

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – MATHEMATICS

FIRST SEMESTER – NOVEMBER 2007

MT 1808 - COMPUTER ALGORITHMS

AB23

Date : 05/11/2007
Time : 1:00 - 4:00

Dept. No.

Max. : 100 Marks

ANSWER ALL QUESTIONS. EACH QUESTION CARRIES 20 MARKS

- 1 a. What is a recursive algorithm? Illustrate with an example.
OR
b. Define a binary tree. Give the parent, left child and the right child of a node of a binary tree labeled j . Give the maximum number of nodes on level i of a binary tree and the maximum number of nodes in a binary tree of depth k . (5)
c. Give an algorithm to create a heap using INSERT. Find the worst case time for heap creation using INSERT. Simulate the algorithm on $a(1:5) = (20, 56, 34, 10, 100)$.
OR
d. Give an algorithm to form a heap using ADJUST. Simulate it on $a(1:5) = (67, 45, 90, 12, 39)$. Discuss the worst-case time for heap creation using ADJUST. (15)
- 2 a. Explain the divide and conquer strategy.
OR
b. State algorithm BINSRCH. (5)
c. State algorithm MERGESORT. Show that the computing time for MERGESORT is $O(n \log n)$ where n is the number of inputs..
OR
d. State algorithm QUICKSORT. Simulate it on $a(1:7) = (34, 67, 12, 89, 30, 90, 55)$ (15)
- 3 a. Explain how optimal merge pattern works on merging sorted arrays. Give an example.
OR
b. Describe job sequencing problem with an example. (5)
c. Explain the 'optimal storage on tapes' problem. Give an ordering of the lengths of the programs that minimizes the *mean retrieval time* and prove the same.
OR
d. State algorithm GREEDY KNAPSACK and prove that it generates an optimal solution to the given instance of the knapsack problem. (15)
- 4 a. Explain the 4-queens problem.
OR
b. Explain the sum of subsets problem with an example. (5)

[PTO]

- c. Describe the inorder, preorder and postorder traversals in a tree. Label the vertices of a complete binary tree on 15 vertices using inorder, preorder and postorder traversals. State an algorithm for breadth first graph traversal

OR

- d. Give a recursive backtracking algorithm to solve n -queens problem. (15)

- 5 a. Give a nondeterministic algorithm to search for an element x in an array $a[1:n]$.

OR

- b. Explain 'satisfiability' problem. State Cook's theorem on satisfiability. (5)

- c. What is clique decision problem (CDP)? Prove that CDP is NP -complete.

OR

- d. Explain node cover decision problem ($NCDP$) with an example. Prove that the clique decision problem (CDP) reduces to $NCDP$ problem. (15)
