Hall Ticket No: **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
II/IV B. Tech I- Semester Regular Examinations Oct - 2016
(Regulations: R15)

Data Structures & Algorithms

(CSE)

Time: 3 hours **Max Marks: 60**

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 Data structure. List different operations performed on Data Structures. **(2M)**
   (b) Identify the types of Data Structures suitable for the following scenarios
   Scenario 1:Representing the list of Names of 10 students in a class
   Scenario 2:Representing the following items
   items: emp name, emp address, emp sal, emp age, dependants
   emp: employee
   note:

Group items	Elementary items
emp name	emp sal
emp address	emp age
	dependents

   Scenario 3: A college bus moving between different routes in working days is as follows:
   Route1(R1), Route2(R2), Route3(R3), Route4(R4), Route5(R5),
   Represent the way through which the college bus moves between different stops listedabove using an appropriate data structure. **(10M)**

(OR)

2. (a) Define an algorithm. List out and discuss the sequence of steps needed to design and analyze an algorithm in not more than four sentences each. **(6M)**
   (b) Inspect, why do we need an Asymptotic notation. Explain the differentAsymptotic notations with definition and example. **(6M)**

UNIT-II

3. (a)Prefix sum of a list X[N] is defined as the Sequence s of n elements, with sk = x1 + ... + xk. For example, x = [1, 4, 3, 5, 6, 7, 0, 1] , s = [1, 5, 8, 13, 19, 26, 26, 27]
   Write a program to compute the prefix sum of an array of integers and compute its time complexity. **(6M)**
   (b) You are given a set of n types of rectangular 3-D boxes, where the ith box has height h(i),width w(i) and depth d(i) (all real numbers). You want to create a stack of boxes which is as tall as possible, but you can only stack a box on top of another box, If the dimensions of

the 2-D base of the lower box are each strictly larger than those of the 2-D base of the higher box. Of course, you can rotate a box so that any side functions as its base. It is also allowable to use multiple instances of the same type of box. **(6M)**

(OR)

4. (a) Explain operations of a stack with an example. **(6M)**

(b)Explain how an infix expression can be converted to a post fix expression with an example. **(6M)**

UNIT-III

5 (a) Explain ADT of a queuewith an example. Implement queue using C. **(8M)**
(b)Explain Applications of a queue. **(4M)**

(OR)

6. (a) Explain and implement a single linked list with an example. **(6M)**
(b) What is a priority queue? Implement using a linked list. **(6M)**

UNIT-IV

7. (a) What is a binary tree give short notes on types of binary trees. **(4M)**
(b) Explain a Binary Search Tree(BST) with an example. **(8M)**

(OR)

8. (a) Explain hashing, hash table and a function. Explain with a example. **(4M)**
(b)Compare and analyse sequential search, binary search and interpolation search.Explain the complexity of search algorithm. **(4M)**
(c) Explain selection sort with an example. Give its complexity. **(4M)**

UNIT-V

9. (a) What is a graph? Explain how graphs are represented. **(6M)**
(b) What is a spanning tree? Explain how minimal spanning trees are constructed with an example. **(6M)**

(OR)

10.Explain in brief how shortest path iscalculated using Dijkstra's algorithm. **(12M)**

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
II/IV B. Tech I- Semester Regular Examinations Oct – 2016
(Regulations: R15)
Digital Logic Design
(Common for CSE and IT)

Time: 3 hours **Max Marks: 60**

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)** Perform the following arithmetic operations using 8-bit registers. Use binary signed 1's complement notation, indicate overflow/underflow, if any (i) 29+ (-49) (ii) 27 -101 (iii) -28 + (-100) (iv) 68 + (-75). **(8M)**

(b). Design a full adder using two half adders and logic gates along with the logic equations **(4M)**

(OR)

2. **(a).**Determine the logic required to decode the binary number 1011 by producing a HIGH level on the output. **(2M)**

(b) Design a full subtractor and implement it using NAND gates. Explain its operation with the help of a truth table. **(4M)**

(c). Simplify the following expressions: **(6M)**
(i)AB + A(B+C) + B(B+C)
(ii)$\bar{A}BC + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + A\bar{B}C + ABC$
(iii)$A\bar{B}C(BD+CDE) + A\bar{C}$

UNIT-II

3. **(a).** Minimize the following function in SOP form using k-map
F(A,B,C,D)= $\sum m(1,2,3,8,9,10,11,14) + \sum d(7,15)$. **(4M)**
(b) Realize the above obtained Boolean function by using NOR gates. **(4M)**

(c) Draw the logic diagram of a 2- to- 4 line decoder using NAND gates and active Low enable input and write a HDL module for the same. (**4M)**

(OR)

4 (a) Use Karnaugh map, to realize the following POS expression,
(A+B+C) (A+B+$\overline{C}$) (A+$\overline{B}$+C)($\overline{A}$+$\overline{B}$+C) (A+$\overline{B}$+$\overline{C}$) **(4M)**

(b) Implement the resultant expression using NAND gates. **(4M)**

(c) Draw the logic diagram of a 2-to-4 line decoder with only NOR gates. Include an enable input. **(4M)**

UNIT-III

5. **(a)** Realize an edge triggered J-K flip-flop with SET and RESET inputs using NAND gates and explain its operation with truth table and waveforms. (**6M)**

(b) Show how a BCD ripple counter can be implemented. (**6M)**

(OR)

6. (a) Convert clock R-S flip-flop (FF) into
(i) JK F-F (ii) D-F-F (iii) T- F-F & Give the truth table for each. (**6M)**

(b) Explain different types of shift registers with neat diagrams. (**6M)**

UNIT-IV

7. **(a)** Write short notes about Races & Hazards. **(6M)**

(b) State Reduction & Assignment Problem. **(6M)**

(OR)

8. (a) State Reduction & Assignment Problem. **(5M)**

(b) Design a synchronous counter that goes through the sequence 2,6,1,7,5,4 and repeat. Use JK flip. **(7M)**

UNIT-V

9 (a) Design a ROM size to realize the following logic functions 5 * 32 line decoder & implement it. (**6M)**

(b) Draw a PLA circuit to implement the following functions and develop the programming table.

F1 = A'B + AC' + A'BC'

F2 = (AC + AB + BC)' (**6M)**

(Or)

10. **(a)** Write short note on types of ROMs. What is the use of EEPROM? **(4M)**

(b) Design a PLA to realize the following functions show the internal connection

F_1 (a,b,c,d,e)=a'b'd' +a'cd'+a'bcde'; **(8M)**

F_2 (a,b,c,d,e)=a'bc + b'cd'e;

F_3 (a,b,c,d,e)=a'b'd'+b'cd'e +a'bcd.

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
II/IV B. Tech I- Semester Regular Examinations Oct - 2016
(Regulations: R15)
DISCRETE MATHEMATICAL STRUCTURES
(CSE, IT)

Time :3hours **Max Marks:60**

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 A-B = $A \cap \overline{B}$ (6)

   b) Check whether the proposition is a $\{(PVQ)\Lambda(P\rightarrow R)\Lambda(Q\rightarrow R)\}\rightarrow R$ is tautology or not. (6)

(OR)

2. a) Using mathematical induction, Prove that if F_n is the nth Fibonacci number then

$$F_n=\frac{1}{\sqrt{5}}\left(\left(\frac{1+\sqrt{5}}{2}\right)^{n+1}-\left(\frac{1-\sqrt{5}}{2}\right)^{n+1}\right)$$ (6)

   b) Represent the following statement in to logical statement by using quantifiers.
   All men are fallible.
   All kings are men.
   Therefore all kings are fallible. (6)

UNIT – II

3. a) How many 3-digit numbers can be formed using the digits 1,2,3,4,5,6,8 and 9? and how many can be formed if no digit can be repeated? (6)

   b) In how many ways can 7 women and 3 men be arranged in a row if the 3 men must always stand next to each other? (6)

(OR)

4. a) Find the coefficient of x^3y^7 in i). $(x+y)^{10}$ and ii). $(2x-9y)^{10}$ (6)

   b) Use the multinomial theorem to expand $(x_1+x_2+x_3+x_4)^4$. (6)

UNIT – III

5. a) Find the coefficient of x^{20} in $(x^3 + x^4 + x^5 + ...)^5$. (6)

   b) Solve the recurrence relations
   $a_n - 3a_{n-1} - 4a_{n-2} = 0$ for $n \geq 2$ and $a_0 = a_1 = 1$ (6)

(OR)

6. a) Solve the recurrence relation $a_n - 5a_{n-1} + 8a_{n-2} - 4a_{n-3} = 2^n$. (6)

   b) Solve the recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = n4^n$. (6)

UNIT – IV

7. a) Draw the digraph of each of the following relations. (6)

   i) The relation "divides," defined by "a divides b iff there exists a positive integer c such that a.c =b", on the integers $\{1,2,3,4,5,6,7,8\}$.

   ii) the relation $\neq$ on the $\{0,1,2\}$.

   b) Find the transitive closure of the relation R= {(a,b),(b,c),(c,d),(d,e)} on
   A = { a, b, c d, e } . (6)

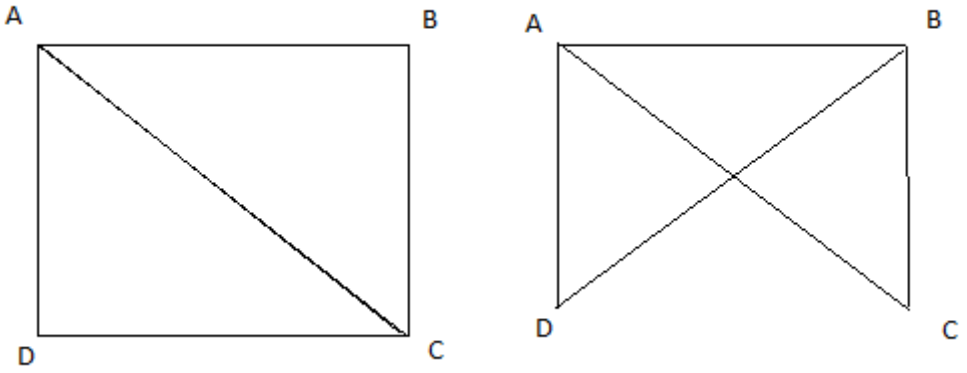
(OR)

8. a) Define equivalence relation and ordering relation with examples? (6)

   b) Using Warshall's algorithm, compute the adjacency matrix of the transitive closure of the relation R = { (a,b),(b,c),(c,d),(d,e),(e,d) } on the set
   A = { a, b, c, d ,e }. (6)

UNIT - V

9. a) Verify the following graphs are isomorp hic or not? (6)

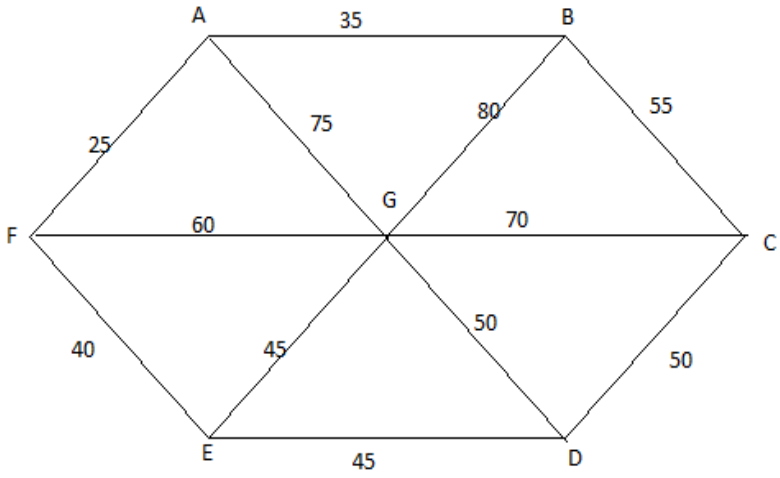


b) State and prove Euler's formula on plane graphs? (6)

(OR)

10. a) Define tree? Prove that a tree with n vertices has exactly n-1 edges. (6)

b) Find a minimal spanning tree for the following graph, Using kruskal's algorithm (6)



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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
II/IV B. Tech I- Semester Regular Examinations Oct - 2016
(Regulations: R15)
DISCRETE MATHEMATICAL STRUCTURES
(CSE, IT)

Time :3hours **Max Marks:60**

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 $A=\{1,2,3\}$ *and* $\mathbf{B}=\{1,3,5\}$ are two sets, then find $((A\Delta B)\Delta B)-(A\Delta(B\Delta B))$ (6M)

b) Show that the proposition $((p\to q)\wedge(q\to r))\to((p\vee q)\to r)$ is a Tautology . (6M)

(OR)

2 a) Verify that the following argument is valid (or) not by using the rules of inference: (6M)
If Clifton does not live in France, then he does not speak French.
Clifton does not drive a Datsun.
If Clifton lives in France, then he rides a bicycle.
Either Clifton speaks French, of he drives a Datsun.
Hence, Clifton rides a bicycle.

b) Using Mathematical Induction, Prove that for all integers $n\geq 4,\ 3^n > n^3$ (6M)

UNIT-II

3 a) How many 3-letter words can be formed using the letters $a,b,c,d,e\ and\ f$ and using a letter only once if the letter $'a'$ is to used? (6M)

b) Use the multinomial theorem to expand $(x_1+x_2+x_3+x_4)^4$ (6M)

(OR)

4 a) How many integral solutions are there for $x_1+x_2+x_3+x_4=20$ if (6M)
$1\leq x_1\leq 6, 1\leq x_2\leq 7, 1\leq x_3\leq 8,$ and $1\leq x_4\leq 9$

b) Find the coefficient of x^5y^5 in *i*). $(x+y)^{10}$ ii). $(2x-9y)^{10}$? (6M)

UNIT-III

5 a) Calculate $B(X)=\sum_{r=o}^{\infty} b_r X^r = \frac{1}{X^2-5X+6}$ (6M)

b) Solve the recurrence relation using the characteristic roots (6M)

$a_n + 7a_{n-1} + 8a_{n-2} = 0$ *and* $a_0 = 2, a_1 = -7$

(OR)

6 a) In how many ways can we distribute 24 pencils to 4 children, so that each child gets at least 3 pencils but not more than Eight? (6M)

b) Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 7.3^n$ *for* $n \geq 2$ (6M)

using the method of undetermined coefficients.

UNIT-IV

7 a) Let **A** be the set of all nonzero real numbers. For $a, b \in A$, define $(a,b) \in R$ iff a/b is a rational number. Prove that R is an equivalence relation on **A** (6M)

b) Consider the relation $R = \{(a,b), (b,c), (b,d), (d,a), (c,c)\}$ on A={a,b, c, d, e } (6M)

Then Draw a digraph of the relation i). R. ii). The complement of R,

iii). The inverse of R, iv). $R \cap R^{-1}$.

(OR)

8 a) Define a POSET and show that $\langle P(A), \subseteq \rangle$ is a POSET where $P(A)$ is the Power set of $A = \{a, b, c\}$. (6M)

b) Find the Transitive closure of the Relation $R = \{(1.2), (1,3), (2,3), (3,1)\}$ on $A = \{1, 2, 3\}$. (6M)

UNIT-V

9 a) Write BFS and DFS algorithms for a spanning trees. (6M)

b) Prove that a complete graph K_n is planar graph if and only if $n \leq 4$. (6M)

(OR)

10 a) Write Kruskal's and Prim's algorithms for finding minimal spanning tree. (6M)

b) Define tree traversals of a binary tree and find a binary tree whose preorder, in order traversals are given (6M)

Preorder: $G\ B\ Q\ A\ C\ P\ D\ E\ R$

In order: $Q\ B\ C\ A\ G\ P\ E\ D\ R$

Hall Ticket No: **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY &SCIENCES

(AUTONOMOUS)

II B. Tech I Semester Regular Examinations November-2016

(Regulations: R15)

Object Oriented Programming with JAVA

(CSE)

Time: 3hours Max Marks: 60

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) Briefly describe the importance of the OOP paradigm. 6M
   B) Define method? What is the purpose of defining a method? How the method can be declared and invoked? Explain. 6M

(OR)

2. A) Differentiate abstract class, nested class and inner class? 6M
   B) Define constructor? Discuss about various types of constructors in java? 6M

UNIT-II

3. A) Define polymorphism? Write a java program to find the area of the triangle, square and circle? 6M
   B) What is inheritance? List various types of inheritances? Is multiple inheritance was supported in java? If not how it can be achieved justify your answer? 6M

(OR)

4. A) Define package? Explain how a package can be created and imported to a java class? 6M
   B) Define interface? Give the syntax for interface? How it can be extended to another Interface? Explain. 6M

UNIT-III

5. A) Explain about arithmetic, null pointer and array index out of bound exceptions with an example? 6M
   B) Explain any four character stream I/O Classes. 6M

(OR)

6. A) Define multi-threading? Write a java program to create two threads one thread will perform the sum of odd numbers and other thread will perform even numbers sum in given series of 1 to n numbers? 6M

B) Explain different ways defined by the java to create threads? 6M

UNIT-IV

7. Explain Life cycle of an Applet with an example java program? 12M

(OR)

8. A) How to pass parameters to an applet? Explain with an example? 6M

   B) Write a java program to draw a pentagon? 6M

UNIT-V

9. A) What is a Listener? Explain about various methods supported by Mouse Listener and Mouse Motion Listener? 6M

   B) Write a java application which implements key Listener? 6M

(OR)

10. A) Explain the usage of an Adapter Class with a suitable java program. 6M

    B) Give the syntax for the following components JLabel, JTextBox, Scrollbar, TextArea and JButton? 6M

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
II/IV B. Tech I- Semester Regular Examinations Oct - 2016
(Regulations: R15)
PROBABILITY, STATISTICS & QUEUING THEORY
(CSE)

Time :3hours **Max Marks:60**

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 and prove Addition theorem and Multiplication theorem of probability for two events. (6M)

(b) There are two bags A and B. The bag A contains n white and 2 black balls and bag B contains 2 white and n black balls. One of the two bags is selected at random and two balls are drawn from it without replacement. If both the balls drawn are white and the probability that the bag A was used to draw the ball is $\frac{6}{7}$, find the value n? (6M)

(OR)

2 (a) A random variable X has the following probability distribution.

x	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find (i) the value of k, (ii) P(1.5<X<4.5/X>2), (iii) P(X<6), P(X≥6)(iv) the smallest value of λ for which $P(X \le \lambda) > ½$. (6M)

(b) A continuous Random Variable X has a pdf $f(x) = kx^2e^{-x}, x \ge 0$.

Find (i) k (ii) Variance (6M)

UNIT-II

3 (a) Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls, (ii) at least one boy, (iii) at most two girls and (iv) children of both sexes. Assume equal probabilities for boys and girls.

(b) Show that for Poisson Distribution the mean and variance are same

(OR)

4 (a) X is a normal variate with mean 30 and S.D. 5. Find the probabilities that

(i)P($26 \le X \le 40$) (ii) P($X \ge 45$) (iii) $P(|X-30|>5)$. (6M)

(b) If X has uniform distribution in (0, 2) and Y has exponential distribution with parameter λ,

find λ such that P(X<1) = P(Y<1). (6M)

UNIT-III

5 (a) Derive the normal equations for the fitting of a straight line. (6M)

(b) Fit a second degree parabola to the following data using the method of least squares

X	1	2	3	4	5	6	7	8	9
Y	2	6	7	8	10	11	11	10	9

(6M)

(OR)

6 (a)Find the coefficient of correlation between X and Y using the following data: (6M)

X	5	10	15	20	25
Y	16	19	23	26	30

(b) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: Variance of X=1. The regression equations are $3x + 2y = 26$ and

$6x + y = 31$.What were (i) the mean values of X and Y? (ii) the standard deviation of Y? and (iii) the correlation between X and Y? (6M)

UNIT-IV

7 (a) Explain (i) Null Hypothesis, (ii) Alternative Hypothesis (iii) Critical Region,

(iv)Level of Significance (v) One-tailed test (vi) Two-tailed test (6M)

(b) The mean height and the standard deviation height of 8 randomly chosen soliders are 166.9 and 8.29 cm respectively. The corresponding values of 6 randomly chosen sailors are 170.3 and 8.50 cm respectively. Based on this data, can we conclude that the soliders are, in general, shorter than sailors? (6M)

(OR)

8 (a) A cubical die is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the die cannot be regarded as an unbiased one, and find the extreme limits between which the probability of a throw of 3 or 4 lies. (6M)

(b) Two samples drawn from two different populations gave the following results:

	Size	Mean	SD
Sample-I	100	582	24
Sample-II	100	540	28

Test the hypothesis, at 5% level of significance, that the difference of the means of the population is 35. (6M)

UNIT-V

9 (a) Explain the characteristics of a queueing model. (6M)

(b) Arrivals at a telephone booth are considered to be Poisson with an average time of 12min. between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4min. (6M)

(i) Find the average number of persons waiting in the system.

(ii) What is the probability that a person arriving at the booth will have to wait in the queue?

(OR)

10 (a) For (M/M/1): (∞/FIFO) queueing model, in the steady state case, obtain the average queue length in terms of the relevant parameters λ *and* μ. (6M)

(b) The local one-person barber shop can accommodate a maximum of 5 people at a time (6M)

(4 waiting and 1 getting hair-cut). Customers arrive according to a Poisson distribution with mean 5 per hour. The barber cuts hair at an average rate of 4 per hour.

(i) What percentage of time is the barber idle?

(ii) What fraction of the potential customers are turned away?

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II/IV B. Tech I- Semester Regular Examinations Oct - 2016
(Regulations: R15)
PROBABILITY, STATISTICS & QUEUING THEORY
(CSE)

Time :3hours **Max Marks:60**

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 and prove Bayes theorem. (6)
   b). A discrete random variable X has the following probability distribution. (6)

x	0	1	2	3	4	5	6	7	8
p(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find the value of a, P(X< 3), variance.

(OR)

2. a). A problem is given to three students whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. (6)
What is the probability that (i) only one of them solves the problem and (ii) the Problem is solved.
b). A contineous random variable has a pdf $f(x) = 3x^2, 0 \le x \le 1$. Find a and b such that(6)
$(i)\, P(X \le a) = P(X > a)$ *and* $(ii)\, P(X > b) = 0.05$.

UNIT-II

3. a). Fit a binomial distribution for the following data: (6)

x:	0	1	2	3	4	5	6	Total
f:	5	18	28	12	7	6	4	80

b). Define Normal distribution, write any four properties of it. (6)

(OR)

4. a). Prove that, Poisson distribution as limiting form of Binomial distribution. (6)
b). If the roots of the quadratic equation $x^2 - ax + b = 0$ are real and b is positive but otherwise unknown, what are the expected values of the roots of the equation. (6)

UNIT-III

5. a). Fit a second degree parabola to the following data: (6)

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

b). Ten participants in a contest are ranked by two judges as follows: (6)

x:	1	6	5	10	3	2	4	9	7	8
y:	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation co-efficient.

(OR)

6. a). Find the correlation co-efficient between $x \text{ and } y$ for the given table. (6)

x:	1	2	3	4	5	6	7	8	9	10
y:	10	12	16	28	25	36	41	49	40	50

b). The two regression equations of the variables $x \text{ and } y$ are (6)
$x = 1.93 - 0.87y \text{ and } y = 11.64 - 0.50x$. Find (i) Mean of $x's$ (ii) mean of $y's$ (iii) the correlation co-efficient between $x \text{ and } y$.

UNIT-IV

7. a). A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that he mean of a sample size 900 drawn from this population will be negative. (6)
b). Define the students t-distribution and write its properties. (6)

(OR)

8. a). In a large city A, 20% of a random sample of 900 school boys had a slight physica defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (6)
b). Fit a Poisson distribution for the following distribution and also test the goodness of fit. (6)

x:	0	1	2	3	4	5	Total
f:	142	156	69	27	5	1	400

UNIT-V

9. a). Derive (i) Average number of customers in the system (ii) Average number of customers in the queue for Queuing model [(M/M/1) : (∞/FIFO) model]. (6)
b). Arrivals at a telephone booth are considered to be Poisson with an average time of 12 min. between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 min. (6)
(i) Find the average number of persons waiting in the system.
(ii) What is the probability that a person arriving at the booth will have to wait in the queue?

(OR)

10. a). Explain any three characteristics of Finite Capacity, Single Server Poisson Queue [(M/M/1) : (k/FIFO) model] (6)
b). A supermarket has two girls attending to sales at the counters. If the service time for each customer is exponential with mean 4 min. and if people arrive in Poisson fashion at the rate of 10 per hour. (6)
(i) What is the probability that a customer has to wait for service?
(ii) What is the expected percentage of idle time for each girl?

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