K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2025

(B. Tech) Program: Electronics and Telecommunication Engineering Scheme: III

Regular Examination: TY Semester: V

Course Code:**EXDLC5044** and Course Name:**Data Structures and Algorithms**

Date of Exam: 28 Nov 2025 Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q.	Question	Marks	CO	BT
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Define stack as an Abstract Data Type (ADT). Explain the array implementation of stack. Write algorithms for PUSH and POP operations and state the conditions for overflow and underflow.		2	U
b)	Explain how a stack can be used for infix to postfix expression conversion. Describe the algorithm and list the rules used for operators and parentheses.		2	U
c)	Define a singly linked list. Compare array and singly linked list w.r.t.: Memory allocation, Insertion and deletion, Traversal, Flexibility in size.		3	U
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Define a Binary Tree. Explain the terms with small diagrams: Root node, Leaf node, Degree of a node, Height of a tree, Complete binary tree.		4	U
b)	Differentiate between Sequential Search and Binary Search.State the advantages and limitations of Binary Search. Mention the condition on the input data for applying Binary Search.		5	U
c)	Define hashing and hash function. Explain the need for collision resolution and briefly describe any two collision resolution techniques.		5	U

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Q.3	Solve any two questions out of three: (10 marks each)	20		

a)	Define data structure and Abstract Data Type (ADT). Differentiate between linear and non-linear data structures with suitable examples. Explain the need for algorithm analysis. For the following code fragment, derive the time complexity using Big-O notation and justify the steps:
	for (i = 1; i <= n; i++) {
	for (j = 1; j <= n; j++) {
	sum = sum + i + j;}}
			1	U

b)	Design an algorithm that takes an expression containing (), {}, [] and checks whether the parentheses are balanced using a stack. Trace your algorithm for the expression: {[(A+B)* C]−(D/E)} showing the stack contents at each significant step.		2	Ap
c)	Explain doubly linked list with a neat diagram and describe forward and backward traversals. Write an algorithm to delete a node with a given key from a doubly linked list. Consider and handle all cases: Node to be deleted is the first node (ii)Node is in the middle (iii) Node is the last node. State clearly how you update the links (prev and next pointers) in each case.		3	Ap
Q.4	Solve any **two** questions out of three: (10 marks each)	20		
a)	Define a Binary Search Tree (BST). Insert the keys 50, 30, 70, 20, 40, 60, 80. into a BST in the given order and draw the final tree. Explain inorder, preorder, and postorder traversals on the resulting BST and write the traversal sequences.		4	Ap
b)	Explain the Breadth First Search (BFS) algorithm for graphs. For a connected undirected graph of at least 6 vertices (draw a suitable graph), perform BFS starting from a specified vertex and show the order in which vertices are visited. Mention two applications of BFS.		4	Ap
c)	Explain the concept of Dynamic Programming and the principle of optimality. Solve the following 0/1 Knapsack problem using Dynamic Programming and construct the DP table: Capacity W=7 Weight={1,3,4,5} Profit={1,4,5,7} Find the maximum profit and indicate which items are selected in the optimal solution.		6	Ap

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