R.N.G. PATEL INSTITUTE OF TECHNOLOGY-RNGPIT
(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1IT303	**DATE: 20-12-2025**
SUBJECT NAME: DATA STRUCTURES	
TIME: 11:00 AM to 01:30 PM	**TOTAL MARKS: 70**

Instructions
1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

			Marks	BL	CO
Q.1	**(a)**	List characteristics of an algorithm.	03	R	1
	(b)	Explain any two non-linear data structures in brief.	04	U	1
Q.2	**(a)**	Define Queue. What are the benefits of a circular queue over a simple Queue?	03	R	2
	(b)	Explain any three applications of the stack in computer science.	04	U	2
	(c)	Write a C program to implement a stack using an array.	07	A	2

OR

			Marks	BL	CO
Q.2	**(a)**	State the difference between a simple Queue & Deque.	03	R	2
	(b)	Explain the push() and pop() operations with an example.	04	U	2
	(c)	Convert the expression $A + B * C – D / E * H$ from infix notation to postfix notation by applying the stack-based algorithm.	07	A	2
Q.3	**(a)**	Define a circular linked list. What is the role of the head node in a circular linked list?	03	R	3
	(b)	Explain a single-linked list with an example.	04	U	3
	(c)	Write an algorithm to insert a node at the beginning and end of a Circular linked list.	07	A	3

OR

			Marks	BL	CO
Q.3	**(a)**	List the steps involved in the insertion operation of a single-linked list.	03	R	3

			Marks	**BL**	**CO**
(b)	Explain the difference between a single-linked list and a double-linked list	04	U	3
(c)	Write a C Program to insert a node at the beginning and end of a double-linked list.	07	A	3

SECTION B

			Marks	**BL**	**CO**
Q.4	**(a)**	Summarize Hashing and its techniques.	03	U	6
	(b)	Define Terms: 1. Trie DS 2. Skip Lists 3. Suffix Trees 4. Union - Find DS.	04	R	6
Q.5	**(a)**	Define the concept of Tree and its basic terminologies used in DS.	03	R	4
	(b)	Construct a binary search tree (BST) and perform inorder, preorder, and postorder traversals with your own example.	04	A	4
	(c)	Discuss the representation of binary tree using arrays and linked list concept and also write various applications of Tree DS in real world computer Science applications.	07	U	4

OR

			Marks	**BL**	**CO**
Q.5	**(a)**	Identify difference between Threaded Binary Tree and Weight Balanced Tree.	03	R	4
	(b)	Demonstrate AVL Tree Construction and its insertion and show balance factor for each node with example.	04	A	4
	(c)	Explain conversion of General Tree to Binary Tree. Also discuss about B-Trees and 2-3 Trees with their structure and applications in database systems.	07	U	4
Q.6	**(a)**	Define Graph Data Structure and its application area in the field of computer science.	03	R	5
	(b)	Apply Prim's algorithm for finding the Minimum Spanning Tree (MST) with a suitable example.	04	A	5
	(c)	Describe Dijkstra's shortest path algorithm with an example and write step-by-step calculations.	07	U	5

OR

			Marks	**BL**	**CO**
Q.6	**(a)**	Compare adjacency matrix and adjacency list representations of Graph with example.	03	R	5
	(b)	Implement Kruskal's algorithm for finding the Minimum Spanning Tree (MST) with a suitable example.	04	A	5
	(c)	Explain Traversing a Graph with BFS and DFS traversal algorithms.	07	U	5

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