GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code: 3130702   **Date: 26-11-2024**
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)**	Differentiate Primitive and Non Primitive Data Structures	**03**
	(b)	Derive basic operation of stack and write C function to implement it.	**04**
	(c)	Explain Row Major and Column Major with Example.	**07**
Q.2	**(a)**	What is Sparse Matrix?	**03**
	(b)	Translate infix expression into its equivalent post fix expression: A*(B+D)/E-F*(G+H/K)	**04**
	(c)	Write a program to implement Circular queue and show how it differ from normal queue?	**07**
		OR	
	(c)	Explain the concept of Reverse Polish Notation (RPN) and describe the process for evaluating an RPN expression using a stack. Provide a detailed example of evaluating the following RPN expression: 5 1 2 + 4 * + 3 -	**07**
Q.3	**(a)**	Write an algorithm for Bubble sort.	**03**
	(b)	Sort 20,35,40,100,3,10,15 using insertion sort. Show all passes.	**04**
	(c)	Compare and contrast Depth First Search (DFS) and Breadth First Search (BFS) in terms of their algorithms, uses, and performance.	**07**
		OR	
Q.3	**(a)**	Write an algorithm for Merge Sort.	**03**
	(b)	Sort the given values using Quick Sort? 65, 70, 75, 80, 85, 60, 55, 50, 45. Show all passes.	**04**
	(c)	Describe the concept of hashing and explain different collision resolution techniques, including separate chaining and open addressing. Illustrate how each technique works with examples.	**07**
Q.4	**(a)**	Define Graph and list any 3 uses of graph.	**03**
	(b)	How to prove array is sequential and contiguous?	**04**
	(c)	Explain the concept of a graph and its representations. Compare adjacency matrix and adjacency list representations in terms of space complexity and use cases.	**07**
		OR	
Q.4	**(a)**	List any three uses of linked list.	**03**

	(b)	Write an algorithm to delete next element from doubly linked list from given position,	**04**
	(c)	Write an algorithm to implement singly linked list and its operation such as insert element at front, last and at any position.	**07**
Q.5	**(a)**	What is priority queue?	**03**
	(b)	Write an algorithm to implement queue using Linked List.	**04**
	(c)	Explain the concept of a binary search tree (BST) and its properties. Discuss how operations such as insertion, deletion, and searching are performed in a BST.	**07**

OR

Q.5	**(a)**	Define (1) Forest (2) Leaf Node (3) Tree	**03**
	(b)	Construct tree from Following	**04**

- **In order Traversal:** D, B, E, A, F, C
- **Pre order Traversal:** A, B, D, E, C, F

	(c)	Discuss the key concepts and techniques of AVL trees and 2-3 trees, focusing on their balance mechanisms and the impact on performance. Provide examples of insertions and deletions to illustrate how these trees maintain balance.	**07**

****