Second Semester Examination, 2004

DATA STRUCTURES USING C

Full Marks : 70

Time : 3 hours

Answer Q. No. 1 which is compulsory and any five from the remaining questions

The figures in the right-hand margin indicate marks

1. (a) Write an algorithm to swap two values without using a third variable. 2 x 10

(b) Represent the following polynomial using a linked list

$$2x^5y^4 - 6x^4y^3 + 4x^3y - 2xy + y - 7$$

(c) Find the time complexity to determine whether an integer is prime or not.

(d) Construct a binary tree to represent the following arithmetic expression

$$a + b * (c - d) + e / (f + g - h)$$

(Turn Over)

(*e*) The following sequence of operations is performed on an empty stack :
push (1), push (0), pop, push (0), push (1), pop, pop, push (1), pop, pop, push (1)

Write the sequence of poped out items.

(*f*) Write the overflow condition of a circular queue.

(*g*) Write the underflow condition of a linked stack.

(*h*) Construct a binary search tree with the following sequence of items : 50, 20, 60, 10, 80, 70, 15, 90, 40, 30, 75.

(*i*) Write the postorder expression of the inorder expression

$$A^*B+C^*D+E$$

(*j*) For an undirected graph G with n vertices and e edges prove that

$\sum_{i=1}^{n} d_i = 2^*e$, where d_i, is degree of vertex i. 2×10

2. Explain the reference of elements in a two-dimensional matrix in

(*a*) Row-major order

(*b*) Column-major order. $5+5$

3. (*a*) Write the PUSH and POP algorithms of a stack using array representation. 5

(*b*) Write the algorithm to evaluate an arithmetic expression in postfix notation using a stack. 5

4. There are two polynomial P and Q represented as single linked list structure. Write the algorithm to

(*a*) add the polynomials

(*b*) multiply the polynomials. $5+5$

5. (*a*) Discuss the algorithm to insert as a leaf node into a linked representation of a binary tree. 5

(*b*) Discuss the algorithm to merge two binary trees represented as linked structure. 5

6. With a suitable illustration discuss the Dijkstra's algorithm of a single source shortest path problem. 10

7. (a) Write a suitable illustration discuss the Merge sort algorithm. 5

(b) Discuss the binary search algorithm and find its time complexity. 5

8. (a) Given N set of integers, write a program in C to arrange them in descending order using insertion sort technique. 5

(b) Write a program in C to find the sum of the elements of the lower triangular matrix of order m × n. 5