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# MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June 2025

Design and Analysis of Algorithms

(CSE, IT, CSE-AI&ML, B.Tech-AIDS & B.Tech-AIML)

| Roll No |  |  |  |  |  |  |  |  |  |
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Time: 3 hours

Max. Marks: 70

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each **SECTION** and each Question carries 14 marks.

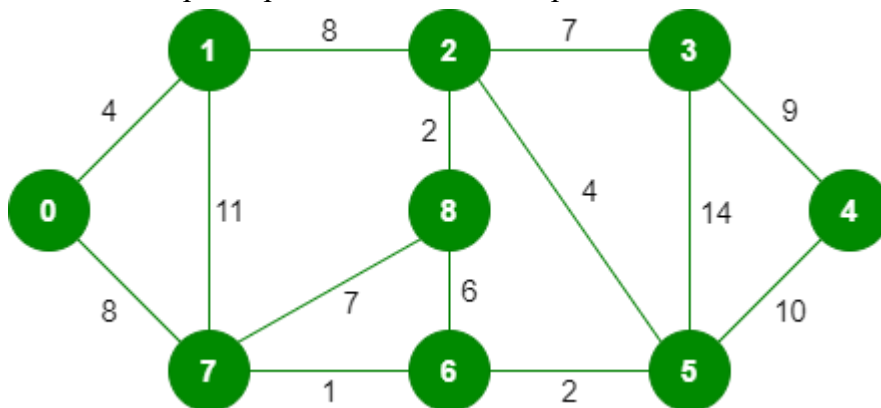
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## SECTION-I

|   |   |                                                                                         | BCL | CO(s) | Marks |
|---|---|-----------------------------------------------------------------------------------------|-----|-------|-------|
| 1 | A | Define Pseudocode. Differentiate pseudocode and algorithm.                              | L   |       |       |
|   | B | (i)What is the role of time complexity and space complexity in designing of algorithms. | L2  | CO-I  | [7M]  |
|   |   | (ii) Write a short note on Big Oh notation.                                             | L1  | CO-I  | [7M]  |
|   |   | OR                                                                                      |     |       |       |
| 2 | A | Describe the Characteristics of Divide and Conquer Algorithm.                           | L2  | CO-I  | [5M]  |
|   | B | Illustrate Merge sort using divide and conquer with an example.                         | L2  | CO-I  | [9M]  |

## SECTION-II

|   |   |                                                         |    |       |      |
|---|---|---------------------------------------------------------|----|-------|------|
| 3 | A | Implement the algorithms for union and find operations. | L4 | CO-II | [8M] |
|   | B | What are connected and Biconnected components?          | L1 | CO-II | [6M] |
|   |   | OR                                                      |    |       |      |
| 4 | A | Illustrate Knapsack problem with an example.            | L2 | CO-II | [7M] |
|   | B |                                                         | L5 | CO-II | [7M] |



Explain the step by step process to find the minimum cost spanning tree using Kruskal's algorithm.

## SECTION-III

|   |   |                                                                  |    |        |       |
|---|---|------------------------------------------------------------------|----|--------|-------|
| 5 | A | Find an optimal solution to the knapsack instance $n=7$ $m=15$ . | L5 | CO-III | [10M] |
|---|---|------------------------------------------------------------------|----|--------|-------|

$(P1, P2, P3, P4, P5, P6, P7) = (10, 5, 15, 7, 6, 18, 3)$ , and  
 $(W1, W2, W3, W4, W5, W6, W7) = (2, 3, 5, 7, 1, 4, 1)$  Using dynamic programming

**B** Explain the terms feasible solution, optimal solution and objective function. **L4** **CO-III** **[4M]**

OR

**6** **A** Design three stage system with device types D1, D2, D3. The costs are Rs. 30, Rs. 15 and Rs. 20 respectively. The Costs of the system into be not more than Rs. 105. The reliability of each device type is 0.9, 0.8 and 0.5 respectively. **L6** **CO-III** **[7M]**

**B** Explain about chained matrix multiplication. **L2** **CO-III** **[7M]**

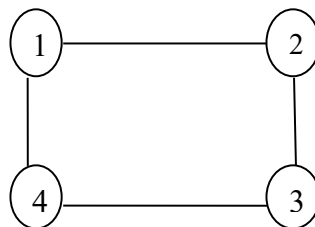
#### SECTION-IV

**7** **A** Explain about Hamiltonian cycles with an example. **L2** **CO-IV** **[5M]**

**B** Write recursive Backtracking algorithm for Sum of Subsets problem **L1** **CO-IV** **[9M]**

OR

**8** **A** Draw the state space tree for the following graph when  $m=3$  ( $m$ -Colouring graph problem). **L4** **CO-IV** **[7M]**



**B** Consider the following instance of Sum of Subsets problem: **L5** **CO-IV** **[7M]**  
 $W = \{15, 7, 20, 5, 18, 10, 12\}$  and  $m=35$ . Find all possible Sub Sets of  $w$  that sum to  $m$ . Draw the portion of the state space tree that is generated.

#### SECTION-V

**9** **A** Define the term Branch and Bound and Explain it with an example **L2** **CO-V** **[4M]**

**B** Draw the portion of the State Space Tree generated by LCB for the following Knapsack instance. **L5** **CO-V** **[10M]**  
 $N=4$ ,  $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$ ,  $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$  and  $m=15$ .

OR

**10** **A** With a neat diagram, explain the relevance of NP-hard and NP-complete problems. **L4** **CO-V** **[9M]**

**B** Write short notes on Deterministic and Non-Deterministic algorithm with an example. **L1** **CO-V** **[5M]**

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