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<b>R-20</b>
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**Code: 20DF12T**

M.C.A. I Semester Supplementary Examinations November 2021

**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 )

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Marks CO BL

**UNIT-I**

- 1. a) Write short notes on efficiency of an algorithm. 6M CO1 L3
- b) What do you mean by recursion? What conditions should be mandatory for writing a recursive function? 6M CO1 L2

**OR**

- 2. a) Write short notes on analysis of an algorithm. 6M CO1 L3
- b) What is an Abstract Data type (ADT)? Explain. 6M CO1 L2

**UNIT-II**

- 3. a) What are the linear data structures? Give some examples 6M CO2 L2
- b) Define queue? Explain about queue operations and its applications. 6M CO2 L4

**OR**

- 4. a) Compare array and linked list with suitable examples. 6M CO2 L4
- b) Briefly explain about stack using linked list 6M CO2 L2

**UNIT-III**

- 5. a) Define Binary Tree. Name and explain with suitable example the following terms:
  - i) Root node
  - ii) Left sub-tree and Right sub-tree
  - iii) Depth of tree. 6M CO3 L2
- b) Explain threaded binary tree with an example. What is its advantage? 6M CO3 L4

**OR**

- 6. a) What is a Hash function? What are its characteristics? List the different hash functions used. 6M CO3 L2
- b) Discuss briefly about multi-key file organization and access methods. 6M CO3 L4

**UNIT-IV**

- 7. a) Discuss in detail about binary tree traversal. 6M CO4 L2
- b) Define AVL tree and how it different from other trees? Explain with an example. 6M CO4 L4

**OR**

- 8. a) Explain with suitable examples, BFS and DFS traversal of a graph. 6M CO4 L4
- b) Define shortest path algorithm. Explain Dijkstra algorithm with an example. 6M CO4 L4

**UNIT-V**

- 9. a) Write a program to sort the elements of an array using selection sort method with an example. 6M CO5 L3
- b) Perform Merge sort with the following: 15, 5, 6, 24, 75, 3, 50, 43, 8, 2 6M CO5 L3

**OR**

- 10. a) Sort the following sequence of numbers using Insertion sort: 14,18,1,2,9,6,7,3 6M CO5 L3
- b) Distinguish between Sequential and Binary search methods with suitable examples. 6M CO5 L4

\*\*\*END\*\*\*

**Code: 20DC11T**

M.C.A. I Semester Supplementary Examinations November 2021

**Probability and Statistics**

Max. Marks: 60

Time: 3 Hours

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

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Marks    CO    BL

**UNIT-I**

1. A problem is given to four students A, B, C, and D. Probabilities of solving them independently are  $\frac{2}{3}$ ,  $\frac{2}{5}$ ,  $\frac{1}{4}$ ,  $\frac{3}{4}$  .If all of them try to solve the problem, what is the probability that the problem is solved 12M    CO1    L2

**OR**

2. A fair coin is tossed until a head or five tails occurs. Find the expected number E of tosses of the coin. 12M    CO1    L2

**UNIT-II**

3. Fit a Poisson distribution for the following data and calculate the expected frequencies.

x	0	1	2	3	4
f(x)	109	65	22	3	1

12M    CO2    L3

**OR**

4. The mean and standard deviation of a population are 11,795 and 14,054. What can one assert that 95% confidence about the maximum error if  $\bar{x} = 11.795, n = 50$  . 12M    CO2    L3

**UNIT-III**

5. A random sample of size 144 is taken from an infinite population having the mean 75 and variance 225. What is the probability that  $\bar{x}$  will be between 72 and 77 12M    CO3    L2

**OR**

6. A random sample of 400 items is found to have mean of 82 and standard deviation of 18. Find 95% confidence limits for the mean of the population from which the sample is drawn 12M    CO3    L2

**UNIT-IV**

7. The gain in weight of two random samples of rats fed on two different diets A and B are given below. Examine whether the difference in mean increases is significant

Diet-A	13	14	10	11	12	16	10	8	
Diet-B	7	10	12	8	10	11	9	10	11

12M    CO4    L4

**OR**

8. Fit a Poisson distribution to the following data and for its goodness of fit at level of significance 0.05 level of significance.

x	0	1	2	3	4	5	6	7
f	3005	366	210	80	28	9	2	1

12M    CO4    L4

**UNIT-V**

9. Barber A takes 15 minutes to complete one haircut. Customers arrive in his shop at an average rate of one every 30 minutes. Barber B takes 25 minutes to complete one haircut and customers arrive at his shop at an average rate of one every 50 minutes. The arrival processes are Poisson and the service firms follow an exponential distribution

- (a) Where would you expect a bigger Queue?  
 (b) Where would you require more time waiting included to complete a haircut? 12M    CO5    L3

**OR**

10. A bank plans to open a single server drive-in banking facility at a certain Centre. It is estimated that 20 customers will arrive each hour on hour on average, it is requires 2 minutes to process a customer's transaction.

Determine

- a) The proportion of time that the system will be idle  
 b) On the average, how long a customer will have to wait before reaching the server.  
 c) The fraction of customers who will have to wait. 12M    CO5    L3

\*\*\*\*END\*\*\*\*

**Code: 20DF11T**

M.C.A. I Semester Supplementary Examinations November 2021

**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 )

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	Marks	CO	BL
<b>UNIT-I</b>			
1. a) Explain the term tautology? Show that $[(p \vee q) \wedge r] \wedge [(p \vee q) \wedge \neg p \wedge r]$ is tautology	6M	1	L2,L3
b) Prove that for any three propositions $[(P \vee Q) \wedge R] \Leftrightarrow [(P \wedge R) \wedge (Q \wedge R)]$	6M	1	L4
<b>OR</b>			
2. a) Obtain the principal disjunctive normal form of $(\sim P \vee \sim Q) \wedge (\sim P \wedge R)$	6M	1	L5
b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from premise $P \vee Q, Q \wedge R, P \wedge M$ and $\sim M$ .	6M	1	L3
<b>UNIT-II</b>			
3. a) Let $A = \{1, 2, 3\}$ . Determine whether the following relations are Reflexive, Symmetric and Transitive defined on the set A i) $R = \{(1,2), (2,1), (1,3), (3,1)\}$ ii) $S = \{(1,1), (2,2), (3,3), (2,3)\}$ iii) $T = \{(2,3), (3,4), (2,4)\}$	6M	2	L3
b) Construct the Hasse diagram represented with positive divisors of 36?	6M	2	L6
<b>OR</b>			
4. a) Define a Transitive Closure? Let $A = \{1,2,3,4\}$ and $R = \{(1,2), (2,1), (2,3), (3,4), (4,2)\}$ Find the Transitive closure of R.	6M	2	L1,L3
b) Define Equivalence relation? Let $A = \{1,2,3,4\}$ and $R = \{(1,1), (1,2), (2,1), (2,2), (3,4), (4,3), (3,3), (4,4)\}$ be a relation on A. Verify that R is an equivalence relation.	6M	2	L1, L3
<b>UNIT-III</b>			
5. a) Find the co-efficient of $xyz^2$ in the expansion of $(2x - y - z)^4$	6M	3	L5
b) A total amount of Rs 1500 is to be distributed to 3 poor students A, B, C of a class. In how many ways the distribution can be made in multiples of Rs 100 (i) if everyone of these must get at least Rs 300? (ii) If A must get at least Rs. 500, and B and C must get at least Rs.400 each?	6M	3	L5
<b>OR</b>			
6. a) Explain the concept of Pigeon-Hole Principle with examples	6M	3	L5
b) In a sample of 100 logic chips, 23 have a defect D1, 26 have a defect D2, 30 have defect D3, 7 have the defects D1 and D2, 8 have defects D1 and D3, 10 have D2 and D3 and 3 have all the 3 defects, Find the number of chips having i) At least 1 defect ii) no defect	6M	3	L5
<b>UNIT-IV</b>			
7. Solve the recurrence relation $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3}$ , given $a_0=1, a_1=4, a_2=28$	12M	4	L3
<b>OR</b>			
8. Find the generating function for the recurrence relation $a_{n+1} - a_n = 3n, n \geq 0$ and $a_0 = 1$ , Hence solve the relation.	12M	4	L3,L4
<b>UNIT-V</b>			
9. a) Is there a simple graph with 1, 1, 3, 3, 3, 4, 6, 7 as the degrees of its vertices?	6M	5	L4
b) Explain i) Planar Graph ii) Chromatic number of a graph iii) Spanning tree.	6M	5	L2
<b>OR</b>			
10. Explain Depth First Search Algorithm with an example.	12M	5	L2

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<b>R-20</b>
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**Code: 20DF13T**

M.C.A. I Semester Supplementary Examinations November 2021

**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 )

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Marks CO BL

**UNIT-I**

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|--|----|---|----|
| 1. a) Explain the main characteristics of the database approach versus the file processing approach? | 6M | 1 | L2 |
| b) Explain the different types of data models with examples?   | 6M | 1 | L2 |

**OR**

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|---|----|---|----|
| 2. a) Discuss about different types of attributes with examples?  | 6M | 1 | L6 |
| b) Draw an ER-diagram of an Airline reservation system, taking into account at least five entities. Indicate all keys, constraints and assumptions that are made? | 6M | 1 | L3 |

**UNIT-II**

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|--|----|---|----|
| 3. a) Discuss about domain relational calculus?                      | 6M | 2 | L6 |
| b) Explain about join and division operations in relational algebra? | 6M | 2 | L2 |

**OR**

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|--|-----|---|----|
| 4. Explain in detail about structure of Relational Database? | 12M | 2 | L2 |
|--|-----|---|----|

**UNIT-III**

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|--|----|---|----|
| 5. a) Explain the format of basic SQL query in detail with examples? | 6M | 3 | L2 |
| b) List and explain about aggregate functions supported by SQL?      | 6M | 3 | L2 |

**OR**

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|--|----|---|----|
| 6. a) What is multi valued dependency? Illustrate 4NF with an example? | 6M | 3 | L2 |
| b) State BCNF. How does it differ from 3NF?                            | 6M | 3 | L4 |

**UNIT-IV**

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|--|----|---|----|
| 7. a) Draw transaction state diagram and describe each state that a transaction goes through during its execution? | 6M | 4 | L3 |
| b) Why the concurrency control is needed? Explain it?  | 6M | 4 | L2 |

**OR**

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|--|-----|---|----|
| 8. Discuss in detail about ARIES recovery technique? | 12M | 4 | L6 |
|--|-----|---|----|

**UNIT-V**

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|---|----|---|----|
| 9. a) Explain the various indexing schemes used in database environment?                        | 6M | 5 | L2 |
| b) Describe the different types of file organization? Write their advantages and disadvantages? | 6M | 5 | L2 |

**OR**

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|--|----|---|----|
| 10. a) Demonstrate the implementation of B+ trees?         | 6M | 5 | L2 |
| b) Distinguish between static hashing and dynamic hashing? | 6M | 5 | L4 |

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<b>R-20</b>
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**Code: 20DF14T**

M.C.A. I Semester Supplementary Examinations November 2021

**Computer Organization**

Max. Marks: 60

Time: 3 Hours

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

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Marks    CO    BL

**UNIT-I**

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|----|----|--|----|-----|----|
| 1. | a) | Write about Combinational and Sequential circuits.   | 6M | CO1 | L1 |
|    | b) | Design a combinational circuit with three inputs x, y, z and three outputs A, B, C. When the binary output is 0, 1, 2, or 3, the binary output is one greater than the input. When the binary output is 4, 5, 6, or 7, the binary output is one less than the input. | 6M | CO1 | L1 |

**OR**

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|----|----|---|----|-----|----|
| 2. | a) | What is full adder? Design a full adder circuit by constructing truth table.                            | 8M | CO2 | L2 |
|    | b) | Show that a JK flip-flop can be converted to a D flip-flop with an inverter between the J and K inputs. | 4M | CO2 | L2 |

**UNIT-II**

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|----|----|---|----|-----|----|
| 3. | a) | Explain Memory hierarchy with the help of a suitable diagram.     | 6M | CO2 | L2 |
|    | b) | Explain the concept of memory connection to CPU with neat diagram | 6M | CO2 | L2 |

**OR**

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|----|---|-----|-----|----|
| 4. |   | 12M | CO2 | L2 |
|    | What is cache memory? Explain types of mapping functionalities in cache memory. |     |     |    |

**UNIT-III**

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|----|---|-----|-----|----|
| 5. |   | 12M | CO2 | L2 |
|    | Discuss the different types of addressing modes |     |     |    |

**OR**

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|----|--|-----|-----|----|
| 6. |  | 12M | CO3 | L3 |
|    | Explain the Instruction formats of 8086. |     |     |    |

**UNIT-IV**

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|----|----|--|----|-----|----|
| 7. | a) | Explain various types of interrupts.   | 6M | CO2 | L2 |
|    | b) | Explain Conditional and unconditional transfer instructions with suitable examples | 6M | CO3 | L3 |

**OR**

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|----|---|-----|-----|----|
| 8. |   | 12M | CO3 | L3 |
|    | Explain the shift and rotate instructions with suitable examples. |     |     |    |

**UNIT-V**

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|----|---|-----|-----|----|
| 9. |   | 12M | CO2 | L2 |
|    | What is Priority interrupt? Explain Daisy chaining and Parallel priority interrupt. |     |     |    |

**OR**

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|-----|----|---|----|-----|----|
| 10. | a) | Describe different Modes of transfer.                     | 7M | CO2 | L2 |
|     | b) | What are the various Peripheral devices? Explain briefly. | 5M | CO2 | L2 |

\*\*\*\*END\*\*\*\*