

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

Nov – Dec 2025

(B. Tech) Program: Information Technology Scheme I/II/IIB/III: III

Regular Examination: SY Semester: III

Course Code: ITC302 and Course Name: Data Structures and Analysis

Date of Exam: 27/11/2025, (Thursday) Duration: 10:30 am to 01:00 pm 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)	Explain Static and Dynamic Data Structures? Compare them in terms of memory management, flexibility, and examples.		CO1	U
b)	Explain Singly Linked List, Circular Linked List, and Doubly Linked List.		CO3	U
c)	Sketch the Adjacency List and Adjacency Matrix for the below Graph:		CO5	A
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Explain Circular Queue? How does it overcome the limitation of a simple linear queue implemented using an array?		CO2	U
b)	Explain B Trees and B+ Trees.		CO4	U
c)	Describe the Mid-Square Hashing Method with a suitable example. Show how the middle digits are extracted.		CO6	U
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Implement Reversal of a String using Stack? Explain Dequeue with Diagram.		CO2	A
b)	Apply Kruskal's algorithm to the given graph Edges: (1,2)=6, (1,3)=4, (2,3)=5, (2,4)=7, (3,4)=10, (3,5)=8, (4,5)=9		CO5	A

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c)	Write an algorithm for the Quick sort and hence sort the following list of elements using Quick Sort method and comment on its time complexity. 35, 50, 15, 25, 80, 20, 90, 45, 100		CO6	A
Q.4	Solve any two questions out of three. (10 marks each)	20		
a)	Implement all stack operations (push, pop, peek, isFull, isEmpty) with diagrams for array representation.		CO2	A
b)	Implement insertion and deletion operations with diagrams in a Doubly Linked List for the following positions: 1. Beginning 2. End 3. Any given position		CO3	A
c)	Use Huffman Encoding with a complete example. Given characters and frequencies: A:5, B:9, C:12, D:13, E:16, F:45. Construct the Huffman Tree, derive the binary codes, and compute the average code length.		CO4	A
