

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

End Semester Exam
Supplementary Exam - Feb-March 2024

B.Tech. Program: Information Technology **Scheme: II-B**

Examination: SY - Semester III

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

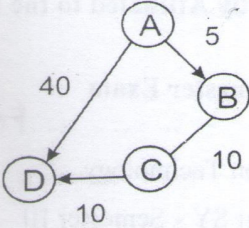
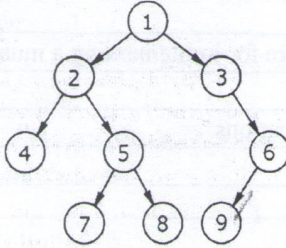
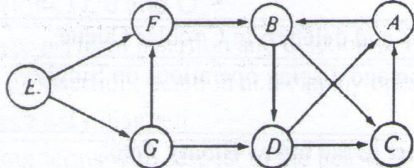
Date: 28/2/24 **Duration: 2.5 Hours**

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) | Explain Static and Dynamic Data Structures with example. | 2 | CO1 | U |
| ii) | Describe linear Queue as an Abstract Data Type. | 2 | CO2 | U |
| iii) | Explain applications of Stack. | 2 | CO2 | U |
| iv) | Explain Double Ended Queue. | 2 | CO3 | U |
| v) | Describe the Linked List that is most appropriate for implementing a music player. | 2 | CO3 | U |
| vi) | Compare B Trees and B+ Trees. | 2 | CO4 | U |
| vii) | Explain Minimum Spanning Tree and its applications. | 2 | CO5 | U |
| viii) | Explain Quadratic Probing and its need. | 2 | CO6 | U |
| Q2. | Solve any four questions out of six: | 16 | | |
| i) | Explain the necessary characteristics of an algorithm. Describe the Asymptotic Notations Ω , θ and O . | 4 | CO1 | U |
| ii) | Write an algorithm to perform insertion and deletion in Circular Queue. | 4 | CO2 | U |
| iii) | Sketch the process of insertion, deletion and display operations on Singly Linked List with necessary diagram. | 4 | CO3 | A |
| iv) | Explain the following terms with respect to the below Binary Tree: <div style="text-align: center;"> <pre> graph TD A((A)) --- B((B)) A --- C((C)) A --- D((D)) B --- E((E)) B --- F((F)) C --- G((G)) D --- H((H)) D --- I((I)) G --- J((J)) G --- K((K)) </pre> </div> <ol style="list-style-type: none"> a) Name the ancestors of K. b) Name the descendants of A. c) Name the sibling nodes. d) Find the height of the tree. e) Possible subtrees of Degree 2. | 4 | CO4 | U |

| | | | | |
|------------|--|-----------|-----|---|
| v) | Sketch adjacency matrix and adjacency list for the following graph:  | 4 | CO5 | A |
| vi) | Apply Division method to find hash values of the elements 1892, 1921, 2007, 3456, 1234, 5462 considering hash table size = 100. | 4 | CO6 | A |
| Q3. | Solve any two questions out of three: | 16 | | |
| i) | Identify a suitable data structure to implement reverse of a string. Comment on the best-case and worst-case time complexities. | 8 | CO1 | U |
| 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) | Apply suitable concept 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 |
| Q4. | Solve any two questions out of three: | 16 | | |
| i) | Apply the binary tree Inorder traversal technique on the below tree and write the algorithm for the same. Show all intermediate steps. Comment on its time complexity.  | 8 | CO4 | A |
| ii) | Consider the following Graph available with a user:  | 8 | CO5 | A |
| iii) | Apply Breadth-First Search algorithm to obtain the Graph's traversal sequence with node E as the source. Show all steps. | 8 | CO6 | A |
| | Apply Collision Resolution techniques with the help of examples. | 8 | CO6 | A |
