MCSE/MSE-102

M. E./M. Tech. (First Semester) EXAMINATION, Dec., 2010

ADVANCED DATA STRUCTURES AND ALGORITHMS

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

NOTE: Attempt any five questions. All questions carry equal marks. Provide proper comments in algorithms. Give explanations wherever necessary.

1. (a) Discuss procedure to analyze algorithms. How O notation is used to compare efficiency of two algorithms in respect of computing time. Explain with example.

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

2 (a) Give an algorithm to transpose a sparse matrix. Also analyze the computing time and storage requirement of your algorithm.

(b) Write an algorithm to transform an expression from prefix to postfix. How much time and space does your algorithm take ? Clearly state any assumption that you make regarding the input.

3.(a) Let P be a pointer to a circularly linked list. Write algorithms to add and delete elements to use this list as a queue. Specify the value for P when the queue is empty.

(b) Design an algorithm to copy a sparse matrix. What is the computing time of your algorithm ?

4.(a) Give a non-recursive algorithm for preorder traversal of a binary tree. Analyze it for time requirement.

(b) Do the in-order and post-order sequences of binary tree uniquely define the binary tree ? Prove your answer.

5. (a) For an un-directed graph G with n vertices and e edges, show that :

$$\sum_{1}^{n} d_i = 2e$$

where d_i = degree of vertex i.

(b) Give an algorithm to find a minimum spanning tree of a graph. Also analyze it for best and worst case time • requirement.

6. (a) Write a non-recursive merge sort algorithm using linked list to represent sorted sub files. What will be the time requirement if n records each of size m is sorted ?

(b) Show that the algorithms to find a cycle using depth first and breadth first search must beO (n).

7. (a) Discuss and compare first-fit, best-fit and worst-fit.

(b) Given pointers p and q to two list nodes, write an algorithm to determine if node (q) is accessible for node. (p). Also analyze it for time requirement.

8. Write short notes on any four of the following :

(a) Quick sort (b) Divide and conquer (c) Greedy method

(d)Buddy system (e) Dynamic programming (f) Dijkstra' algorithm