

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

$$\{ a + b * (c - d) \} + \{ c / (f + g - h) \}$$

(Total 70)

(2)

(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 popped 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

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

2 x 10

(3)

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

(a) Row-major order

(b) Column-major order. 5 + 5

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

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

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

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

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