| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DF12T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Data Structures and Algorithms

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Define Data Structure. List the operations of the data structures with examples | 6M | CO1 | L1 |
| | b) | Differentiate between iterative and recursive algorithms | 6M | CO1 | L2 |
| | | **OR** | | | |
| 2. | a) | What is Abstract Data Type (ADT)? Explain between primitive and non-primitive data types | 6M | CO1 | L2 |
| | b) | Describe about the best case, average case and worst case efficiency of an algorithm | 6M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 3. | | Write about traversing a linked list with an example and write an algorithm for traversals. | 12M | CO2 | L2 |
| | | **OR** | | | |
| 4. | | Describe the procedure to convert infix expression to postfix form. Convert infix expression into its equivalent post fix expression A*(B+D)/E-F*(G+H/K) | 12M | CO2 | L3 |
| | | **UNIT–III** | | | |
| 5. | | Build the binary tree for the given in order and preorder traversals:<br>In order: E A C K F H D B G<br>Preorder: F A E K C D H G B | 12M | CO3 | L3 |
| | | **OR** | | | |
| 6. | a) | Explain about Quadratic Probing with example | 6M | CO3 | L2 |
| | b) | Explain about collision resolution techniques | 6M | CO3 | L2 |
| | | **UNIT–IV** | | | |
| 7. | | Define a balanced search tree. Construct an AVL tree with the following keys: **3, 2, 1, 4, 5, 6, 7, 16, 15 and 14** with the necessary rotations. | 12M | CO4 | L3 |
| | | **OR** | | | |
| 8. | a) | Explain about BSF graph traversal algorithm with an example | 6M | CO4 | L2 |
| | b) | Explain about Prim's algorithm with an example | 6M | CO4 | L2 |
| | | **UNIT–V** | | | |
| 9. | a) | Write an algorithm to perform binary search. Illustrate it with an example. | 6M | CO5 | L2 |
| | b) | Apply insertion sort on the following elements 3, 1, 4,7,5, 9, 2, 6, 5,10 | 6M | CO5 | L3 |
| | | **OR** | | | |
| 10. | a) | State and explain merge sort with an example | 6M | CO5 | L2 |
| | b) | Write an algorithm to implement bubble Sort and write its efficiency. | 6M | CO5 | L3 |

***END***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DF11T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Mathematical Foundations of Computer Science

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Explain the connectives and their truth tables | 8M | CO1 | L2 |
| | b) | Prove that $(p \vee q) \rightarrow (p \rightarrow q)$ is a contingency. | 4M | CO1 | L3 |
| | | **OR** | | | |
| 2. | | Obtain the PDNF and PCNF of $(P \vee Q) \wedge (\neg P \vee R) \wedge (Q \vee R)$ | 12M | CO1 | L3 |
| | | **UNIT–II** | | | |
| 3. | a) | Let X={1,2,3,4} and $X = \{(1,1),(1,4),(2,2),(2,3),(3,2),(3,3),(4,1),(4,4)\}$. Then prove that R is an equivalence relation. | 6M | CO2 | L2 |
| | b) | Define the properties of relations with an example. | 6M | CO2 | L1 |
| | | **OR** | | | |
| 4. | a) | Define Lattice and write down its properties. | 4M | CO2 | L1 |
| | b) | Draw Hasse diagram representing the positive divisor of 36. | 8M | CO2 | L4 |
| | | **UNIT–III** | | | |
| 5. | a) | Find the number of permutations of all the letters of the word BASEBALL if the words are to begin and end with a vowel. | 6M | CO3 | L3 |
| | b) | Find the value of n such that $P(n,2) = 90$ | 6M | CO3 | L1 |
| | | **OR** | | | |
| 6. | a) | Find the Coefficient of $x\,y\,z^5$ in the expansion of $(x+y+z)^7$ | 6M | CO3 | L2 |
| | b) | How many persons must chose in order that at least 5 of them will have birthdays in the same calendar month. | 6M | CO3 | L3 |
| | | **UNIT–IV** | | | |
| 7. | a) | Find the coefficient of $x^{12}$ in $(1-4x)^{-5}$. | 6M | CO4 | L1 |
| | b) | Find the sequence generated by the function $(2+x)^4$ | 6M | CO4 | L3 |
| | | **OR** | | | |
| 8. | a) | Solve $a_n + a_{n-1} - 6a_{n-2} = 0$ for $n \geq 2$ given that $a_0 = -1, a_1 = 8.$ | 6M | CO4 | L3 |
| | b) | Solve the recurrence relation $a_n = a_{n-1} + n,\ n \geq 1$ where $a_0 = 2$ by substitution method. | 6M | CO4 | L3 |
| | | **UNIT–V** | | | |
| 9. | a) | Define the following with examples: (i) Degree of a vertex (ii) Complete Graph (iii) Regular Graph | 6M | CO5 | L2 |
| | b) | Define chromatic number and explain with a suitable example. | 6M | CO5 | L4 |
| | | **OR** | | | |
| 10. | | Explain Depth First Search and Breadth First Search algorithms with suitable examples. | 12M | CO5 | L4 |

***END***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DC11T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Probability and Statistics

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

*********

| | | Marks | CO | BL |
|---|---|---|---|---|

## UNIT–I

1. a) The students in a class are selected at random one after the other for an examination. Find the probability that the boys and girls sit alternatively if there are (i) 5 boys and 4 girls (ii) 4 boys and 4 girls. 6M 2 1

   b) Calculate expectation and variance of X, if the probability distribution of the random variable X is given by

| X | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|
| F | 0.3 | 0.1 | 0.1 | 0.3 | 0.2 |

6M 3 3

**OR**

2. a) In a bolt factory machines A, B, C manufacture 20%, 30%, 50% of the items in which 6%, 3%, 2% of the items are defective. A bolt is drawn at random and found to be defective. Find the probability that is manufactured from
   (i) Machine A (ii) Machine B (iii) Machine C. 6M 1 2

   b) If a probability density function $f(x) = \begin{cases} Kx^3 \ in \ 0 \leq x \leq 3 \\ 0 \ else \ where \end{cases}$.
   Find the value of *K* and find the probability between $x = \frac{1}{2}$ and $x = \frac{3}{2}$. 6M 2 4

## UNIT–II

3. 10 % of screws produced by a company are defective. Find the probability that out of 10 screws chosen at random (i) 1 will be defective (ii) at most 2 will be defective (iii) none will be defective. 12M 4 5

**OR**

4. Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 (or) 3 boys (iv) At least one boy. 12M 5 6

## UNIT–III

5. A population consists of five numbers 2, 3, 6, 8 & 11. Consider all possible samples of size two can be drawn with replacement from this population. Find
   i) Mean of the population.
   ii) Standard deviation of the population.
   iii) The mean of the sampling distribution of means.
   iv) The Standard deviation of the sampling distribution of means. 12M 3 4

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 6. | a) | The mean and standard deviation of a population are 11,795 and 14,054 respectively. What can we assert with 95% about the maximum error if $\bar{x}$=11,795, n=50.Also construct the 95% confidence interval for true mean. | 6M | 1 | 1 |
| | b) | A random sample of size 100 is taken from a population with $\sigma$ = 5.1. Given that the sample mean is 21.6. Construct a 95% confidence interval for the population mean $\mu$. | 6M | 3 | 3 |

**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | A mechanist is making engine parts with axle diameters of 0.7000 inches. A random sample of 10 parts shows a mean diameter of 0.742 inch, with S.D of 0.04 inch. Compute the statistic you would use to test whether the work is meeting the specifications at 0.05 level of significance. | 6M | 2 | 2 |
| | b) | A random sample of six steel beams has a mean compressive strength of 58,392 p.s.i (pounds per square inch) with a S.D of 648 p.s.i. use this information and the level of significance 0.05 to test the true average compressive strength of the steel from which this sample came is 58,000 p.s.i. assume normality. | 6M | 3 | 1 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 8. | a) | Producer of "gutkha" claims that the nicotine content in his gutkha on the average is 1.83 mg. can this claim accepted if a random sample of 8 gutkha of this type have the nicotine contents of 2.0, 1.7, 2.1, 1.9, 2.2, 2.1, 2.0, 1.6 mg. Use a 0.05 level of significance. | 6M | 1 | 2 |
| | b) | The mean life time of a sample of 25 fluorescent light bulbs produced by a company is computed to be 157 hours with S.D of 120 hours. The company claims that the average life of the bulbs is 1600 hours using the level of significance of 0.05. Is the claim acceptable? | 6M | 3 | 3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 9. | a) | A washing machine repairmen finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day, what is repairman's expected ideal time each day. How many jobs are ahead of the average set just brought in? | 6M | 1 | 4 |
| | b) | Write the relation between $L_s$, $L_q$, $W_s$, and $W_q$. | 6M | 2 | 1 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 10. | a) | Describe a queue model of M/M/I and determine the probability that at least one unit is present in the system. | 6M | 3 | 2 |
| | b) | What are the Assumptions and Limitations of Queuing model. | 6M | 2 | 1 |

***END***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DF13T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Relational Database Management Systems

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

*********

| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | | With neat diagram explain the architecture of Data Base Management Systems (DBMS) and Write the main Applications of DBMS? | 12M | CO1 | L2 |
| | | **OR** | | | |
| 2. | a) | Explain E-R diagrams design issues | 6M | CO1 | L2 |
| | b) | Explain about Specialization and Generalization with suitable examples | 6M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 3. | a) | Illustrate the Structure of Relational database | 6M | CO2 | L3 |
| | b) | Differentiate between Tuple relational calculus, Domain relational calculus | 6M | CO2 | L2 |
| | | **OR** | | | |
| 4. | a) | Illustrate Relational algebra Operations with example queries | 6M | CO2 | L3 |
| | b) | Illustrate QBE (Query-by-Example) with example queries | 6M | CO2 | L3 |
| | | **UNIT–III** | | | |
| 5. | a) | Discuss nested queries with examples? | 6M | CO3 | L2 |
| | b) | Illustrate various types Integrity constraints in SQL with examples | 6M | CO3 | L3 |
| | | **OR** | | | |
| 6. | a) | Describe functional dependencies. How are primary keys related to FD's? | 6M | CO3 | L2 |
| | b) | Interpret Why do we need normalization? Explain the difference between 3NF and 4NF with example. | 6M | CO3 | L2 |
| | | **UNIT–IV** | | | |
| 7. | a) | Discuss different phases of transaction? | 6M | CO4 | L2 |
| | b) | Illustrate concurrent execution of transaction with examples? | 6M | CO4 | L3 |
| | | **OR** | | | |
| 8. | a) | Illustrate How does Recovery manager ensure atomicity of transactions? How does it ensure durability? | 6M | CO4 | L3 |
| | b) | Explain about Log-Based Recovery | 6M | CO4 | L2 |
| | | **UNIT–V** | | | |
| 9. | a) | Explain in detail about various File Organization techniques | 6M | CO5 | L2 |
| | b) | Explain in detail about Data-Dictionary Storage | 6M | CO5 | L2 |
| | | **OR** | | | |
| 10. | a) | Explain about B+ tree index file? | 6M | CO5 | L2 |
| | b) | Explain in detail about Multiple-key access | 6M | CO5 | L2 |

***END***

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DC12T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Technical Communication

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

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| | | Marks | CO | BL |
|---|---|---|---|---|
| | **UNIT–I** | | | |
| 1. | Justify how language is a tool of effective communication. | 12M | CO1 | L5 |
| | **OR** | | | |
| 2. | Outline different types of listening that are basic for communication. | 12M | CO1 | L4 |
| | **UNIT–II** | | | |
| 3. | Describe the role of kinesics in enhancing verbal communication. | 12M | CO2 | L2 |
| | **OR** | | | |
| 4. | Analyse some tips pertaining to the types of visual aids one may commonly use in one's presentations. | 12M | CO2 | L4 |
| | **UNIT–III** | | | |
| 5. | Discuss the significance of Letter Writing and list the seven C s to draft effectively. | 12M | CO4 | L2 |
| | **OR** | | | |
| 6. | Summarize writing techniques required to draft effective professional emails. | 12M | CO4 | L2 |
| | **UNIT–IV** | | | |
| 7. | Asses the common types of reports. | 12M | CO4 | L5 |
| | **OR** | | | |
| 8. | You have been asked by a Shampoo manufactures company to make a study of the consumer reaction to their product. Recommend measures to improve the image and the sales of their product. Develop a report. | 12M | CO4 | L6 |
| | **UNIT–V** | | | |
| 9. | Justify how the Group Discussion plays an important role in job selection and admission to professional courses. | 12M | CO3 | L5 |
| | **OR** | | | |
| 10. | "Tell us about yourself frightens many candidates during job interviews". Do you agree with the above statement? Support. | 12M | CO3 | L5 |

****END****

| Hall Ticket Number : | | | | | | | | | | |
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**R-20**

**Code: 20DF14T**

M.C.A. I Semester Regular & Supplementary Examinations March 2023

# Computer Organization

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 12 = 60 Marks )

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| | | | Marks | CO | BL |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | Explain in detail about Demultiplexer with a block diagram | 6M | CO1 | L2 |
| | b) | Illustrate the implementation of 4-to-2 priority encoder | 6M | CO1 | L2 |
| | | **OR** | | | |
| 2. | a) | Illustrate the 4-to-1 multiplexer implementation using the basic gates | 6M | CO1 | L3 |
| | b) | Explain the implementation of Full-adder along with Truth Table | 6M | CO1 | L2 |
| | | **UNIT–II** | | | |
| 3. | a) | Explain in detail about Typical ROM chip with a schematic | 6M | CO2 | L2 |
| | b) | Explain in detail about set-associative mapping | 6M | CO2 | L2 |
| | | **OR** | | | |
| 4. | | What is meant by Auxiliary memory? Explain about the different types | 12M | CO2 | L2 |
| | | **UNIT–III** | | | |
| 5. | | Discuss in detail about Two & Three address instructions | 12M | CO3 | L2 |
| | | **OR** | | | |
| 6. | | Elaborate in detail about Instruction formats in 8086 | 12M | CO3 | L2 |
| | | **UNIT–IV** | | | |
| 7. | | Discuss in detail about the following<br>i. Statements<br>ii. Directives | 12M | CO4 | L2 |
| | | **OR** | | | |
| 8. | | Explain in detail on the Data transfer modes in 8086 | 12M | CO4 | L2 |
| | | **UNIT–V** | | | |
| 9. | | What is Address Sequencing? Explain in detail about the address sequencing capabilities required in a control memory | 12M | CO5 | L2 |
| | | **OR** | | | |
| 10. | a) | Explain how is Decoding of microoperation fields undertaken in Control Unit | 6M | CO5 | L2 |
| | b) | Explain the differences between hardwired control and Microprogrammed control | 6M | CO5 | L2 |

***END***