Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER - II EXAMINATION - SUMMER 2025

Subject Code: MC02094011   **Date: 29-05-2025**

Subject Name: Data Structure using C

Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of simple calculators and non-programmable scientific calculators are permitted.

			Marks
Q.1	**(a)**	Define Data structure. List various primitive and non-primitive data structure with examples	**07**
	(b)	Explain various operations that can be performed on Data Structure.	**07**
Q.2	**(a)**	What is stack? List the various applications of stack. Write the algorithm to implement push and pop operations on stack.	**07**
	(b)	Give differences between the following: (i) Linear queue and circular queue (ii) Arrays and Linked List	**07**

OR

	(b)	Convert the following expression from infix to postfix using Stack data structure. Show all the intermediate steps used in achieving the postfix form: 　(A+B) * (C+D) / (E+F)	**07**
Q.3	**(a)**	A list of nodes with following data is available as: 2, 3, 4, 5, 6. Write an algorithm to insert node with value "1" at the beginning and node with value "7" end of a singly linked list. Write the output after each operation.	**07**
	(b)	Generate Binary tree using following traversal. i. Inorder : H,D,B,I,E,A,F,J,C,K,G,L ii. Postorder : H,D,I,E,B,J,F,K,L,G,C,A Also perform the Preorder Traversal from the binary tree.	**07**

OR

	(a)	Explain 2-3 Trees in detail by taking suitable example.	**07**
	(b)	Write an algorithm to delete the node at the beginning of the list and node from the end of a singly linked list for the following data: 11, 22, 23, 54, 58, 69, 99.. Write the output after each operation.	**07**
Q.4	**(a)**	Write short note on threaded storage representation of binary tree.	**07**

(b) Write an algorithm for binary searching. Generate the Binary Search Tree for the following data: 42, 23, 74, 11, 65, 58, 94, 36, 99, 87   **07**

OR

(a) Give difference between BFS and DFS. Consider any graph and perform DFS and BFS on it.   **07**

(b) Explain matrix and list representation of a graph with the help of a suitable example.   **07**

Q.5 (a) Explain hash function and collision resolution techniques with suitable examples.   **07**

(b) What is the divide-and-conquer approach? Write the algorithm of Merge Sort. Sort the following data using Merge Sort. 22, 35, 47, 14, 21, 63, 12, 46   **07**

OR

(a) Explain heap sort using max heap to sort the data given below. While constructing the heap, indicate clearly all the changes required to be done in each step. Data: 39, 16, 45, 89, 61, 72, 22, 48, 54   **07**

(b) In a Height-Balanced Tree, what are the cases causing imbalance and how rebalancing is done in such cases. Write a step-by-step method (taking one number at a time) to develop Height-Balanced Tree (by rebalancing at each stage in case of imbalance) for the following sequence of numbers: **07**

12, 6, 9, 11, 10, 4, 7

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