d) Prove that the class NP of languages is closed under union, intersection and concatenation. Discuss the closure of NP under complement.

OR

Explain in brief about Algebraic algorithms with suitable example.

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Roll No .....

MCA-404

MCA IV Semester

Examination, June 2016

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) Differentiate time complexity from space complexity.

b) What are the properties of Big Oh Notation? Explain.

c) Describe in short RAM model of computation.

d) Write an algorithm to search an item in a linear list. If there are n nodes in the list, what is the running time of your algorithm?

OR

Explain various asymptotic methods used to represent the rate of growth of running time of algorithms.

Unit - II

2. a) What is Spanning Tree? Give an example.

   b) What is an Optimal Solution? Explain with example.

   c) Solve the recurrence relation, where

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

   $T(n) = 3T(n/2)+n \quad n >= 2$

   d) Using divide and conquer method, find the maximum an minimum in a set of n element. Also find the recurrence relation for number of elements compared and solve the same.

OR

Describe Master theorem to solve recurrence relation? Also use the same to solve:

$T(n) = 2T(n/4) + Sqrt(n) + 42$

Unit - III

3. a) Write an algorithm to find the shortest path between all pairs of nodes?

   b) What is a FIFO branch-and-bound algorithm?

   c) Describe travelling sales person problem with example.

   d) Find an optimal solution to the Knapsack instance using greedy method:

   $n = 7, m = 15$

   $(p_1, p_2, p_3, \ldots\ldots p_7) = (10, 5, 15, 7, 6, 18, 3)$ and

   $(w_1, w_2, w_3, \ldots\ldots w_7) = (2, 3, 5, 7, 1, 4, 1)$

OR

Write a complete LC branch-and-bound algorithm for the job sequencing with deadlines problem. Use the fixed tuple size formulation.

Unit - IV

4. a) Write the difference between Greedy method and Dynamic programming.

   b) Explain the steps of divide and conquer method.

   c) Explain the characteristics of a problem that can be solved efficiently using dynamic programming technique.

   d) Describe the backtracking solution to solve 8-Queens problem.

OR

With an example, explain how the Dynamic programming technique is used to solve 0/1 knapsack problem.

Unit - V

5. a) What is NP completeness?

   b) Differentiate between decision problem and optimization problem.

   c) Write a short note on string matching algorithms.