

III B. Tech I Semester Regular Examinations, February-2022

DESIGN AND ANALYSIS OF ALGORITHMS

(Information Technology)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I

1. a) Explain the various algorithm design methodologies to solve a problem. [8M]
b) Write about asymptotic notation and give its properties. [7M]
- (OR)**
2. a) Explain the working of a disjoint-set data structure and efficiently implement it. [8M]
b) What is bi-connected component? Explain how it can be determined using DFS. [7M]

UNIT-II

3. a) Demonstrate Divide and Conquer technique through binary search algorithm and analyze its time complexity for all three cases. [8M]
b) State control abstraction of greedy method and explain how it is useful for real time problems. [7M]
- (OR)**
4. a) Construct the various tracing steps of merge sort and quick-sort and analyze the time complexity for the following data: 33, 44, 2, 10, 25, 79, 86, 47, 14, 36. [8M]
b) Obtain the shortest path from source to all other vertices in the graph shown in below Fig.1. Using greedy method .Give the greedy criterion used. [7M]

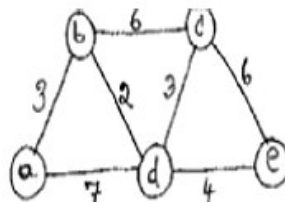


Fig.1



UNIT-III

5. a) What is dynamic programming? Explain how you would solve all pair shortest paths problem using dynamic programming. [8M]
 b) What are the characteristics of dynamic programming? Differentiate between Dynamic and Greedy approach. [7M]
- (OR)**
6. a) Give the necessary recurrence relation used to solve 0/1 knapsack problem using dynamic programming. Apply it to solve the following instance and show the results $n = 4$, $m = 5$ values 12, 10, 20, 15 and weights are 2, 1, 3, 2 respectively. [8M]
 b) Find the shortest path from node 1 to every other node in the graph as shown in Fig.2, using Bellman Ford Algorithm. [7M]

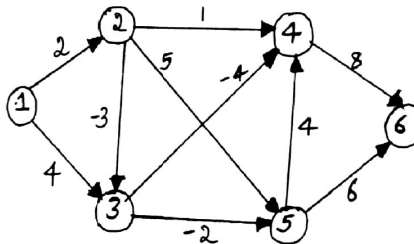


Fig.2

UNIT-IV

7. a) Solve sum of subsets problem for the following example $S = \{3,5,6,7\}$, $d = 15$. Construct a state space tree. [8M]
 b) Explain the principle of FIFO branch and bound. [7M]
- (OR)**
- a) What is branch and bound? Explain briefly the role of bounding functions in it using LC search. [8M]
 b) Discuss graph coloring problem. Find different solutions for 4 nodes and all possible 3 coloring problem. [7M]

UNIT-V

9. a) What are the differences between NP-Hard and NP-Complete Classes? Explain with examples. [8M]
 b) Explain the non-deterministic Sorting Problem. [7M]
- (OR)**
10. a) Explain Rabin Karp algorithm. Using Rabin karp string matching algorithm match the given pattern P with given string S: [8M]
 $P = 745$
 $S = 745727457$
 b) Write Knuth-Morris-Pratt algorithm (both Prefix and Matching functions). [7M]
