Code: 13A05406 **R13**

B.Tech II Year II Semester (R13) Regular & Supplementary Examinations May/June 2016

DESIGN & ANALYSIS OF ALGORITHMS

(Common to CSE and IT)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define an Algorithm. What are the properties of an Algorithm?

(b) Compare two functions n^2 and $2^n/4$ for various values of n. Determine when the second function becomes larger than first.

(c) State the KNAPSACK Problem. What is the difference between KNAPSACK AND 0/1 KANAPSACK problem.

(d) Define Principle of Optimality. What is the essential difference between Greedy method and Dynamic Programming?

(e) Draw the possible binary search trees with the numbers 1, 2, 3, 4, 5, 6, 7 such that the height of the binary search tree must be 6.

(f) What are the differences between Backtracking and Branch and Bound Algorithm design techniques?

(g) What is the use of Comparison trees? Construct a comparison tree for sorting 3 items.

(h) Find the time complexity by solving the following recurrence relation.

$T(n) = 2\,T(n/2) + n,\ n>1$

$T(n) = 1,\ n=1$

(i) Define P and NP class of Problems.

(j) Define NP-complete and NP-Hard class of Problem.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Sort the elements 310, 285, 179, 652, 351, 423, 861, 254, 450, 520 using merge sort algorithm and draw the tree of calls of merge sort.

OR

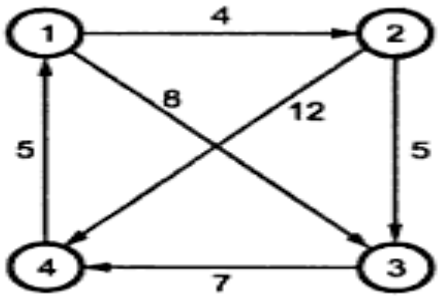
3 Design an algorithm for finding maximum and minimum of a list of elements and illustrate with an example.

UNIT – II

4 Find the Optimal solution to the Knap sack instance of n = 7, m = 15 $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, w_3, w_4, w_3, w_6, w_7) = (2.3.5.7.1.4.1)$ by using Greedy strategy.

OR

5 Design an algorithm for All pairs of shortest path and calculate shortest path between all pairs of vertices by using dynamic programming method for the following graph.



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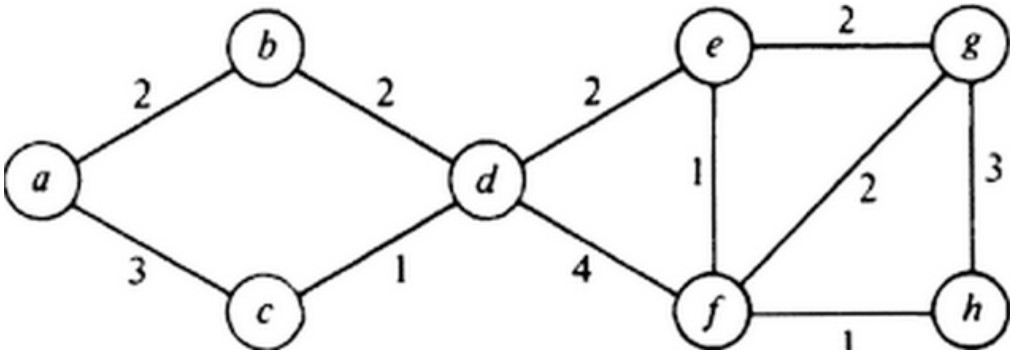
UNIT – III

6 Design a backtracking search algorithm for N-queens problem. Find the positions of 4 queens on a 4X4 chessboard.

OR

7 Design an algorithm for Breadth first search. Identify the Breadth first traversal sequence of vertices for the following graph.



UNIT – IV

8 State 0/1 knapsack problem and design an algorithm of LC Branch and Bound and find the solution for the knapsack instance of n = 4; (pi, p2, p3, p4) = (10, 10, 12, 18); (w1. w2, w 3, w4) = (2, 4, 6, 9) and M = 15.

OR

9 State travelling salesperson problem. Apply Branch and Bound algorithm to solve the TSP instantiated by the following cost matrix.

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

UNIT – V

10 State and prove Cook's theorem.

OR

11 State and prove 3-satisfiablity problem is NP-Complete.

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