

Code No: 155EV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year I Semester Examinations, July/August - 2023****DESIGN AND ANALYSIS OF ALGORITHMS****(Computer Science and Information Technology)****Time: 3 Hours****Max. Marks: 75**

- Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A**(25 Marks)**

- 1.a) Give the general plan of divide and conquer algorithms. [2]
- b) List the asymptotic notations. [3]
- c) Write an algorithm for collapsing find. [2]
- d) Give example for preorder, inorder and postorder traversal of a binary tree. [3]
- e) Define optimal binary search tree with an example. [2]
- f) State the principle of optimality. [3]
- g) Define knapsack problem. [2]
- h) Write an algorithm of greedy knapsack. [3]
- i) What is NP-hard problem? [2]
- j) Write the Control Abstraction of Least– Cost Branch and Bound. [3]

PART – B**(50 Marks)**

2. Write Divide– And– Conquer recursive Merge sort algorithm and analyze the algorithm for average time complexity. [10]

OR

3. Write Randomized algorithm of Quick sort. [10]

4. Write an algorithm for graph coloring problem and derive its time and space complexity. [10]

OR

5. What is sum-of-subsets problem? Write a recursive backtracking algorithm for sum of subsets problem. [10]

6. Discuss all pairs shortest path problem. Give solution to it using dynamic programming method. [10]

OR

7. Solve a travelling sales person problem using dynamic programming. [10]

8. State the Job-Sequencing with deadlines problem. Find an optimal sequence to the $n=5$ Jobs where profits $(P_1, P_2, P_3, P_4, P_5) = (20, 15, 10, 5, 1)$ and deadlines $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$. [10]

OR

9. Write an algorithm for Prim's method to find minimum cost spanning tree. [10]

10. Explain the FIFO BB 0/1 Knapsack problem procedure with the knapsack instance for $n=4, m=15, (p_1, p_2, p_3, p_4) = (10, 10, 12, 18), (w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$. Draw the portion of the state space tree and find optimal solution. [10]

OR

11.a) Differentiate between NP-complete and NP-Hard.

b) Explain the classes of P and NP. [5+5]

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Use of Paper July/Aug-2023