Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03000081 **Date: 17-12-2025**

Subject Name: Data Structures

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.

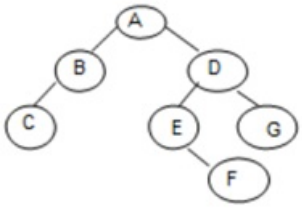
4. Simple and non-programmable scientific calculators are allowed.

			Marks
Q.1	**(a)**	What is the difference between linear and non-linear data structures?	**03**
	(b)	Differentiate between primitive and non-primitive data structures with examples.	**04**
	(c)	Explain storage representation methods for different data structures and discuss their impact on algorithm implementation and efficiency.	**07**
Q.2	**(a)**	Explain the Tower of Hanoi with an example.	**03**
	(b)	Explain the memory representation of a one-dimensional and two-dimensional array with examples.	**04**
	(c)	Show the procedure of converting the following infix expression to postfix form using a Stack. ((A – (B + C)) × D) / (E + F)	**07**
		OR	
	(c)	Define the circular queue and mention its advantages. Write an algorithm to implement the Insert & Delete operation into a Circular Queue.	**07**
Q.3	**(a)**	What is a sparse matrix, and why is it represented differently than a standard matrix?	**03**
	(b)	Define a queue. List three real-time applications of queues with examples.	**04**
	(c)	Analyze the linked list data structure. Compare singly linked lists, doubly linked lists, and circular linked lists in terms of structure, traversal, and applications.	**07**
		OR	
	(a)	Define the following terms: 1. Degree of vertex, 2. Height of a tree, 3. Balanced binary tree.	**03**
	(b)	Explain the depth-first search operation with an example.	**04**
	(c)	Define a threaded binary tree. What are the advantages and disadvantages of a threaded binary tree? Write down a few applications of a threaded binary tree.	**07**
Q.4	**(a)**	Define graph, and list out three applications of graph.	**03**
	(b)	List the applications of trees.	**04**

	(c)	Given the following traversals, create a binary tree from them. Also, generate the postorder traversal for the same. preorder = {7,10,4,3,1,2,8,11}, inorder = {4,10,3,1,7,11,8,2}.	**07**

OR

	(a)	Generate the inorder, preorder and postorder traversal for the following tree.	**03**



	(b)	List out applications of hashing.	**04**
	(c)	What is a minimum spanning tree? Explain Kruskal's algorithm for finding a minimum spanning tree with an example.	**07**
Q.5	**(a)**	Define collision in hashing and mention two collision resolution techniques.	**03**
	(b)	Explain the Binary search method.	**04**
	(c)	Explain Sequential, Indexed and Relative/Random File Organization.	**07**

OR

	(a)	Write an algorithm for Bubble sort.	**03**
	(b)	Explain the working of a hashing function with a suitable example.	**04**
	(c)	Sort the following numbers using (i) Selection sort, (ii)Quick sort: [10, 50, 0, 20, 30, 10]. Show the steps.	**07**

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