Enrollment No./Seat No.:

# GUJARAT TECHNOLOGICAL UNIVERSITY
## M.SC INTEGRATED - SEMESTER - VI EXAMINATION - WINTER 2025

**Subject Code: 1360501**                                          **Date: 14-11-2025**

**Subject Name:** **Design and Analysis of Alrithm**

**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. Use of simple calculators and non-programmable scientific calculators are permitted.**

|  |  |  | Marks |
|---|---|---|---|
| **Q.1** | **(a)** | Define Algorithm. Discuss key characteristics of algorithm. | **03** |
|  | **(b)** | Sort the letters of word "EXAMPLE" in alphabetical order using insertion sort. | **04** |
|  | **(c)** | Explain different asymptotic notations in brief. | **07** |
| **Q.2** | **(a)** | Write an algorithm of Selection Sort Method. Give its complexity. | **03** |
|  | **(b)** | Explain how multiplication of large integers can be done efficiently by using divide and conquer technique. | **04** |
|  | **(c)** | Write the quick sort algorithm. Trace the same on data set - 40,32,15,94,82,29,42,73. | **07** |

**OR**

|  |  |  |  |
|---|---|---|---|
|  | **(c)** | Give the properties of Heap Tree. Sort the following data with Heap Sort Method: 65, 75, 5, 55, 25, 30, 90, 45, 80. | **07** |
| **Q.3** | **(a)** | Define amortized analysis. Briefly explain its two techniques. | **03** |
|  | **(b)** | Differentiate BFS and DFS. | **04** |
|  | **(c)** | Given two sequences of characters, P=<ABCDABE>, Q=<CABE > Obtain the longest common subsequence. | **07** |

**OR**

|  |  |  |  |
|---|---|---|---|
|  | **(a)** | Differentiate greedy programming approach with dynamic programming approach. | **03** |
|  | **(b)** | Solve following recurrence using master method $T(n) = 9T(n/3) + n$ | **04** |
|  | **(c)** | Using greedy algorithm find an optimal schedule for following jobs with n=7 profits: (P1, P2, P3, P4, P5, P6, P7) = (3, 5, 18, 20, 6, 1, 38) and deadline (d1, d2, d3, d4, d5, d6, d7) = (1, 3, 3, 4, 1, 2, 1) | **07** |
| **Q.4** | **(a)** | What is Principle of Optimality in dynamic programming? Explain it with example. | **03** |
|  | **(b)** | Find an optimal Huffman code for the following set of frequency. a : 50, b: 20, c: 15, d: 30. | **04** |

**(c)** Solve Making Change problem using Dynamic Programming. (Denominations: d1=1,   **07**
d2=4, d3=6). Give your answer for making change of Rs. 9.

**OR**

**(a)** Explain: Articulation Point, Graph, Tree   **03**

**(b)** Demonstrate Binary Search method to search Key = 14, form the array A=   **04**
<2,4,7,8,9,10,12,14,18>

**(c)** Write equation for Matrix Chain Multiplication using Dynamic programming. Find   **07**
out optimal sequence for multiplication:
A1 [5 × 4], A2 [4 × 6], A3 [6 × 2], and A4 [2 × 7]. Also give the optimal solution.

**Q.5 (a)** Explain Depth First Traversal Method for Graph with algorithm.   **03**

**(b)** Consider Knapsack capacity W=15, w = (4, 5, 6, 3) and v=(10, 15, 12, 8) find the   **04**
maximum profit using greedy method.

**(c)** What is a minimum spanning tree? Draw the minimum spanning tree correspond to   **07**
following graph using Prim's algorithm. (Consider starting vertex 1)
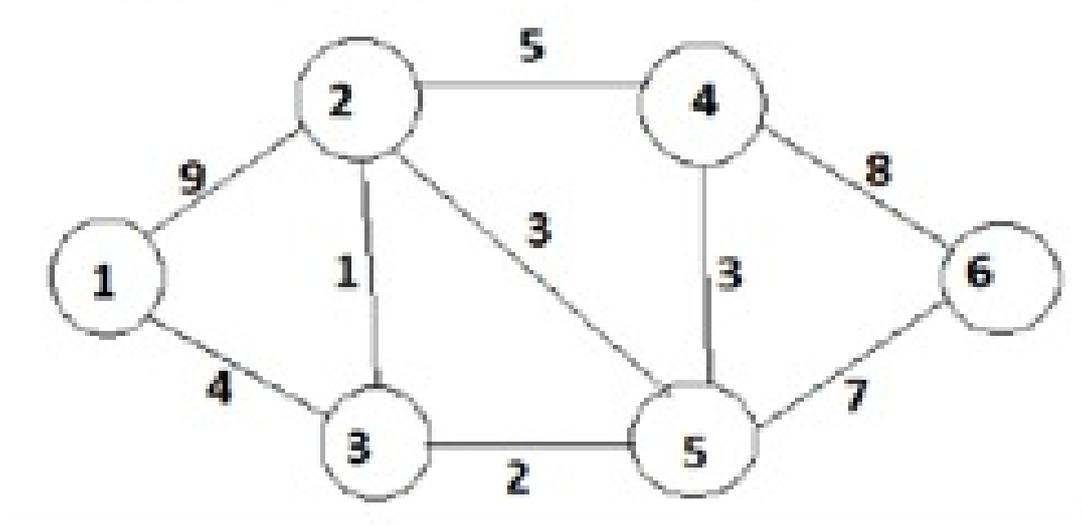


**OR**

**(a)** Write down the characteristics of Greedy Algorithm.   **03**

**(b)** Define: Directed Acyclic Graph, Dense graph, Sparse graph, Preconditioning.   **04**

**(c)** Solve the following 0/1 Knapsack Problem using Dynamic Programming. There are   **07**
five items whose weights and values are given in following arrays.
Weight w[] = { 1,2,5,6,7 }
Value v[] = { 1,6,18, 22, 28 }
Show your equation and find out the optimal knapsack items for weight capacity of
11 units.

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