

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

~~Jan - Nov - Dec 2026~~

(B. Tech) Program: Electronics and Telecommunication Engineering
Supplementary Exam Regular Examination: TY Semester: V
Course Code: EXDLC5044

Scheme: III

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

Date of Exam: ~~28 Nov 2025~~ 02/11/2026

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 a stack. Explain how a stack can be implemented using a linked list. Give the algorithms for PUSH and POP operations and comment on stack overflow in this implementation.		2	U
b)	Define a queue. List the operations of queue ADT. Explain with a neat diagram how an array-based circular queue distinguishes between full and empty conditions.		2	U
c)	Discuss advantages of linked list over array. Explain operations on linked list in brief?		3	U
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Define a Binary Search Tree (BST). State the properties that make a binary tree a BST. Explain why searching in a BST is more efficient than in an unsorted linear list.		4	U
b)	Explain the working of Selection Sort algorithm. Write its algorithm and give its time complexity in all cases. Mention one advantage and one disadvantage of Selection Sort.		5	U
c)	Define hash table. Explain the terms primary clustering and secondary clustering in open addressing.		5	U

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- Q.3 Solve any **two** questions out of three. (10 marks each) 20
- a) Explain the difference between time complexity and space complexity of an algorithm with suitable examples. Determine the time complexity (Big-Oh) of the following code and justify your steps: 1 U
- ```
sum = 0;
for (i = 1; i <= n; i++) {
 for (j = 1; j <= i; j++) {
 sum = sum + j;
 }
}
```
- b) Explain the algorithm to convert an infix expression to prefix using stacks. Apply this method to convert the following infix expression to prefix, showing stack contents at each step:  $(A-B/C)+(D* E-F)$  2 Ap
- c) Discuss the operations on Singly Linked List and Doubly Linked List. Define a double circularly linked list? Write an algorithm to add node at the beginning of the list. 3 Ap
- Q.4 Solve any **two** questions out of three. (10 marks each) 20
- a) Construct an AVL tree by inserting the following keys in the given order: 45, 25, 60, 15, 30, 50, 70. Perform inorder, preorder, and postorder traversals and write the corresponding sequences. Comment on which traversal gives the keys in sorted order and why. 4 Ap
- b) Explain the difference between Breadth First Search (BFS) and Depth First Search (DFS) with respect to: Data structure used Traversal order characteristics Typical applications. 4 Ap
- c) Explain Dijkstra's single-source shortest path algorithm and how it can be viewed in the context of dynamic programming ideas (i.e., using optimal substructure). Given the weighted graph with vertices {A,B,C,D,E} and edges: A-B: 6, A-D: 1, B-C: 5, B-D: 2, B-E: 2, C-E: 5, D-E: 1 Apply Dijkstra's algorithm to find the shortest path from A to all other vertices, showing the distance and predecessor table at each iteration. 6 Ap

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