2013

DATA STRUCTURE AND C

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 the following : $10 \times 1 = 10$

i) Which of the following sorting techniques needs extra space than the data to be stored ?

a) Selection sort b) Bubble sort

c) Merge sort d) Insertion sort.

ii) Inserting a new node after a given node in a single linked list requires

a) four-pointer exchange

b) two-pointer exchange

c) one-pointer exchange

d) no pointer exchange.

iii) The vertex, removal of which makes a graph disconnected is called

a) pendant vertex b) coloured vertex

c) articulation point d) bridge.

iv) Which of the following is the best time for an algorithm ?

a) $O(1)$ b) $O(\log_2 n)$

c) $O(2^n)$ d) $O(n \log_2 n)$.

v) Reverse polish notation is also known as

a) infix b) prefix

c) postfix d) none of these.

vi) The depth of a complete binary tree of n nodes is

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

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

vii) A linear list in which elements can be added or removed at either end but not in the middle is known as

a) stack b) dequeue

c) queue d) linked list.

viii) Which of the following data structures is used for BFS algorithm ?

a) Stack b) Queue

c) Binary tree d) None of these.

ix) The evaluation of the postfix expression 3, 5, 7, *, +, 12, % is

a) 2 b) 3

c) 0 d) 3·17.

x) In C language arrays are stored in memory in which representation ?

a) Row major b) Column major

c) Layer major d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Write an algorithm to search an element in an array using binary search.

3. Let the size of the elements stored in a matrix $A[8][3]$ be 4 bytes each. If the base address of the matrix is 3500, then find the address of $A[4][2]$ both for row major and column major ordering. What is Sparse matrix ? 2 + 2 + 1

4. Write a recursive algorithm to solve Tower of Hanoi problem. Also draw the recursion tree for any set of initial values. 3 + 2

5. How a polynomial such as $8x^5 + 4x^3 - 9x^2 + 2x - 17$ can be represented using a linked list ? What are the advantages and disadvantages of linked list over an array ? 2 + 3

6. What is Priority queue ? Explain the operation of Priority queue. 1 + 4

GROUP – C

(Long Answer Type Questions)

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

7. a) Write down the Merge sort algorithm. 5

b) Show how the merge sort algorithm will sort the following array in increasing order : 5

56, 19, 27, 9, 13, 100, 31, 11, 5, 62.

c) Why does it run faster than Bubble sort in most of the cases ? 2

d) Find the time complexity of Quick sort algorithm. 3

8. a) Write an algorithm to insert a node at the n th position of a doubly linked list. 5

b) Convert the following infix expression into postfix expression. Show all steps : 5

$A*(B+D)/E-F*(G+H\backslash K\hat{}L)$

c) What is Circular queue ? Write an algorithm to insert an element into a Circular queue. 5

9. a) What is a threaded binary tree ? Write an algorithm for non-recursive inorder traversal of a threaded binary tree. 2 + 4

b) The inorder and preorder traversal of nodes in a binary tree are given below :

Inorder : *E A C K F H D B G*

Preorder : *F A E K C D H G B*

Draw the Binary tree. State briefly the logic to construct the tree. Also draw its Post-order Traversal. 5 + 2

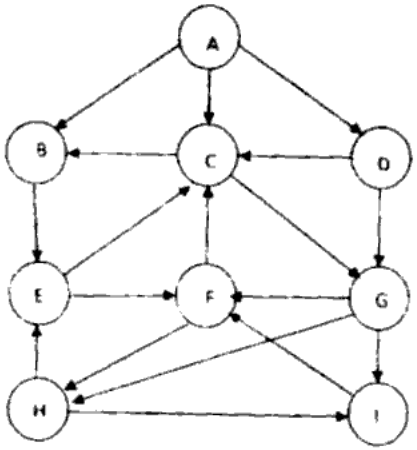
c) Define Hashing. 2

10. a) Construct an AVL tree by inserting the following elements in the given order and describe each step : 5

63, 9, 19, 27, 18, 108, 99, 81.

b) Describe Kruskal's minimal spanning tree algorithm. 5

c) Consider the following graph. Find its BFS traversal. 5



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

a) Dequeue

b) Tail Recursion

c) Multiple Stack

d) Heap Sort

e) BTree.

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