

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

Nov – Dec 2025

(B. Tech / ~~M. Tech.~~) Program: **Artificial Intelligence and Data Science** Scheme: **III**
Regular/~~Supplementary~~ Examination: **SY** Semester: **III**

Course Code: AIC 302 and Course Name: Data Structure and Algorithms

Date of Exam: 27/11/2025

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. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any two questions out of three: (05 marks each)	10		
a)	Define Abstract Data Type (ADT) with a suitable example.		CO1	U
b)	Convert the infix expression $(A+B*C-D)$ to postfix using stack.		CO2	Ap
c)	Define a Graph. Explain the following graph terminologies with examples: Vertex (Node), Edge, Degree, Path, Cycle, Connected Graph, Directed Graph, Undirected Graph.		CO3	U
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Construct an AVL Tree for the sequence: 30, 20, 10, 40, 25, 50, 5. Show rotation steps.		CO4	Ap
b)	Describe the Interpolation Search algorithm for searching a key element in a sorted list.		CO5	U
c)	Write an algorithm to describe the operations insert at beginning, insert at end, and delete by value in a singly linked list.		CO2	U
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Apply the Bubble Sort algorithm to arrange the given supermarket product prices in ascending order. Show the stepwise comparison and swapping process for each pass.		CO6	Ap
b)	Insert 21,31,41,32,42,52 into a size-10 table using (a) Linear Probing (4M) (b) Double Hashing ($h_2(k)=7-(k \bmod 7)$)(4M) Show collisions and the final table for both (2M).		CO5	Ap
c)	Construct a B-Tree of order 3 for the keys: 8, 12, 16, 4, 20, 22, 24, 10, 6		CO4	Ap

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

Nov – Dec 2025	
(B. Tech / M. Tech.) Program: Artificial Intelligence and Data Science Scheme: III	
Regular/Supplementary Examination: SY Semester: III	
Course Code: AIC 302 and Course Name: Data Structure and Algorithms	
Date of Exam: 27/11/2025	Duration: 02.5 Hours Max. Marks: 60

	(insert in the given order). i) Show all node splits and intermediate trees at each insertion. (6M) ii) Draw the final B-Tree and state the height and keys in each node (left-to-right). (4M)			
Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	Write an algorithm to determine whether a given string is a palindrome using a deque (double-ended queue).		CO2	U
b)	Consider the following Binary Search Tree (BST) formed by inserting the keys in the given order: 45, 20, 60, 15, 35, 50, 65, 10, 25 i) Draw the resulting BST after all insertions. ii) Search for the key 35 and show the search path. iii) Delete the key 20 and draw the updated BST. iv) Perform the following tree traversals on the final BST: a) Inorder b) Preorder c) Postorder		CO4	Ap
c)	For the graph $G(V,E)$ with $V=\{A,B,C,D,E\}$ and $E=\{(A,B), (A,C), (B,D), (C,D), (B,E), (A,D), (D,E)\}$: i) Perform DFS starting from A; show discovery/finish order. (5M) ii) Perform BFS starting from A; show level-by-level queues and final shortest-path tree. (5M)		CO3	Ap
