

Code No: 114CS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, November/December - 2015

DESIGN AND ANALYSIS OF ALGORITHMS

(Computer Science and Engineering)

Time: 3 Hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART- A (25 Marks)**

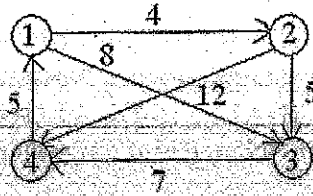
- 1.a) Arrange the following functions in increasing order  
 $n, \log n, n^2, n^3, n \log n, 2^n$  [2]
- b) Find the worst-case, best-case and average -case time complexity of the binary search. [3]
- c) Write an algorithm for set Union operation. [2]
- d) Explain the tree traversal techniques with an example. [3]
- e) State the principle of optimality. [2]
- f) Write control abstraction algorithm of greedy method. [3]
- g) Find the sum of subsets for the following set of integers by using fixed tuple method  
 $\{5, 10, 25, 50, 100\}$  for  $W = 75$  [2]
- h) What do you mean by dynamic program? [3]
- i) Define P, NP, NP-Complete and NP- Hard. [2]
- j) Write the non deterministic sorting algorithm. [3]

**Part-B (50 Marks)**

- 2.a) Derive the time complexity of quick sort in an average case. [5+5]  
 b) Write an Euclid's algorithm. [5+5]
- OR**
- 3.a) Write an algorithm of Merge sort. [5+5]  
 b) Solve the following recurrence relation  
 $T(n) = 4T(n/3) + n^2$ . [5+5]
- 4.a) Write an algorithm of AND/OR graph traversal. [5+5]  
 b) Explain how BFS can be used to identify the connected components in a graph with an example. [5+5]
- OR**
- 5.a) Write an algorithm to find the strongly connected components in a digraph. [5+5]  
 b) Explain the properties of Bi - connected components. [5+5]
- 6.a) Find an optimal solution to the 0/1 knapsack instance  $n=7, m=15$ ,  
 $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$  and  
 $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$  [5+5]  
 b) Write an algorithm for single source shortest path. [5+5]

**OR**

7.a) Obtain all pair shortest paths for the following graph:



b) Write an algorithm for job sequencing with deadlines. [5+5]

8.a) Explain how the Hamiltonian circuit problem is solved by using the backtracking concept.

b) Write an algorithm of FIFO Branch and Bound. [5+5]

OR

9. Draw the portion of the state space tree generated by LCBB for the following knapsack instances:

$n=5, (P_1, P_2, P_3, P_4, P_5) = (W_1, W_2, W_3, W_4, W_5) = (4, 4, 5, 8, 9)$  and  $m=15$ .

[10]

10.a) Show that the Hamiltonian-path problem is NP-complete.

b) Write a non deterministic sum of subsets problem. [5+5]

OR

11.a) Explain satisfiability problem and write the algorithm for the same.

b) Is travelling salesman problem NP-hard or NP-Complete? Justify your answer.

[5+5]

