

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai
(An Autonomous Institute Affiliated to the University of Mumbai)

End Semester Exam
 November – December 2022

B.Tech. (Information Technology)

Examination: SY - Semester III

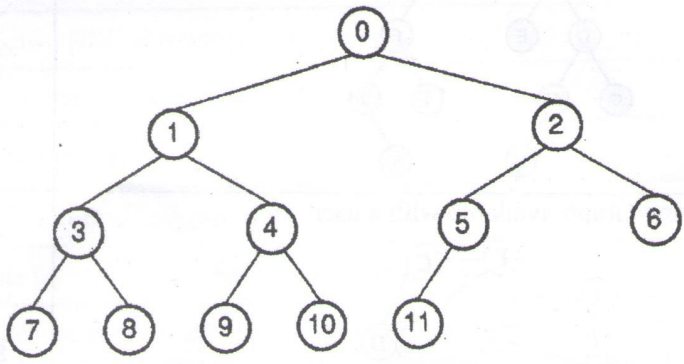
Course Code: ITC302 and Course Name: Data Structures and Analysis **Date: December 06, 2022**

Duration: 2.5 Hours

Max. Marks: 60

Instructions:

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

Ques. No.	Question	Max. Marks	CO	BT Level
Q1.	Solve any six questions out of eight:	12		
i)	Sketch and explain the classification diagram representing various types of data structures.	2	CO1	U
ii)	Solve $10 + 6 * 15 / 5$ using Stack.	2	CO2	U
iii)	Explain applications of Priority Queue.	2	CO2	U
iv)	Explain advantages of Linked List over Array.	2	CO3	U
v)	Explain the Linked List best suitable to implement a music player.	2	CO3	U
vi)	Explain Degree of Tree and write the possible subtrees of Degree 2. 	2	CO4	U
vii)	Explain Minimum Spanning Tree and its applications.	2	CO5	U
viii)	Explain Linear Probing and its need.	2	CO6	U
Q2.	Solve any four questions out of six:	16		
i)	Compare best-case, average-case and worst-case time efficiency of sorting algorithms: Bubble sort, Selection sort, Insertion sort, and Merge sort.	4	CO1	AN
ii)	Write an algorithm to perform deletion in Circular Queue.	4	CO2	U
iii)	Sketch the process of insertion at the beginning in a Singly Linked List.	4	CO3	A
iv)	Explain B Trees and B+ Trees.	4	CO4	U
v)	Sketch adjacency matrix and adjacency list for the following graph:	4	CO5	A

vi)	Apply Folding method to find hash values of the elements 123, 5678, 24680, 987654 considering hash table size = 100.	4	CO6	A
Q3.	Solve any two questions out of three:	16		
i)	Analyze the requirements to implement the undo mechanism in a word editor and identify a suitable data structure for the same. Comment on the best-case and worst-case time complexities in solving this problem using the identified data structure. Also describe the Asymptotic Notations Ω and O .	8	CO1	AN
ii)	Apply parenthesized Infix to Postfix conversion algorithm on the expression $(A+B*C/D-E+F/G/(H+I))$. Also calculate the rank of the expression.	8	CO2	A
iii)	Consider an information management system that maintains data of students (fields - Roll No. and Name). Apply suitable concepts of linked lists and write an algorithm to insert a data record at the beginning of this list.	8	CO3	A
Q4.	Solve any two questions out of three:	16		
i)	Apply the binary tree traversal techniques on the below tree and find: a. Preorder traversal sequence b. Inorder traversal sequence c. Postorder traversal sequence 	8	CO4	A
ii)	Consider the following Graph available with a user: 	8	CO5	A
iii)	Apply Depth-First Search algorithm to obtain the Graph's traversal sequence with node D as the source. Show all steps.			
	Apply Insertion Sort on the elements 16, 28, 22, 4, 8, 7. Write the algorithm and derive its time complexity.	8	CO6	A
