OR

What is backtracking? Solve 8 - queens problem using backtracking.

Unit - V

5. a) Describe various complexity measures.

   b) Compare polynomial Vs non - polynomial complexity.

   c) Explain the relationship between P, NP, NP - hard and NP - complete problems.

   d) Prove that Hamiltonian cycle problem is NP - complete.

OR

Give linked list representation of disjoint sets. Find the tree produced for *i* lying between 1 and 8 using weight union with following operations.

Union (1, 2), Union (3, 4), Union (5, 6), Union (7, 8), Union (1, 3), Union (5, 7), Union (1, 5).

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Roll No .....

MCA - 404

MCA IV Semester

Examination, June 2015

Design and Analysis of Algorithms

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Write features of functional model of computation.

   b) Prove that $\sum_{i=1}^{n} i^d \log(i)$ is $O\left(n^{d+1} \log(n)\right)$

   c) Describe the concept of array representation and linked list representation of stack data structure with example.

   d) Explain about all types of asymptotic notations used to describe the running time of an algorithm. If $f(n) = a_0 + a_1 n + ... a_m n^m$ is a polynomial of degree m or less than prove that $f(n) = \theta(n^m)$.

OR

What is meant by best case, worst case and average case time complexity of an algorithm? Use suitable example to explain . Also write algorithm to find the second largest element in a set of n elements. How many comparisons of elements are done in worst case?

Unit - II

2. a) What are the necessary criteria for an algorithm to be a divide and conquer algorithm.

   b) Describe divide and conquer method for multiplying large integers.

   c) Write recursive algorithm for binary search.

   d) Write quick sort algorithm. Also discuss its performance in best case, average and worst case. On which input data does the algorithm exhibit its worst case behaviour?

OR

Explain depth first search technique. Write depth first search algorithm for an undirected graph such that the output is a list of edges encountered with each edge appearing once.

Unit - III

3. a) Explain minimum spanning tree with example.

   b) Discuss branch and bound technique in brief.

   c) Write characteristics of greedy algorithm. Find optimal solution to the knapsack instance.

   $n = 3$, $m = 20$, $(P_1, P_2, P_3) = (25, 24, 15)$ and $(W_1, W_2, W_3) = (18, 15, 10)$.

   d) What is Huffman code? Explain greedy algorithm for constructing a Huffman code.

OR

If the cost adjacency matrix of the travelling salesperson problem is as follows:

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

Obtain the state space tree generated by branch and bound method.

Unit - IV

4. a) Compare dynamic programming and greedy algorithms.

   b) Write algorithm for matrix chain multiplication.

   c) Explain how longest common subsequence problem can be solved by using dynamic programming.

   d) What is multistage graph problem? Find a minimum cost path from 's' to 't' in the given multistage graph using dynamic programming.