

Reg. No.

Question Paper Code

13621

M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

First Semester

M.E. - Computer Science and Engineering

20PCSPC101 - ADVANCED DATA STRUCTURES AND ALGORITHMS

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |  | Marks | K-Level | CO  |
|--|-------|---------|-----|
| 1. Define Space and time complexity of an algorithm.                                   | 2     | K1      | CO1 |
| 2. What is recursion? Give Example.  | 2     | K1      | CO1 |
| 3. List out the properties of B-tree.  | 2     | K1      | CO2 |
| 4. Define Fibonacci heap.  | 2     | K1      | CO2 |
| 5. What is a disjoint set? Give example.   | 2     | K1      | CO3 |
| 6. List any two applications of shortest path algorithms.                              | 2     | K1      | CO3 |
| 7. Write the sequence of steps followed in developing a dynamic programming algorithm. | 2     | K2      | CO4 |
| 8. What is a greedy algorithm? State the characteristics of greedy approach.           | 2     | K1      | CO4 |
| 9. Define NP-Hard. Give an example of NP-Hard problem.                                 | 2     | K1      | CO5 |
| 10. Define polynomial-time reduction in the context of NP-completeness.                | 2     | K1      | CO5 |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

- |   |    |    |     |
|---|----|----|-----|
| 11. a) Describe about asymptotic notations used for algorithm analysis? Give example.   | 13 | K2 | CO1 |
| <b>OR</b>   |    |    |     |
| b) Explain about the Recursion tree method for solving recurrence with an example.  | 13 | K2 | CO1 |
| 12. a) Insert the following elements in Red Black Tree?<br>100,108,75,105,106,300,205,400,600   | 13 | K3 | CO2 |
| <b>OR</b>   |    |    |     |
| b) Construct the binary search tree for the given values and perform pre order, post order, in order traversal? 10,12,7,5,16,3,25,4,60. | 13 | K3 | CO2 |
| 13. a) Explain with suitable examples the graph traversal algorithms.   | 13 | K2 | CO3 |

**OR**

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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b) Outline the steps involved in Kruskal's algorithm to construct a minimum spanning tree with example. 13 K2 CO3

14. a) Explain the elements of dynamic programming. Describe the optimal substructure of LCS problem with an example. 13 K2 CO4

**OR**

b) Illustrate the construction of Huffman code using an example. 13 K2 CO4

15. a) Discuss the approximation algorithm for NP-Hard Problems. 13 K2 CO5

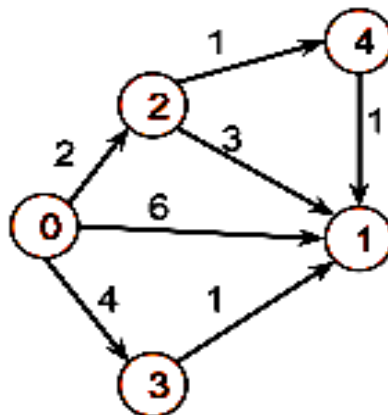
**OR**

b) Explain NP Complete problem with suitable example. 13 K2 CO5

### **PART - C (1 × 15 = 15 Marks)**

Answer ALL Questions

16. a) Solve the following graph to find the shortest path between edges using Floyd Warshall algorithm. 15 K4 CO3



**OR**

b) Given a weighted, directed and connected graph of V vertices and E edges, Find the shortest distance of all the vertices from the source vertex A. 15 K4 CO3

