

**PG (CBCS)**  
**M.Sc. Semester-I Examination, 2022**  
**COMPUTER SCIENCE**  
**PAPER: COS 101**  
**(ANALYSIS OF ALGORITHM)**

**Full Marks: 40****Time: 2 Hours****Group-A****1. Answer any four of the following questions: 4×2=8**

- (a) Define time complexity and space complexity of an algorithm.
- (b) What is NP-Hard problem?
- (c) Find the time complexity of the following recurrence relation  

$$T(n) = 2T(n/2) + n/\log n$$
- (d) What do you mean by Tail recursion? Give example.
- (e) Explain the situation for which back tracking technique is used.
- (f) How dynamic programming strategy is different from greedy approach?
- (g) What is clique? Give Example.
- (h) Explain the disjoint sets?

**Group-B****2. Answer any four of the following questions: 4×4=16**

- (a) Write down the Binary search algorithm using a suitable example.
- (b) Explain Big-Oh, Big-Theta and Big-Omega notation for analysis of algorithm.
- (c) Write down the Merge sort algorithm for two sorted arrays.
- (d) Explain backtracking algorithm using an example.
- (e) Explain the BFS and DFS algorithm for graph traversal.
- (f) Find an optimal solution for the fractional knapsack instance  $n=7$  and  $M=15$ ,  
 $(p_1, p_2, p_3, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ ,  $(w_1, w_2, w_3, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$
- (g) Apply Kruskal's algorithm on the graph (fig 1) to find the minimum-cost-spanning tree (MCST).

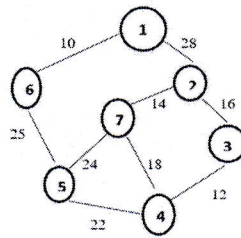


Fig 1.

P.T.O.

(2)

- (h) Write the algorithm for all pair shortest path using dynamic programming approach.

**Group-C**

3. Answer any two of the following questions:

2×8=16

- a) What is matrix chain multiplication problem? Write down the matrix chain multiplication algorithm using dynamic programming strategy. 2+6
- b) Write down the Quick sort algorithm. Why worst-case time complexity of Quick sort is different from its best-case time complexity? Discuss. 6+2
- c) What is Dijkstra's algorithm? Apply Dijkstra's algorithm on the digraph (1 is starting vertex) (fig. 2) source. 2+6

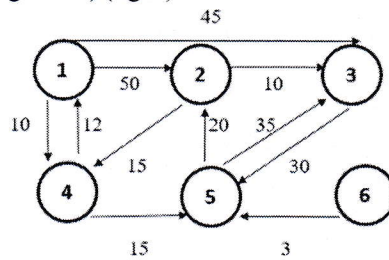


Fig. 2

- d) What is Branch and Bound problem? Write down the 15-puzzle problem algorithm using Branch and Bound strategy. 2+6

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