
       iii. My brother won an award for being _____ best speaker in our college.
       iv. _____ President of India will be visiting Australia next week.
       v. I had _____ fish and chips for dinner.
   (b) Fill up the blanks with suitable verb forms.
       i. Janet _____ karate class every Saturday (attend).
       ii. The eldest brother _____ the family since his father passed away(support).
       iii. The athletes _____ for Canada tomorrow(leave).
       iv. When in season, we _____ mangoes almost every day(eat).
       v. If the weather is fine, we _____ the telematches in the field (hold).
   (c) Fill up the blanks with suitable prepositions.
       i. Jessica is _____ vacation. She is _____ Italy now.
       ii. Look _____ the flowers.
       iii. This dress is very special _____ me.
       iv. Guess what I have _____ my hand?

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
ENVIRONMENTAL STUDIES
(Common for all branches)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain energy flow pattern in different types of ecosystem. What happens to the energy flow as we move up the tropical levels? **[7M]**

   (b) List the main components of ecosystem and briefly describe the functions of each **[7M]**

2. (a) Explain the role of producers, consumers and decomposers in an ecosystem with practical example. **[7M]**

   (b) List the biogeochemical cycles. Explain about carbon and nitrogen cycles with the help of a diagram. **[7M]**

UNIT – II

3. (a) Explain how water becomes a renewable resource. What are the effects of over exploitation of water resources? **[7M]**

   (b) Discuss briefly droughts and floods with respect to their occurrence and impacts. **[7M]**

4. (a) List out alternate energy sources. Explain their present status, merits and demerits. **[7M]**

   (b) Explain how serious are water logging and soil salinity in land degradation. **[7M]**

UNIT – III

5. (a) Define biodiversity. Explain genetic diversity, species diversity and ecosystem diversity. **[7M]**

   (b) Our India is a "Mega diversity Nation". Support the statement highlighting the biodiversity greatness of INDIA. **[7M]**

6. (a) Explain hotspots of biodiversity and mention three hotspots found in India. Discuss their salient features. **[7M]**

   (b) What are the major causes of human-wildlife conflicts? Suggest suitable wild life conservation practices. **[7M]**

7. (a) What are primary and secondary air pollutants? Enumerate various methods to control air pollution. **[7M]**

   (b) What adverse effects can solid wastes cause? Discuss how the solid waste can be managed. **[7M]**

8. (a) Describe the major sources of soil pollution. How does soil pollution affect soil productivity and what measures can be taken to prevent soil pollution. **[7M]**

   (b) Discuss the difference of opinion between north block and south block countries during earth summit, 1992. **[7M]**

UNIT – V

9. (a) Discuss the salient features of Air (Prevention and control of pollution) Act, 1981. **[7M]**

   (b) What are the major municipal solid waste management and handling rules? **[7M]**

10. (a) Discuss the salient features of environmental protection act, 1986. **[7M]**

    (b) Define sustainable development. What are the threats and measures for sustainable development? **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
ENVIRONMENTAL STUDIES
(Common for all branches)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What are the ecological pyramids? Explain why some of these pyramids are upright while others are inverted in different ecosystem. **[7M]**

    (b) What is a food chain? Differentiate between grazing food chain and detritus food chain. **[7M]**

2. (a) What are biogeochemical cycles? Explain phosphorous cycle with the help of a diagram. **[7M]**

    (b) Discuss the significance of food chains and food webs with relevant examples. **[7M]**

UNIT – II

3. (a) Classify natural resources. What are the different methods of conserving water resource? **[7M]**

    (b) Discuss in detail the major environment and social impacts of mineral extraction. **[7M]**

4. (a) What are the advantages and disadvantages of dams to the society and environment? **[7M]**

    (b) Differentiate between renewable and non-renewable resources with examples. Explain how almost every source of energy has its limits. **[7M]**

UNIT – III

5. (a) Summarize consumptive use value, productive use value, social value, ethical value, aesthetic value and optional value of biodiversity. **[7M]**

    (b) What is the flora and fauna found in Indo-Burma, Western Ghats and Eastern Himalayas regions of India? **[7M]**

6. (a) Explain in-situ and ex-situ conservation of biodiversity with examples. **[7M]**

    (b) What factors lead to biodiversity loss? Explain the human impact on biological diversity. **[7M]**

UNIT – IV

7. (a) Enumerate with examples the major sources of surface water pollution and ground water pollution. Explain the methods to control water pollution. **[7M]**

   (b) Define e-waste. Discuss how e-waste can be managed to prevent environmental pollution. **[7M]**

8. (a) Explain about climate change and global warming. What is the role of kytoprotocol against climate change? **[7M]**

   (b) Discuss the difference of opinion between north block and south block countries during earth summit, 1992. **[7M]**

UNIT – V

9. (a) Write the objectives, principles, key elements and importance of environmental impact assessment. **[7M]**

   (b) What are hazardous wastes? Discuss the rules to manage and handle hazardous wastes. **[7M]**

10. (a) Describe the importance of environmental education. What is value-based environmental education? **[7M]**

    (b) Explain the concept of green building. How will green building impact the environment overall. **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017

Regulation: IARE–R16

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to CSE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) State Kirchhoff's laws.Find the current flowing through network shown in figure 1   **[7M]**
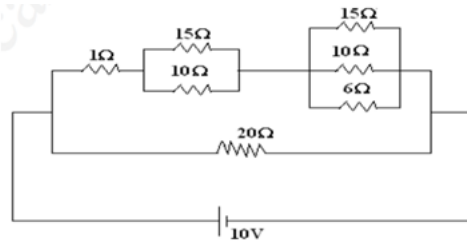
Figure 1

   (b) Define Faraday's law of electromagnetic induction.   **[7M]**

2. (a) Calculate   **[7M]**
   i. the equivalent resistances across the terminals of the supply,
   ii. total current supplied by the source and
   iii. power delivered by the source in the circuit shown in figure 2
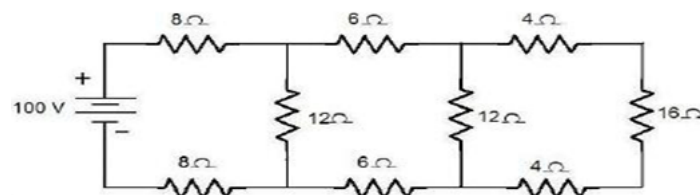
Figure 2

   (b) Derive current and voltage division rules.   **[7M]**

UNIT – II
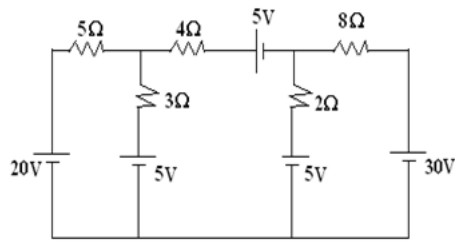
Figure 3

3. (a) Find the loop currents by using mesh analysis for given circuits shown in figure below   **[7M]**

   (b) Define and explain the following terms: **[7M]**
       i. Branch
       ii. Tree
       iii. Twig
       iv. Path
       v. Cutest.

4. (a) Calculate the current flowing through 3 ohms resistor using thevenin's theorem.If the circuit is as below   **[7M]**

element	From node	To node
20 V source	a	0
4 ohms	a	b
5 ohms	b	0
2 ohms	b	c
3 ohms	c	0

   (b) Determine the voltage V_2 and V_3 in the circuit shown in figure 4 using cutset analysis (choose 1,4,3 for this purpose)   **[7M]**
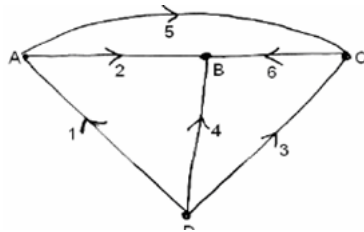
Figure 4

UNIT – III

5. (a) The voltage of a circuit is $v = 200 \sin (wt + 30^0)$ and the current is $i = 50 \sin(wt + 60^0)$. Calculate   **[7M]**
       i. The average power, reactive power and apparent power.
       ii. The circuit elements if w $=100\pi$rad /sec.

(b) Derive the relationship between line and phase quantities in a 3 phase Delta balanced connected system **[7M]**

6. (a) A three phase balanced delta connected load of (8+j8) ohm is connected across a 400V, 3π balanced supply. Determine the phase currents and line currents. Assume the phae of sequence to be RYB **[7M]**

   (b) Explain how reactive power can be measured in three phase circuits

UNIT – IV

7. (a) Define semiconductor.Explain the operation of PN junction diode in forward bias and reverse bias **[7M]**

   (b) A full wave bridge rectifier having load resistance of 100Ω is fed with 220V, 50Hz through a Step-down transformer of turn's ratio 11:1. Assuming the diodes ideal, calculate **[7M]**
       i. DC output Voltage
       ii. Peak inverse voltage
   iii. Rectifier efficiency

8. (a) Define rectifier? Describe all parameters for Half wave rectifier? **[7M]**

   (b) A HWR circuit supplies 100mA DC current to a 250Ω load. Calculate the DC output voltage, PIV rating of a diode and the RMS voltage for the transformer supplying the rectifier **[7M]**

UNIT – V

9. (a) Explain the operation of BJT and its types?Draw the input and output characteristics of a transistor in common emitter Configurations? **[7M]**

   (b) Determine the collector current and emitter current for a transistor with $\alpha = 0.99$ and $I_{CBO} = 490\mu A$ when the base current is 19μA? **[7M]**

10. (a) Define Transistor?Explain the term and current gains and their relationship for N-P-N transistor **[7M]**

    (b) For an NPN transistor with αN= 0.98, ICO= 2μA and IEO= 1.6μA connected in Common Emitter Configuration, Determine the minimum base current for which the transistor enters into saturation region. VCC and load resistance are given as 12 V and 4.0 KΩ respectively **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CSE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Define the power and energy in R, L and C elements.Calculate the power consumed by each resistor   **[7M]**
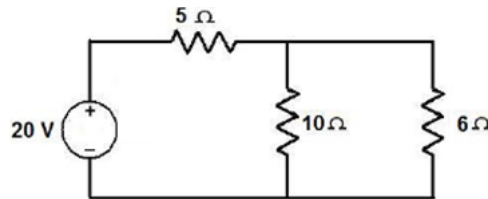
Figure 1

   (b) Explain all the controlled sources with an example   **[7M]**

2. (a) Use the network reduction technique and calculate response in each element   **[7M]**

element	From node	To node
25 V source	a	0
6 ohms	a	b
8 ohms	b	0
2 ohms	b	c
3 ohms	b	c
5 ohms	c	0

   (b) Distinguish between ideal and practical energy sources.   **[7M]**

UNIT – II

3. (a) Calculate the node voltages and the power absorbed by 7 ohms resistor. **[7M]**

element	From node	To node
40 V source	a	0
10 ohms	a	b
8 ohms	b	0
7 ohms	b	c
6 ohms	b	c
9 ohms	c	0

(b) Define network topology and explain its importance in electrical networks? **[7M]**

4. (a) State substitution and compensation theorems **[7M]**

(b) Calculate the mesh currents for the given circuit along with voltage across and power consumed by 3 ohms resistor. **[7M]**

element	From node	To node
30 V source	a	0
4 ohms	a	b
5 ohms	b	c
2 ohms	b	d
3 ohms	c	d
5 ohms	c	0

UNIT – III

5. (a) Give the steady state response of series RLC circuit with sinusoidal input **[7M]**

(b) If the voltage applied is 50V with 45 degrees and current flowing through circuit is 15A with 15 degrees, calculate complex power and circuit constants. **[7M]**

6. (a) Give the steady state response of series RC circuit with step input.Derive the three phase voltage equations of star in terms of delta voltages. **[7M]**

(b) A dc voltage of 20V is applied in a RL circuit where R = 5 and L = 10H. Calculate The time constant and The maximum value of stored energy. **[7M]**

UNIT – IV

7. (a) Explain the theory of PN junction in semiconductors and explain how it acts as Diode. **[7M]**

(b) A full wave rectifier circuit uses two silicon diodes with a forward resistance of 20Ω each. A DC voltmeter connected across the load of 1KΩ reads 55.4 volts. Calculate **[7M]**

    i. Irms

    ii. Average voltage across each diode

    iii. ripple factor

iv. Transformer secondary voltage rating.

8. (a) Define rectifier and describe all parameters for Centre tapped full wave rectifier **[7M]**

   (b) A full wave bridge rectifier having load resistance of 100Ω is fed with 220V, 50Hz through a step-down transformer of turn's ratio 11:1. Assuming the diodes ideal, calculate **[7M]**
      i. DC output voltage
      ii. Peak inverse voltage
      iii. Rectifier efficiency.

UNIT – V

9. (a) Draw the input and output characteristics of a transistor in common collector Configurations?
   [7M]

   (b) Calculate the values of I_C and I_E for a transistor with $\alpha_{dc}= 0.99$ and $I_{CBO} = 5\mu A$, if I_B is measured as 20 μA? **[7M]**

10. (a) Explain the constructional details of Bipolar Junction Transistor? **[7M]**

    (b) If the base current in a transistor is 20A when the emitter current is 6.4mA, what are the values of α_{dc} and β_{dc}? Also determine the collector current? **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
MODERN PHYSICS
(Common to AE/ ME/CE)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Sketch neat diagram depicting structure of simple cubic crystal. Discuss its structure with respect to its coordination number, atomic radius and effective number. Also derive its packing factor.
   [7M]

   (b) Show that in a simple cubic lattice the separation between the successive lattice planes (100), (110) and (111) are in the ratio of 1:0.71:0.58. **[7M]**

2. (a) Show that face centered cubic structure is the most closely packed compared to simple cubic and body centered cubic structures, by calculating the packing factors. **[7M]**

   (b) Copper has FCC structure and the atomic radius is 0.1278nm. Calculate the interplanar spacing for (110) and (212) planes **[7M]**

UNIT – II

3. (a) State Bragg's law of X-ray diffraction. Derive Bragg's law for a set of parallel planes in a crystal with a neat diagram. **[7M]**

   (b) A beam of X-rays is incident on an ionic crystal with lattice spacing 0.313 nm. Calculate wavelength of X-rays if the first order Bragg reflection takes place at a glancing angle of $7^o48'$. **[7M]**

4. (a) Derive an expression for concentration of Frenkel defect in an ionic crystal. Discuss the effect of temperature on concentration of Frenkel defect in an ionic crystal. **[7M]**

   (b) If the average energy required to create a Frenkel defect in an ionic crystal is 1.35 eV, calculate the ratio of Frenkel defects at 25^oC and 350^oC. **[7M]**

UNIT – III

5. (a) Identify Einstein's coefficients corresponding to stimulated absorption, spontaneous emission and stimulated emission of radiation. Derive a relation between them **[7M]**

   (b) Find the relative population of the two states in a ruby laser that produces a light beam of wavelength $6943A^o$ at 300K. **[7M]**

6. (a) What is pressure sensor? Explain the construction and working of any one pressure sensor with a neat sketch. **[7M]**

   (b) Explain how a sensor is calibrated to measure any change in the value taking an example. **[7M]**

UNIT – IV

7. (a) Define Numerical aperture. Derive an expression for numerical aperture of an optical fiber in terms of refractive indices of core and cladding. **[7M]**

   (b) Calculate the refractive indices of core & cladding of an optical fiber with a numerical aperture of 0.33 and their fractional differences of refractive indices being 0.02. **[7M]**

8. (a) Draw the block diagram of fiber optic communication system and explain the functions of each block showing importance of optical fiber in communication system. **[7M]**

   (b) The refractive indices of core and cladding materials of a step index fiber are 1.48 and 1.45 respectively. Calculate numerical aperture and acceptance angle. **[7M]**

UNIT – V

9. (a) Discuss in detail interference of reflected light in thin films. Find the conditions for constructive and destructive interference in thin films. **[7M]**

   (b) A parallel beam of light of 6000A is incident on thin glass plate of refractive index 1.5 such that the angle of refraction into the plate is 50°. Find the least thickness of the glass plate which will appear dark by reflection. **[7M]**

10. (a) Give the theory of Fraunhofer diffraction due to a single slit and hence obtain the condition for primary and secondary maxima. Using this obtain intensity distribution curve. **[7M]**

   (b) A plane transmission grating having 4250 lines per cm is illuminated with sodium light normally. In the second order spectrum, the spectral lines are deviated by 30°. What is the wavelength of the spectral line? **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING
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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
MODERN PHYSICS
(Common to AE/ ME/CE)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Show that in a cubic crystal the spacing (d) between consecutive parallel planes of Miller indices (h k l) is given by d = a $\left(h^2 + k^2 + l^2\right)^{-1/2}$ with a neat sketch. **[7M]**

   (b) Obtain the miller indices of a plane which intercepts at a, a/2 and 3c is a simple cubic unit cell. Draw a neat diagram showing the plane. **[7M]**

2. (a) Explain seven crystal systems with respect to its lattice parameters. Describe the 3-dimensional Bravais lattices and show that there are fourteen Bravais lattices **[7M]**

   (b) Copper has FCC structure and the atomic radius is 0.1278 A. Calculate the density of copper crystal. Given atomic weight of copper is 63.5. **[7M]**

UNIT – II

3. (a) Illustrate the phenomenon of diffraction. Explain Debye-Scherrer (powder) technique used for the determination of internal crystal structure. **[7M]**

   (b) Monochromatic x-rays of $\lambda = 1.5A^o$ is incident on a crystal phase having inter planar spacing of $1.6A^o$. Find the highest order for which Bragg's reflection maximum can be seen. **[7M]**

4. (a) Define Burger's vector? In what direction do the Burger's vectors lie with respect to edge dislocation and screw dislocation. Also draw the schematic diagram. **[7M]**

   (b) The Bragg's angle in the 1st order for (2 2 0) reflection from Ni (BCC) is 38.2^o. When x-rays of wavelength $\lambda = 1.54A^o$ are employed in a diffraction experiment. Determine the lattice parameter of Ni. **[7M]**

UNIT – III

5. (a) Write a note on population inversion and pumping. Describe the construction of He-Ne laser and discuss with relevant energy level diagram, working of He- Ne laser with a neat sketch. **[7M]**

   (b) Calculate the wavelength of emitted radiation from a semiconductor diode laser, which has a band gap of 1.44eV. **[7M]**

6. (a) What is the function of a speed sensor. Discuss in detail with suitable diagram any one of the application of microcontroller based speed sensor. **[7M]**

   (b) Explain the use of thin film in sensor applications. **[7M]**

UNIT – IV

7. (a) Mention different types of optical fibers based on type of material , modes of propogation and refractive index profile. Describe in detail optical fibers with respect to refractive index. **[7M]**

   (b) A step index fiber has a numerical aperture of 0.16, and core refractive index of 1.45.Calculate the acceptance angle of the fiber and refractive index of the cladding. **[7M]**

8. (a) List different types of attenuation in optical fibers that occur during propagation of light signals. Discuss in detail each of them. **[7M]**

   (b) An optical fiber has a numerical aperture of .02 and a cladding refractive index of 1.59.Find the acceptance angle for the fiber in water which has a refractive index of 1.33. **[7M]**

UNIT – V

9. (a) Describe and explain the formation of Newton's rings in reflected light. Prove that in reflected light, **[7M]**
      i. Diameters of the dark rings are proportional to the square roots of natural numbers and
      ii. diameters of bright rings are proportional to the square roots of odd numbers.

   (b) In a Newton's rings experiment, the diameter of the ring changes from 1.45 cm to 1.25 cm when a liquid is introduced between the lens and the glass plate. Find the refractive index of the liquid. **[7M]**

10. (a) What is plane transmission grating? Explain experimental method of determination of wavelength of spectral lines of a given source of light using plane transmission grating. **[7M]**

   (b) A plane grating having 1052 lines per cm is illuminated with light having a wavelength of $5 \times 10^{-5} cm$ at normal incidence. How many orders are visible in the grating spectra? **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017

Regulation: IARE–R16

MATHEMATICAL TRANSFORM TECHNIQUES

(Electrical and Electronic Engineering)

Time: 3 Hours   Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Obtain the Fourier series expansion of f(x) given that in and deduce the value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} +$ .... $= \frac{\pi^2}{6}$ **[7M]**

   (b) Obtain the Fourier cosine series for f(x) = x sin x when 0<x< and show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + ... = \frac{\pi-2}{4}$. **[7M]**

2. (a) Find the Fourier series to represent the function $f(x) = e^{-ax}$ from $x = (-\pi, \pi)$ and hence deduce that $\frac{\pi}{\sinh \pi} = 2 \left[\frac{1}{2^2+1} - \frac{1}{3^2+1} + \frac{1}{4^2+1} - - - - -- \right]$ **[7M]**

   (b) Find the half- range Fourier sine series for the function $f(x) = \frac{e^{ax}-e^{-ax}}{e^{a\pi}-e^{-a\pi}} in \ (0,\pi)$ **[7M]**

UNIT – II

3. (a) Find the Fourier transform of f(x) defined by $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$ and hence evaluate

   $\int_{-\infty}^{\infty} \frac{\sin ap. \cos px}{p} dp$ **[7M]**

   (b) Find the Fourier sine transform of $\frac{x}{a^2+x^2}$ and Fourier cosine transform of $\frac{1}{a^2+x^2}$ **[7M]**

4. (a) Find the Fourier sine and cosine transform of $f(x) = \frac{e^{-ax}}{x}$ and deduce that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x} \sin sx \, dx = Tan^{-1}\left(\frac{s}{a}\right) - Tan^{-1}\left(\frac{s}{b}\right)$ **[7M]**

   (b) Find the inverse Fourier cosine transform f(x)=$F_c(p) = p^n e^{-ap}$ of and inverse Fourier sine transform f(x) of $F_s(p) = \frac{p}{1+p^2}$ **[7M]**

UNIT – III

5. (a) Apply convolution theorem to evaluate $L^{-1}\left\{ \frac{s^2}{(s^2+a^2)(s^2+b^2)} \right\}$ **[7M]**

   (b) Find $L\left\{e^{-3t}\sinh 3t\right\}$ using change of scale property **[7M]**

6. (a) Find the Laplace transform of the function $f(t) = \begin{cases} (t-1)^2, & t > 1 \\ 0, & 0 < t < 1 \end{cases}$ **[7M]**

   (b) Apply convolution theorem to evaluate $L^{-1}\left\{\frac{1}{(s-2)(s+2)^2}\right\}$ **[7M]**

UNIT – IV

7. (a) Using the power series method find the inverse Z –Transform of $\frac{z}{(10+7z+z^2)}$ **[7M]**

   (b) Solve difference equation using z-transform $u_{n+2} - 4u_{n+1} + 4u_n = 2^n$ given $u_0 = 0, u_1 = 1$ **[7M]**

8. (a) Using the partial fraction method find the inverse Z –Transform of $\frac{z^2+2z+1}{z^2-\frac{3}{2}z+\frac{1}{2}}$ **[7M]**

   (b) Solve the difference equation using z- transform $y_{n+2} - 2y_{n+1} + y_n = 2^n$ with $y_0 = 2, y_1 = 1$ **[7M]**

UNIT – V

9. (a) Solve the partial differential equation $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$ **[7M]**

   (b) A string is stretched and fastened to two points at x=0 and x=L. Motion is started by displacing the string into the form y=k(lx-x2) from which it is released at time t=0. Find the displacement of any point on the string at a distance of x from one end at time t **[7M]**

10. (a) Solve $\frac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$ given that u=0 when $t = 0$ and $\frac{\partial u}{\partial t} = 0$ When $x = 0$ show also that as t tends to ∞ , u tends to sin x. **[7M]**

    (b) A tightly stretched string with fixed end points x=0 and x=1 is initially in a position given by $y = y_0\sin^3\frac{\pi x}{l}$ .If it is released from rest from this position, find the displacement(x,t). **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
MATHEMATICAL TRANSFORM TECHNIQUES
(Electrical and Electronic Engineering)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) The intensity of an alternating current after passing through a rectifier is given by

$$i(x) = \begin{cases} I_0 \sin x \ for \ 0 \le x \le \pi \\ 0 \qquad for \ \pi \le x \le 2\pi \end{cases}$$ where is the maximum current and the period is 2π .Express

as a Fourier series.   **[7M]**

(b) Expand the function $f(x) = \left(\frac{\pi-x}{2}\right)^2$ as a Fourier series in the interval $0 < x < 2\pi$,
hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ----- = \frac{\pi^2}{12}$ **[7M]**

2. (a) Find the half range sine series for $f(x) = x(\pi - x) \, 0 < x < \pi$
Deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + ----- = \frac{\pi^3}{32}$ **[7M]**

(b) Find the Fourier series of the periodic function defined as $f(x) = \begin{cases} -\pi \ , \ -\pi < x < 0 \\ x \qquad , \ 0 < x < \pi \end{cases}$ Hence

deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ------ = \frac{\pi^2}{8}$ **[7M]**

UNIT – II

3. (a) Find the Fourier Transform of defined by $f(x) = e^{\frac{-x^2}{2}}, -\infty < x < \infty$ or, Show that the Fourier
Transform of $e^{\frac{-x^2}{2}}$ is reciprocal.   **[7M]**

(b) Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2 \ , \ |x| < a \\ 0 \qquad , |x| > a \end{cases}$

hence show that $\int\limits_{0}^{\infty} \frac{\sin x - \cos x}{x^3} \, dx = \frac{\pi}{4}$ **[7M]**

4. (a) Find Fourier cosine and sine transforms of $e^{-ax}, a > 0$ and hence deduce $\int_0^\infty \frac{\cos px}{a^2+p^2} dp$ **[7M]**

(b) Find the Fourier transform of defined by $f(x) = \begin{cases} 1 - x^2, \ |x| \le 1 \\ 0, \qquad |x| > 1 \end{cases}$ Hence evaluate $\int_0^\infty \frac{x \cos x - \sin x}{x^3} \, dx$

     [7M]

UNIT – III

5. (a) Find $\mathcal{L}^{-1}\left[\frac{s^2+2s-4}{(s^2+9)(s-5)}\right]$ **[7M]**

    (b) Using convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2+4)(s+1)^2}$ **[7M]**

6. (a) Find $\mathcal{L}^{-1}\left[\frac{s^2+s-2}{s(s+3)(s-2)}\right]$ **[7M]**

    (b) Solve the following differential equation using Laplace transform $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 2y = 5\sin t, y(0) = y'(0) = 0$ **[7M]**

UNIT – IV

7. (a) Using the power series method find the inverse Z –Transform of $\frac{1+2z^{-1}}{(1+2z^{-1}+4z^{-2})}$ **[7M]**

    (b) Using convolution theorem to find the inverse Z –Transform of $\frac{8z^2}{(4z+1)(2z-1)}$ **[7M]**

8. (a) Using the partial fraction method find the inverse Z –Transform of $\frac{z(2z-1)}{(z-2)^2(z-1)}$ **[7M]**

    (b) Using the partial fraction method find the inverse Z –Transform of $\frac{z(4z-2)}{(z-2)^2(z-1)}$ **[7M]**

UNIT – V

9. (a) Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$ by the method of separation of variables. **[7M]**

    (b) Write the boundary conditions for a rectangular plate is bounded by the line x=0, y=0, x=a, and y=b its surface are insulated the temperature along x=0 and y=0 are kept at 00C and the other are kept at1000C. **[7M]**

10. (a) Solve by the method of separation of variables $2u_x + u_y = 3u$ and $u(0,y) = e^{-5y}$ **[7M]**

    (b) A tightly stretched string with fixed end points x=0 and x= l is initially at rest its equilibrium position. If it is set to vibrate by giving each of its points a velocity $\lambda x(1-x)$, find the displacement of the string at any distance x from one end at any time t. **[7M]**

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

MODEL QUESTION PAPER – I

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
PROBABILITY AND STATISTICS
(Common for CSE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT − I

1. (a) If the probability density function of Random variable f(x)=$k\left(1-x^2\right), 0 < x < 1$ then find **[7M]**
    i. k
    ii. P[0.1<x<0.2]
    iii. P[x>0.5]

   (b) Prove that the Poisson distribution is a limiting case of Binomial distribution. **[7M]**

2. (a)) A random variable X has the following probability function: **[7M]**

X	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

   Then find
    i. k
    ii. mean
    iii. variance
    iv. P$(0 < x < 3)$

   (b) In a Normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. **[7M]**

UNIT − II

3. (a) Find joint probability density function of two random variables x and y where joint distribution function is $F(x,y) = \begin{cases} (1-e^{-x^2})(1-e^{-y^2}), x > 0, y > 0 \\ 0, \ Otherwise \end{cases}$ and also find P(1≤ x ≤2,1 ≤y≤ 2).

   [7M]

   (b) Calculate the coefficient of correlation from the following data **[7M]**

X	12	9	8	10	11	13	7
y	14	8	6	9	11	12	13

4. (a) Find the angle between the two regression lines. **[7M]**

(b) A sample of 12 fathers and their elder sons gave the following data about their elder sons. Calculate the coefficient of rank correlation. **[7M]**

Fathers	65	63	67	64	68	62	70	66	68	67	69	71
Sons	68	66	68	65	69	66	68	65	71	67	68	70

UNIT – III

5. (a) Samples of size 2 are taken from the population 1, 2, 3, 4, 5, 6. Which can be drawn with replacement? Find **[7M]**
   i. The mean of the population
   ii. The standard deviation of the population
   iii. The mean of the sampling distribution of means
   iv. The standard deviation of the sampling distribution of means

   (b) A random sample of size 100 is taken from an infinite population having the mean 76 and the variance 256. What is the probability that will be between 75 and 78. **[7M]**

6. (a) A random sample of size 64 is taken from an infinite population having the mean 45 and the standard deviation 8. What is the probability that x will be between 46 and 47.5. **[7M]**

   (b) If the population is 3, 6, 9, 15, 27 **[7M]**
   i. List all possible samples of size 3 that can be taken without replacement from the finite population.
   ii. Calculate the mean of each of the sampling distribution of means.
   iii. Find the standard deviation of sampling distribution of means.

UNIT – IV

7. (a) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of S.D 2.5 inches **[7M]**

   (b) In a random sample 125 cool drinkers 68 said that they prefer thumsup to pepsi test the null hypothesis P=0.5 against the alternative hypothesis P>0.5 at 5%level of significance **[7M]**

8. (a) A sample of 400 items is taken from a population whose standard deviation is 10.The mean of sample is 40.Test whether the sample has come from a population with mean 38 also calculate 95% confidence interval for the population. **[7M]**

   (b) Random sample of 400 men and 600 women were asked wether they would like to hava flyover near their residence. 200 men and 325 women were in favour of proposal. Test the hypothesis that the proportion of men and women in favour of proposal are same at 5% level. **[7M]**

UNIT – V

9. (a) A random sample of 10 boys had the following I.Q's 70,120,110,101,88,83,95,98,107,100. Do the data support the assumption of population means I.Q of 100. Test at 5% level of significance? **[7M]**

   (b) The following is the distribution of the hourly number of trucks arriving at a company wear house.Fit a Poisson distribution to the following table and test the goodness of fit at 0.05 level. **[7M]**

Trucks per hour	0	1	2	3	4	5	6	7	8
frequency	52	151	130	102	45	12	3	1	2

10. (a) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins. The sample standard deviation of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test hypothesis that the true variances are equal. **[7M]**

  (b) Three training methods were compared to see if they led to greater productivity after training.The productivity measures for individuals trained by different methods are as follows.At the 0.05 level of significance,do the three training methods lead to difference levels of productivity? **[7M]**

Method 1	36	26	31	20	34	25
Method 2	40	29	38	32	39	34
Method 3	32	18	100	21	33	27

INSTITUTE OF AERONAUTICAL ENGINEERING

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MODEL QUESTION PAPER – II

B.Tech II Semester End Examinations (Regular), January – 2017
Regulation: IARE–R16
PROBABILITY AND STATISTICS
(Common for CSE / IT)

Time: 3 Hours   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Out of 800 families with 5 children each, how many would you expect to have   **[7M]**
    i. 3 boys
    ii. 5girls
    iii. either 2 or 3 boys ? Assume equal probabilities for boys and girls.

   (b) The mean weight of 500 male students at a certain college is 75kg and the standard deviation is 7kg assuming that the weights are normally distributed find how many students weigh   **[7M]**
    i. Between 60 and 78 kg
    ii. more than 92kg.

2. (a) A continuous random variable has the probability density function   **[7M]**

    $$f(x) = \begin{cases} kxe^{-\lambda x}, for\ x \geq 0, \lambda > 0 \\ 0, otherwise \end{cases}$$

    Determine
    i. k
    ii. Mean
    iii. Variance

   (b) If a Poisson distribution is such that then find   **[7M]**
    i. $P(X \geq 1)$
    ii. $P(X \leq 3)$
    iii. $P(2 \leq X \leq 5)$

UNIT – II

3. (a) x and y are two random variables with a joint probability density function $f(x,y) = \begin{cases} e^{-y}, & 0 < x < y \\ 0. & Otherwise \end{cases}$ Find the marginal probability density function of x and y. **[7M]**

   (b) The ranks of 16 students in Mathematics and Statistics are as follows (1,1),(2,10),(3,3),(4,4),(5,5),(6,7),(7,2),(8 Calculate the rank correlation coefficient for proficiencies of this group in mathematics and statistics. **[7M]**

4. (a) Give the following data compute multiple coefficient of correlation of X_3 on X_1 and X_2 **[7M]**

X_1	3	5	6	8	12	14
X_2	16	10	7	4	3	2
X_3	90	72	54	42	30	12

   (b) If $\sigma_x = \sigma_y = \sigma$ and the angle between the regression lines is $Tan^{-1}\frac{1}{2}$. Find r. **[7M]**

UNIT – III

5. (a) A population consists of five numbers4, 8, 12, 16, 20, 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find **[7M]**

   i. The mean of the population
   ii. The standard deviation of the population
   iii. The mean of the sampling distribution of means
   iv. The standard deviation of the sampling distribution of means

   (b) The mean height of students in a college is 155 cms and standard deviation is 15. What is the probability that the mean height of 36 students is less than 157 cms. **[7M]**

6. (a) A normal population has a mean of 0.1 and standard deviation of 2.1. find the probability that mean of a sample of size 900 will be negative. **[7M]**

   (b) A random sample of size 64 is taken from a normal population with =51.4 and =68. What is the probability that the mean of the sample will **[7M]**

   i. exceed 52.9
   ii. fall between 50.5 and 52.3
   iii. be less than 50.6.

UNIT – IV

7. (a) Experience had shown that 20% of a manufactured product is of the top quality. In one day's production of 400 articles only 50 are of top quality Test the hypothesis at 0.05 level. **[7M]**

   (b) A sample of 100 electric bulbs produced by manufacturer 'A' showed a mean life time of 1190 hrs and s .d. of 90 hrs A sample of 75 bulbs produced by manufacturer 'B' Showed a mean life time of 1230 hrs with standard deviation of 120 hrs. Is there difference between the mean life times of the two brands at a significance level of 0.05. **[7M]**

8. (a) In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes .Can we reject the null hypothesis $\mu = 32.6$ minutes in favour of alternative null hypothesis $\mu > 32.6$ at $\alpha = 0.05$ level of significance. **[7M]**

(b) In an investigation on machine performance the following results are obtained.Test whether there is any significance performance of two machines at $\alpha = 0.05$ **[7M]**

	No. of units inspected	No. of defectives
Machine I	375	17
Machine II	450	22

UNIT – V

9. (a) Two independent samples of items are given respectively had the following Values.Test whether there is any significant difference between their means? **[7M]**

Sample I	11	11	13	11	12	9	12	14
Sample II	9	11	10	13	9	8	10	-

(b) The following table gives the classification of 100 workers according to gender and nature of work. Test whether the nature of work is independent of the gender of the worker. **[7M]**

	Stable	Unstable	Total
Female	10	30	40
Total	50	50	100

10. (a) A survey of 240 families with 4 children each revealed the following Distribution.Test whether the male and female births are equally popular. **[7M]**

Male Births	4 3	2 1	0		
No of families	10	55	105	58	12

(b) Three different methods of teaching statistics are used on three groups of students. Random samples of size 5 are taken from each group and the results are shown below the grades are on a 10-point scale .Determine on the basis of the above data whether there is difference in the teaching methods **[7M]**

Group A	Group B	Group C
7	3	4
6	6	7
7	5	7
7	4	4
8	7	8