

Code No: 155EV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech III Year I Semester Examinations, August/September - 2024****DESIGN AND ANALYSIS OF ALGORITHMS****(Common to CSIT, CE(SE), CSE(CS), CSE(AI&ML), CSE(DS), CSE(IOT), CSE(N), AI&DS, AI&ML, CSD)****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) Define algorithm. [2]
- b) Derive the time complexity of Binary search. [3]
- c) What is backtracking? [2]
- d) Explain about disjoint set operations. [3]
- e) What is OBST? [2]
- f) Explain about all pairs shortest path in Dynamic Programming. [3]
- g) What is Greedy method? [2]
- h) What is knapsack problem? Explain. [3]
- i) Define NP-hard problem. [2]
- j) What are applications of branch and bound? [3]

PART – B**(50 Marks)**

- 2.a) Analyze the time complexity of Quick sort algorithm.
- b) What are asymptotic notations? Explain with examples. [5+5]

OR

- 3.a) Write merge sort algorithm and explain.
- b) Explain about time complexity and space complexity of an algorithm. [5+5]

- 4.a) Briefly discuss about sets and disjoint sets.
- b) Explain the weighted rule for finding UNION of sets. [5+5]

OR

- 5.a) Explain about sum of subsets problem with example.
- b) Describe the general method of backtracking in detail. [5+5]

6. Use the function OBST to compute $w(i,j)$, $r(i,j)$, and $c(i,j)$, $0 \leq i < j \leq 4$, for the identifier set $(a_1, a_2, a_3, a_4) = (\text{cout}, \text{float}, \text{if}, \text{while})$ with $p(1) = 1/20$, $p(2) = 1/5$, $p(3) = 1/10$, $p(4) = 1/20$, $q(0) = 1/5$, $q(1) = 1/10$, $q(2) = 1/5$, $q(3) = 1/20$, and $q(4) = 1/20$. Using the $r(i,j)$'s construct the optimal binary search tree. [10]

OR

7. Consider the knapsack instance $n=6$, $m=165$, $(p_1, p_2, \dots, p_6) = (w_1, w_2, \dots, w_6) = (100, 50, 20, 10, 7, 3)$. Generate the S_i sets containing the pair (p_i, w_i) and determine the optimal solution. [10]

8. Briefly discuss about an optimal randomized algorithm of minimum-cost spanning trees. [10]

OR

9. Explain how Greedy algorithm is used to minimize the mean compilation time for multiprocessor job scheduling. [10]

10. Explain the following:

a) NP - Hard and NP-Complete classes

b) Travelling sales person problem. [5+5]

OR

11. Explain the following:

a) General method of branch and bound

b) Cook's theorem. [5+5]

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Question Paper Aug-2024