

G 7053

M.E. DEGREE EXAMINATION, JANUARY 2006.

First Semester

Computer Science And Engineering

CS 1602 — DATA STRUCTURES AND ALGORITHMS

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is an Abstract Data Type?
2. What is Pointer? Compare it with cursor.
3. What is the minimum number of nodes in AVL tree of height 15?
4. What is the postfix equivalent of the infix expression $a + b * c + (d * e + f) * g$?
5. Define Priority Queue.
6. What is chromatic number of a graph G?
7. What is garbage collection?
8. What is buddy system? List its advantages.
9. What are the running times of Quick Sort and Merge sort for presorted input?
10. State Greedy algorithm.

PART B — (5 × 16 = 80 marks)

11. (i) A and B are two sorted linked lists. Write an algorithm to create new linked list C that contains all data in A, B without duplicates in sorted order. (6)
- (ii) Formulate an algorithm to multiply two polynomials P1, P2 using linked list implementation. Explain with suitable example. (10)

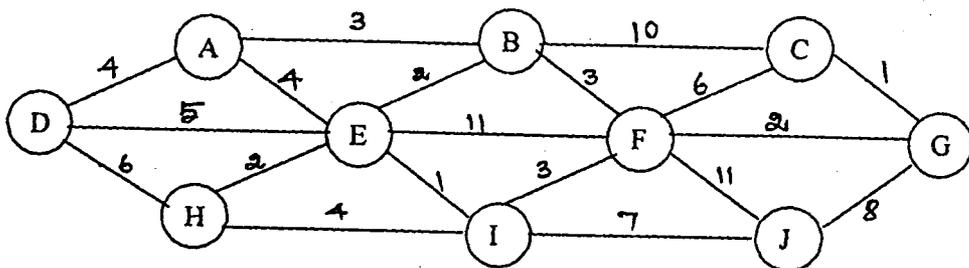
12. (a) (i) Write an algorithm to insert and delete from i th stack when multiple stacks are represented in a single array. Check for "Stack Full" condition. (6)
- (ii) Show the results of inserting 3, 2, 1, 4, 5, 6, 7, 9, 6, 15, 14, 13, 11, 10, 8 and 9 into an initially empty AVL tree. Explain with necessary algorithm. (6)
- (iii) Write an algorithm for insertion in B-Tree. (4)

Or

- (b) (i) Two binary trees are similar if they are both empty or both non-empty and have similar left and right subtrees. Write an algorithm to decide whether two binary trees are similar. (10)
- (ii) Write a non-recursive algorithm for post order tree traversal. Perform time analysis for your algorithm. (6)
13. (a) (i) Write an algorithm to find the smallest and largest element in a given set S. (8)
- (ii) Give an algorithm to find the minimum number of edges that need to be removed from an undirected graph G so that the resulting graph is acyclic. (8)

Or

- (b) (i) How do you remove data from a priority queue? Explain the applications of priority queue. (6)
- (ii) Explain the Prim's algorithm and apply to the following graph. (10)



- (a) (i) Explain an efficient method for garbage collection of equal sized blocks. (8)
- (ii) Explain the buddy system of memory management in detail. (8)

Or

- (b) (i) Discuss the problems in allocating and freeing space in each memory management scheme. (8)
- (ii) Explain the different techniques for implementing storage compaction. (8)

- (a) (i) Explain the heap sort algorithm for sorting a list of n values and perform the time analysis. (6)
- (ii) Explain the Optimal Binary Search Tree with an example and algorithm. (6)
- (iii) Explain about local search algorithms. (4)

Or

- (b) (i) What is external sorting? Explain the polyphase sort with example. (6)
- (ii) In the game of chess, a Knight in row R and column C may move to row $1 \leq R' \leq B$ and column $1 \leq C' \leq B$ (Where B is the size of the board) provided that either

$$|R - R'| = 2 \text{ and } |C - C'| = 1$$

Or

$$|R - R'| = 1 \text{ and } |C - C'| = 2$$

A Knight's tour is a sequence of moves that visits all sequences exactly once before returning to the starting point. Give a backtracking algorithm to find a knight's tour. (10)
