

**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 2021

**B.Tech. (Information Technology)**

Examination: SY - Semester III

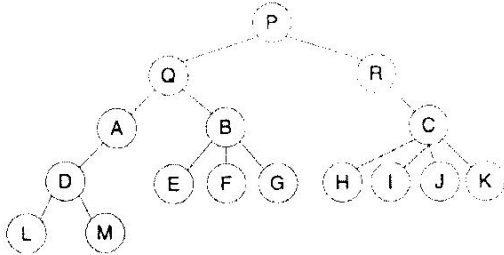
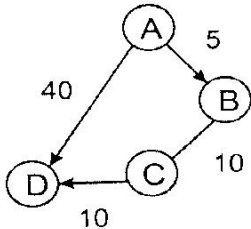
Course Code: 1UITC302 and Course Name: Data Structures and Analysis

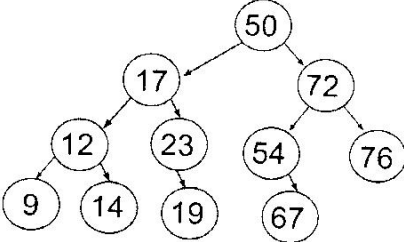
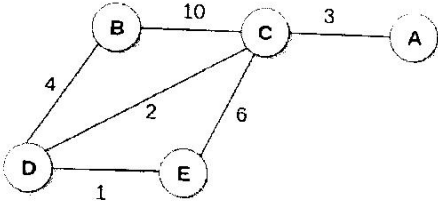
Duration: 03 Hours

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
<b>Q1.</b>	<b>Solve any six questions out of eight:</b>	<b>12</b>		
i)	Explain the necessary characteristics of an algorithm.	2	CO1	U
ii)	Write applications of Stack data structure.	2	CO2	U
iii)	Explain the need of Circular Queue.	2	CO2	U
iv)	Explain different types of Linked Lists.	2	CO3	U
v)	Explain the Linked List best suitable to implement a photo viewer for looking at photos continuously in a slide show.	2	CO3	U
vi)	Consider the below Tree and identify its Height and Degree. 	2	CO4	U
vii)	Mention data structures used for BFS and DFS Graph traversal strategies. Explain the need of these strategies.	2	CO5	U
viii)	Explain Divide and Conquer strategy with reference to Merge Sort.	2	CO6	U
<b>Q2.</b>	<b>Solve any four questions out of six:</b>	<b>16</b>		
i)	Compare static and dynamic data structures.	4	CO1	AN
ii)	Write an algorithm to perform PUSH operation on Stack.	4	CO2	U
iii)	Sketch the process of insertion at front in a Circular Linked List.	4	CO3	A
iv)	Explain Binary Search Trees.	4	CO4	U
v)	Sketch the Adjacency List and Adjacency Matrix for the below Graph: 	4	CO5	A
vi)	Apply Insertion Sort on the elements 22, 37, 9, 76, 48, 3 and comment on its time complexity.	4	CO6	A

<b>Q3. Solve any two questions out of three:</b>		<b>16</b>		
i)	Analyze the requirements to implement an application that searches elements from a list using binary search and identify a suitable data structure for the same. Comment on the best-case and worst-case time complexities in solving the problem using the identified data structure. Describe the Asymptotic Notation for its Upper and Lower Bound.	8	CO1	AN
ii)	Apply unparenthesized Infix to Postfix conversion algorithm on the expression $a + b * c + d / b + a * c + d$ . Also calculate the rank of the expression.	8	CO2	A
iii)	Consider implementation of a multi-player computer game with player IDs 1, 2, ..., n. Apply suitable concepts of linked lists for adding a new player to the game and write an algorithm for the same. (Assume storing only the player ID to the list).	8	CO3	A
<b>Q4. Solve any two questions out of three:</b>		<b>16</b>		
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
Also write functions to implement Binary Tree Traversal.				
ii)	Apply Prim's and Kruskal's algorithms to find the minimum cost spanning tree. Show all intermediate steps.  	8	CO5	A
iii)	Explain Hashing. Apply Division method and Truncation method to find hash values of the elements 22, 89, 15, 94, 31, 68, 23, 55, 86 considering hash table size = 10. Use suitable methods to resolve collisions, if any.	8	CO6	A

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