Enrolment No./Seat No_____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–III EXAMINATION – SUMMER 2025**

**Subject Code:3130702 Date:29-05-2025**

**Subject Name:Data Structures**

**Time:02:30 PM TO 05:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

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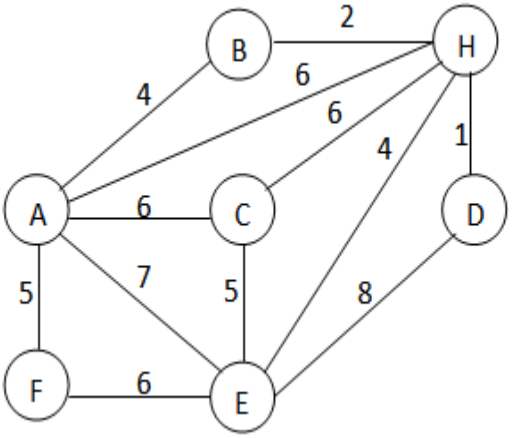
|---|---|---|---|
| **Q.1** | **(a)** | What is the best-case, average-case, and worst-case time complexity analysis? | **03** |
| | **(b)** | Explain row-major order and column-major order representation of 2-D array.ss | **04** |
| | **(c)** | Construct a Binary Search Tree for the following data.<br>21, 51, 12, 45, 17, 71, 19, 47, 78.<br>Write Pre-order, In-order, and Post-order traversal of constructed BST. | **07** |
| **Q.2** | **(a)** | Define following terms:<br>1. Full Binary Tree 2. Complete Binary Tree 3. Skewed Binary Tree | **03** |
| | **(b)** | Write the importance of asymptotic analysis. Is $O(n \log_2 n^2)$ faster than $O(n^2)$? Justify your answer with an example. | **04** |
| | **(c)** | Convert the following infix expression into a postfix expression using stack.<br>(a+b)^((c*d)/(e-f)) | **07** |
| | | **OR** | |
| | **(c)** | Write an algorithm to convert infix expression into postfix expression. | **07** |
| **Q.3** | **(a)** | Illustrate how stack is used in the recursion. | **03** |
| | **(b)** | Describe Threaded Binary Tree with example. | **04** |
| | **(c)** | Write a C program for the following operations on a circular queue.<br>1. Insert 2. Delete 3. Display | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Write a recursive solution for Tower of Hanoi problem. | **03** |
| | **(b)** | Explain the DFS traversal of the graph with an example. | **04** |
| | **(c)** | Write an algorithm to sort existing singly linked list in acceding order according to the information field. | **07** |
| **Q.4** | **(a)** | Define the following terms:<br>1. Field 2. Record 3. File | **03** |
| | **(b)** | Sort the following data using merge sort.<br>50, 20, 70, 05, 30, 80, 55, 25 | **04** |
| | **(c)** | Find the minimum spanning tree of the following graph using Kruskal's algorithm. | **07** |

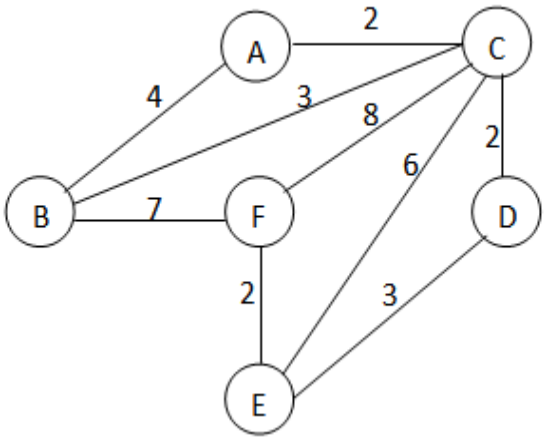



**OR**

**Q.4** **(a)** What is hashing? Write the properties of a good hash function. **03**

**(b)** Sort the following data using quick sort. **04**
50, 30,80,40, 35,70, 60, 20,75

**(c)** Find the shortest path from A to F using Dijkstra's Algorithm. **07**




**Q.5** **(a)** Compare linear search and binary search in terms of their time complexity. **03**

**(b)** Write a C program for a bubble sort. **04**

**(c)** What is hash collision? Explain collision resolution techniques. **07**

**OR**

**Q.5** **(a)** Does a pivot selection method affect the time complexity of quick sort? Justify your answer. **03**

**(b)** Write a C program for a selection sort. **04**

**(c)** List various file organizations and explain one in detail. **07**

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