LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FIRST SEMESTER – **NOVEMBER 2016**

16PMT1MC04 – COMPUTER ALGORITHMS

Date: 09-11-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Answer ALL the Questions:

1. a) The Fibonacci numbers are defined as $f_0 = 1, f_1 = 1, f_i = f_{i-1} + f_{i-2}$ for $i > 1$. Write a recursive algorithm to compute fi. Simulate FIBONACCI(n), when $n = 6$. (5)

   OR

   b) Define a circular queue. Write an algorithm to delete a data from circular queue. (5)

   c) (i) Discuss: Analyzing algorithms in general.
   (ii) Given a set n ≥ 1 elements, write an algorithm to print all possible permutations of this set. Simulate PERMUTATION(A, 1, 2). (6 + 9)

   OR

   d) Write algorithm HEAPIFY. Simulate A(1 : 6) = (12, 30, 44, 50, 61, 70). (15)

2. a) State algorithm MERGESORT. (5)

   OR

   b) Give procedure PARTITION. (5)

   c) State algorithm BINSEARCH. Simulate it on

   $A(1 : 10) = (12, 34, 43, 45, 50, 62, 69, 70, 80, 90)$ when (i) $x = 34$, (ii) $x = 57$, (iii) $x = 90$. Draw the binary decision tree when $n = 10$. (15)

   OR

   d) Write algorithm QUICKSORT. Simulate it on
   $A(1 : 10) = (63, 75, 12, 47, 23, 90, 55, 11, 2, 76)$. (15)

3. a) Give the control abstraction for greedy method. (5)

   OR

   b) Explain the problem 'Optimal Merge Pattern'. (5)

   c) Explain Job sequencing problem with deadlines. State greedy algorithm for sequencing unit jobs with deadlines and profits. Find the optimal solution when $n = 5$, $(p_1, p_2, p_3, p_4, p_5) = (20, 15, 10, 5, 1)$, $(d_1, d_2, d_3, d_4, d_5) = (2, 2, 1, 3, 3)$. (15)

   OR

   d) Explain optimal storage on tapes problem. With usual notations, prove that if $l_1 \leq l_2 \leq \cdots \leq l_m$, then the ordering $i_j = j$, $1 \leq j \leq n$ minimizes $\sum_{i=1}^{n} \sum_{j=1}^{k} l_{i_j}$ overall possible permutations of i_j. (15)

4. a) Describe depth first search with an example. (5)

   OR

   b) Explain the inorder traversal with an example. (5)

   c) Explain in detail the 4-queens problem. Give a backtracking algorithm to solve the n-queens problem. (15)

   OR

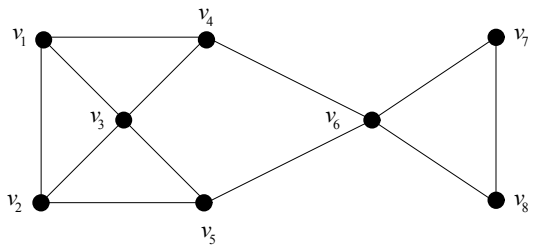
   d) Explain the sum of subsets problem. Give a recursive backtracking algorithm for sum of subsets problem. (15)

5. a) What is satisfiability problem ? State Cook's theorem. (5)

OR

b) Write a note on nondeterministic algorithm. (5)

c) Define a node cover for a graph *G*. Determine the minimum node cover for the following graph.



Prove that the node cover decision problem is NP-Complete. (15)

OR

d) Explain the maximum clique problem with an example. Prove that CNF-satisfiability reduces to clique decision problem. (15)

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