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| R-20 |
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Code: 20DC11T

M.C.A. I Semester Supplementary Examinations November 2022

Probability and Statistics

Max. Marks: 60

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x12 = 60 Marks)

Marks CO BL

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| UNIT-I |
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1. a) Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles with replacement being made after each drawing. Find the probability that (i) both are white (ii) first is red and second is white 4M CO1 L2

- b) A random variable X has the following probability function

| | | | | | | | |
|--------|----|----|----|----|----|-----|-----|
| X=x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| P(X=x) | k | 3k | 5k | 7k | 9k | 11k | 11k |

- Find (i) k (ii) Mean (iii) Variance (iv) $P(1 < X < 5)$ 8M CO1 L3

OR

2. a) Of the three men, the chances that a Politian, a business man or an academician will be appointed as VC of university are 0.5, 0.3, 0.2 respectively. Probability that research is promoted by the person if the person is appointed as VC are 0.3, 0.7, 0.8 respectively.

(i) Determine the probability that research is pursued.

(ii) If research is promoted, what is the probability that VC is an academician? 6M CO1 L2

- b) A continuous random variable has the probability density function $f(x) = kxe^{-\alpha x}$, for $x \geq 0, \alpha > 0$, otherwise.

Determine (i) k (ii) Mean (iii) Median 6M CO1 L3

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| UNIT-II |
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3. a) If X is a Poisson Variable $2P(X=0) = P(X=2)$. Find the probability that $P(X \leq 3)$ (ii) $P(2 \leq X \leq 3)$ (iii) $P(X \geq 3)$ 6M CO2 L2

- b) In a distribution exactly normal 7% of the items are under 35 and 89% are under 63. What are the mean and Standard Deviation of the distribution? 6M CO2 L2

OR

4. Fit a Poisson Distribution for following data and calculate the expected frequencies

| | | | | | |
|------|-----|----|----|---|---|
| X=x | 0 | 1 | 2 | 3 | 4 |
| f(x) | 109 | 65 | 22 | 3 | 1 |

12M CO2 L4

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| UNIT-III |
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5. A population consists of six numbers 3,6,9,15,27. Consider all samples of size 2 which can be drawn without replacement from this population. Find
- (i) The population mean
- (ii) The population standard deviation
- (iii) The mean of sampling distribution of means
- (iv) The standard deviation of sampling distribution of means. 12M CO3 L3

OR

Code: 20DC11T

6. a) The mean and Standard deviation of a population are 14,054 and 11795 respectively .What can one assert with 95% confidence about the maximum error if sample mean = 14054 and n=50.And also construct 95% confidence interval for the true mean. 8M CO3 L4
- b) A sample of 11 rats from a central population had an average blood viscosity of 3.92 with S.D of 0.61.Estimate the 95% confidence limits for the mean blood viscosity of the population. 4M CO3 L4

UNIT-IV

7. Five unbiased dice were thrown 96 times and the number of times 4 or 5 or 6 was obtained is given below.

| | | | | | | |
|------------------------------|---|----|----|----|----|---|
| No. of dice showing 4,5 or 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Frequency | 8 | 18 | 35 | 24 | 10 | 1 |

Fit a suitable distribution and test for goodness of fit. 12M CO4 L4

OR

8. Two random sample drawn from 2 normal populations are given below. Do the estimate of variances differ significantly at 5% level of significance?

| | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|
| Sample I | 20 | 16 | 26 | 27 | 23 | 22 | 18 | 24 | 25 | 19 | | |
| Sample II | 17 | 23 | 32 | 25 | 22 | 24 | 28 | 16 | 31 | 33 | 20 | 27 |

12M CO4 L4

UNIT-V

9. In a telephone exchange the arrival of calls follow Poisson Distribution with an average time of 8 minutes between two consecutive calls. The length of a call is exponentially distributed with mean 4 minutes. Determine
- (i) The probability that a call arriving at the booth will have to wait.
 - (ii) The average queue length that forms from time to time.
 - (iii) The probability that an arrival will have to wait for more than 10 minutes before the phone is free.
 - (iv) The hours of a day that the exchange will be in use.
- 12M CO5 L3

OR

10. At a one man barber shop, customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and the hair cutting time is exponentially distributed, with an average hair cut taking 10 minutes. It is assumed that because of his excellent reputation customers are always willing to wait. Calculate
- (i) Average number of customers in the shop
 - (ii) Average number of customers waiting for hair cut
 - (iii) The percent of time an arrival can walk right in without waiting
 - (iv) The percent of customers who have to wait prior to getting into the Barber's chair.
- 12M CO5 L3

END

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| R-20 |
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Code: 20DF13T

M.C.A. I Semester Supplementary Examinations November 2022

Relational Database Management Systems

Max. Marks: 60

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x12 = 60 Marks)

| | Marks | CO | BL |
|--|-------|----|----|
| UNIT-I | | | |
| 1. Explain the components of the database architecture with a neat diagram | 12M | 1 | 2 |
| OR | | | |
| 2. Explain the process of database design with ER model. Construct an ER diagram for banking enterprise. | 12M | 2 | 3 |
| UNIT-II | | | |
| 3. Construct the Relational algebra expressions for the following schema: SAILORS (SID, SNAME, CITY) BOATS (BID, BNAME, COLOR) RESERVES (SID, BID, DAY) Find name of the boats sailed by the sailors who live in Boston. Find the names of sailors who sailed in both green and blue color boats. Find the sailor IDs of those, whose rating is greater than 9. Find the names of boats, used for sailing on 09/May/22. | 12M | 3 | 3 |
| OR | | | |
| 4. a) Explain QBE with appropriate examples. | 6M | 2 | 2 |
| b) Represent the following SQL queries in Domain Relational Calculus | | | |
| i) Select lno from loan where amount > 1200; | | | |
| ii) Select cname from depositor, account where depositor.ano = account.ano and bname = 'Brighton': | 6M | 2 | 3 |
| UNIT-III | | | |
| 5. a) Differentiate Nested queries and Co-related queries with an example | 6M | 3 | 2 |
| b) What are DDL commands? Give the syntax of each command | 6M | 3 | 2 |
| OR | | | |
| 6. a) What is a Trivial functional dependencies? Give an example. | 4M | 5 | 3 |
| b) Define and Explain 1NF, 2NF and 3NF | 8M | 5 | 2 |
| UNIT-IV | | | |
| 7. a) What are the states of a transaction? | 5M | 5 | 2 |
| b) What is a schedule? Illustrate view serializability | 7M | 5 | 3 |
| OR | | | |
| 8. Explain the three phases of an ARIES recovery model. | 12M | 5 | 3 |
| UNIT-V | | | |
| 9. What is the fanout for a B+ tree of degree 4? Construct a B+ tree of 4 th order for the following values. 20, 16, 3, 21, 9, 7, 23, 15, 11 | 12M | 6M | 6M |
| OR | | | |
| 10. a) Explain hashing. What is linear Probing? | 6M | 6M | 3 |
| b) List the advantages and disadvantages of Static and Dynamic Hashing. | 6M | 6M | 2 |

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R-20

Code: 20DF14T

M.C.A. I Semester Supplementary Examinations November 2022

Computer Organization

Max. Marks: 60

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x12 = 60 Marks)

Marks CO BL

UNIT-I

1. a) What is BCD code write the conversion steps of BCD to binary code? 6M 2 2
b) Briefly explain the following.
i. Decoders ii. Multiplexers iii. Error Detecting Codes. 6M 2 2

OR

2. Define Flip-Flop? Explain the different types of Flip-Flop. 12M 2 1

UNIT-II

3. What is cache memory? Explain types of mapping functionalities. 12M 3 2

OR

4. a) Explain Memory Address Map in detail. 6M 2 2
b) What is the difference between RAM and ROM in terms of applications? 6M 3 2

UNIT-III

5. a) What is address transfer and explain it clearly? 6M 2 2
b) Explain the concept of Intel 8086 CPU architecture in detailed. 6M 1 2

OR

6. Define instruction format? Explain about various types of instruction formats? 12M 3 2

UNIT-IV

7. a) Describe interrupts and its control instructions? 6M 1 2
b) Define the data transfer instructions, arithmetic and logical instructions? 6M 2 2

OR

8. a) Describe assembler directives and explain it. 6M 3 1
b) Describe the importance of address instructions. 6M 2 1

UNIT-V

9. a) Explain parallel priority and its use. 6M 2 2
b) Define peripheral devices and why peripheral devices are important 6M 2 1

OR

10. Explain micro instruction format. Explain design of control unit 12M 3 3

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Code: 20DF12T

M.C.A. I Semester Supplementary Examinations November 2022

Data Structures and Algorithms

Max. Marks: 60

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x12 = 60 Marks)

| | Marks | CO | BL |
|--|-------|----|----|
| UNIT-I | | | |
| 1. a) Define Performance Analysis of an algorithm? | 4M | 1 | 1 |
| b) Illustrate time and space complexity related to algorithms and also state their importance? | 8M | 1 | 4 |
| OR | | | |
| 2. a) Explain Big-oh and omega notation with examples. | 6M | 1 | 2 |
| b) Calculate time and space complexity for the following algorithm. Algorithm MAdd(A,B,C,n) { for i=1 to n do for j=1 to n do C[i][j]=A[i][j] + B[i][j] } } | 6M | 1 | 3 |
| UNIT-II | | | |
| 3. a) Illustrate stack operations to check whether the given string is palindrome or not. | 6M | 2 | 3 |
| b) Illustrate insert, delete and display operations in a Circular queue. | 6M | 2 | 4 |
| OR | | | |
| 4. a) Illustrate insert and delete operations an element in a circular linked list. | 6M | 2 | 3 |
| b) Build an algorithm to invert a linked list. | 6M | 2 | 6 |
| UNIT-III | | | |
| 5. a) Define Hash Table? Explain the functions of Hash table? | 4M | 3 | 1 |
| b) Illustrate the basic two techniques for Collision-resolution in Hashing with example. | 8M | 3 | 4 |
| OR | | | |
| 6. a) Choose different File Organizations and discuss the advantages and disadvantages of each of them. | 6M | 3 | 5 |
| b) Illustrate indexed file organization. | 6M | 3 | 4 |

UNIT-IV

7. a) Develop algorithm to create a Binary Search Tree and perform Insertion and Deletion Operations. 6M 4 6
- b) Evaluate the time complexity for the above binary search tree algorithm. 6M 4 5

OR

8. a) Explain Kruskal's algorithm with the help of example for minimum spanning tree. 6M 4 2
- b) Develop single source shortest path using Dijkstra's algorithm. 6M 4 6

UNIT-V

9. a) Build Minimum Heap for an array 12, 3, 45, 65, 9, 28. 6M 5 6
- b) Develop Heap Sort algorithm to sort an integer array in an ascending order. 6M 5 6

OR

10. a) Illustrate Quick sort algorithm using divide and conquer method 6M 5 3
- b) Evaluate Quick Sort for best, average and worst case. 6M 5 5

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Code: 20DF11T

M.C.A. I Semester Supplementary Examinations November 2022

Mathematical Foundations of Computer Science

Max. Marks: 60

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x12 = 60 Marks)

Marks CO BL

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| UNIT-I |
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- | | | | |
|--|----|-----|----|
| <p>1. a) Define Statement and Explain various types of Statements with Examples</p> | 6M | CO1 | L3 |
| <p>b) Prove the validity of the following argument. "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. Therefore, either I will not get the job or I will not work hard."</p> | 6M | CO1 | L2 |

OR

- | | | | |
|--|----|-----|----|
| <p>2. a) Define Predicate Statement and explain all the Quantifiers with the help of examples</p> | 6M | CO1 | L3 |
| <p>b) Establish the validity of the following arguments. $\exists x (p(x) \wedge q(x))$ $\forall x (p(x) \rightarrow r(x))$ ----- $\therefore \exists x (r(x) \wedge \neg q(x))$ -----</p> | 6M | CO1 | L4 |

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| UNIT-II |
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|---|----|-----|----|
| <p>3. a) Define and Explain various types of Relations with their Properties</p> | 6M | CO2 | L3 |
| <p>b) Explain the properties of the relation R, Given $S=\{1,2,3,..,10\}$ and a relation R on S where $R = \{(x,y) / x+y =10\}$</p> | 6M | CO2 | L4 |
| OR | | | |
| <p>4. a) Define Lattice and Explain the various properties of lattices.</p> | 6M | CO2 | L3 |
| <p>b) Define Hasse Diagram and Draw the Hasse diagram for all the positive divisors of 36 where the relation is x divides y</p> | 6M | CO2 | L3 |

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| UNIT-III |
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| <p>5. a) In how many ways can the 26 letters of the English alphabet be permittted So that none of the patterns CAR , DOG , PUN or BYTE occurs</p> | 6M | CO3 | L1 |
| <p>b) How many 8 digit numbers can be formed by arranging the digits 1, 1, 1, 1, 2, 3, 3, 3?</p> | 6M | CO3 | L1 |

OR

6. a) State and prove principle of inclusion-exclusion for two sets with the help of example. 6M CO3 L4
- b) Define and Explain Pigeon-Hole Principles and its Application. 6M CO3 L3

UNIT-IV

7. a) Find the generating function for the sequence 1, 3, 5, 7, 9.....? 4M CO4 L4
- b) Find the generating function $G(n)$ for $F_n = 5F_{n-1} + 6F_{n-2}$ where $F_0 = 1$ and $F_1 = 4$. 8M CO4 L4

OR

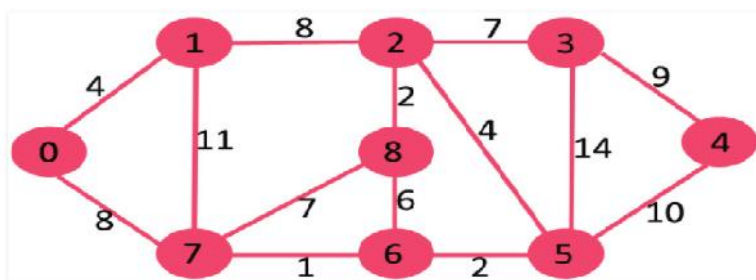
8. a) Find the generating function for the sequence 1, 1, 1, 1, 1, 1...? 4M CO4 L4
- b) Solve the recurrence relation $a_n + a_{n-1} - 6a_{n-2} = 0$ for $n \geq 2$ given that $a_0 = -1$ and $a_1 = 8$ 8M CO4 L3

UNIT-V

9. a) Define Graph and Explain the various types of representation of a Graphs. 6M CO5 L3
- b) Define the terms Eulers formula with the help of an example 6M CO5 L3

OR

10. a) Define Spanning Tree. 2M CO5 L3
- b) Draw the Spanning Tree by using Kruskals Algorithm for the given graph



10M CO5 L4

END