2012

DATA STRUCTURE & ALGORITHMS

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Reserve Polish notation is often known as

a) Infix b) Prefix

c) Postfix d) none of these.

ii) Which of the following algorithm should execute the slowest for large values of N ?

a) $0(N)$ b) $0(N^2)$

c) $9(\log 2\ N)$ d) None of these.

[Turn over

iii) The evaluation of the postfix expression

3, 5, 7, *, +, 12, % is

a) 2 b) 3

c) 0 d) 3·17.

iv) A machine needs a minimum of 100 sec to sort 1000 names by quick sort. The minimum time needed to sort 100 names will be approximately

a) 72·7 sec b) 11·2 sec

c) 50·2 sec d) 6·7 sec.

v) Linked list are not suitable for

a) Stack b) Deque

c) AVL Tree d) Binary search.

vi) What will be the time complexity for selection sort to sort an array of n elements ?

a) $O(\log n)$ b) $O(n \log n)$

c) $O(n)$ d) $O(n^2)$.

vii) The depth of a complete binary tree with n nodes

a) $\log(n+1)-1$ b) $\log(n)$

c) $\log(n-1)+1$ d) $\log(n)+1$.

viii) In a binary search tree, if the number of nodes of a tree is 9, then the minimum height of the tree is

a) 9 b) 5

c) 4 d) none of these.

ix) Dynamic memory allocation use

a) Calloc b) Malloc

c) Free d) all of these.

x) A vertex with degree one in a graph is called

a) Leaf

b) Pendant vertex

c) End vertex

d) None of these.

xi) Adjacency matrix of a diagraph is

a) Identity matrix

b) Symmetric matrix

c) Asymmetric matrix

d) None of these.

xii) Which method of traversal does not use stack to hold nodes that are waiting to be processed :

a) Breadth-first

b) Depth-first

c) D-search

d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) Define big *O* notations.

b) $T(n) = 4n^2 + 3n \log n$, express $T(n)$ in Big (*O*) notations. 2 + 3

3. a) How the polynomial $4x^3 - 10x^2 + 3$ can be represented using a linked list ?

b) Compare and contrast between an array and a single linked list. 2 + 3

4. a) Consider the array int a [10] [10] and the base address 2000, then calculate the address of the array a [2] [3] in the row and column major ordering.

b) Write the advantage of circular queue over linear queue. 3 + 2

5. What do you mean by recursion ? Write down a *C* function to find out the GCD of two nos. using recursive technique.

1 + 4

6. What is binary tree ? Construct a binary tree using the inorder and postorder traversal of the node given below :

Inorder :	D	B	F	E	A	G	C	L	J	H	K
Postorder :	D	F	E	B	G	L	J	K	H	C	A

1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Draw a minimum heap tree from the below list :

12, 11, 7, 3, 10, – 5, 0, 9, 2

Now do the heap sort operation over the heap tree which you have formed. Write the insertion sort algorithm. 2 + 2 + 3

b) What is a minimum spanning tree ? Describe Huffman's Algorithm. 3 + 4

c) What are the differences between AVL Tree & Binary Search Tree ? 1

8. a) Radix Sort the following list :

189, 205, 986, 421, 97, 192, 535, 839, 562, 674

Write the Radix sort algorithm. 3 + 5

b) Find the time complexity of Binary Search Algorithm. 4

c) What is hashing ? 3

9. a) Construct an AVL tree using the below list. Show all the steps 12, 11, 13, 10, 09, 15, 14, 18, 7, 6, 5, 4. 5

b) What is a priority queue ? 3

c) Write the recursive algorithm to find $x \wedge n$. 4

d) Find the postfix notation of

$(a + b * x) \setminus (a ! - d) s - c \wedge y$ (show all steps). 3

10. a) Write the advantage of circular queue over linear queue. 4

b) What is a self referential structure ? 2 + 3

c) Describe a string reversal algorithm. 3

d) Write the difference between a[ ] [ ] and ** a. 3

e) What is difference between Union & Structure ? 3

11. Write short notes on any *three* of the following : 3 × 5

a) Abstract Data type

b) BFS

c) BTree

d) Tail recursion

e) Merge Sort.