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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 7306    Roll No.

# M. C. A. (Second Semester) Theory Examination, 2010-11

## DATA STRUCTURE USING C

*Time : 3 Hours]*                    *[Total Marks : 100*

*Note* : This question paper contains three Sections. Selecting-A, Section-B and Section-C with the weightage of 20, 30 and 50 marks respectively. Follow the instructions as given in each Section.

### Section-A

This question contains 10 questions of multiple choice, True/False and Fill in the blanks. Attempt *all* parts of this Section.                    2×10=20

1.    (a)    Consider the following tree :
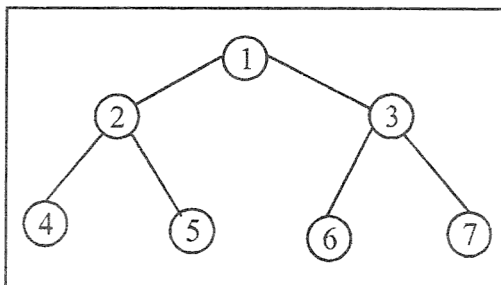
If the post order traversal gives a b c d − + * then the label of the nodes 1, 2, 3, ........ will be :

(i)   +, −, *, a, b, c, d

(ii)  a, −, b, +, c, *, d

(iii) a, b, c, d, −, +, *

(iv)  −, a, b, +, *, c, d .

(b)  The number of swapping needed to sort the numbers 8, 22, 7, 9, 31, 19, 5, 13 in ascending order using bubble sort will be :

(i)   11

(ii)  12

(iii) 13

(iv)  14.

(c)  The depth of a complete binary node with $n$ nodes will be :

(i)   $\log_2(n+1)-1$

(ii)  $\log_2(n)$

(iii) $\log_2(n-1)+1$

(iv)  $\log_2(n)+1$.

(d) The average successful search time for sequential search on $n$ items is :

    (i)    $n/2$

    (ii)   $(n-1)/2$

    (iii) $(n+1)/2$

    (iv) $\log(n)+1$ .

(e) There are four different algorithms $A1, A2, A3, A4$ to solve the given problem with the order $\log(n), \log(\log(n)), n\log(n), n/\log(n)$. Which is the best algorithm ?

    (i)    $A1$

    (ii)   $A2$

    (iii) $A3$

    (iv) $A4$ .

(f) The way a card game player arranges his card as he picks them up one by one, is an example of :

    (i)    Selection sort

    (ii)   Insertion sort

    (iii) Merge sort

    (iv) Bubble sort.

(g) Select odd man out :

    (i) Depth first search

    (ii) Prims' algorithm

    (iii) Adjacency Matrix

    (iv) In order traversal.

(h) Polynomial representation can be done using :

    (i) Structure

    (ii) Linked List

    (iii) Tree

    (iv) Graph.

(i) In every case time complexity is given priority to space complexity in designing algorithm. (True/False)

(j) Priority queue can be implemented using ..............

## Section B

Attempt any *three* questions. All questions carry equal marks. 10×3=30

2. (a) Differentiate between iteration and recursion giving suitable example. Recursion takes more execution time when compared to iteration ? Give reason.

(b) Define algorithm. What are the criteria that every algorithm must satisfy ? Write an algorithm to find the second largest from the list of given integers.

(c) (i) How two-dimensional arrays are stored in one dimensional memory ?

(ii) If an array is defind an int $a[10][20]$ in C. Device a formula to calculate the address of an any variable say $a[i][j]$, for any valid value of $i$ and $j$.

(d) What is hash table ? How using hash table is beneficial for us ? Explain collision resolution strategies used in hash table.

(e) Write an algorithm for quick sort. Trace your algorithm on the following data to sort the list :

12, 5, 14, 2, 56, 7, 85, 51, 18, 1, 75, 42, 1, 9.

*Section-C*

Attempt any *two* parts from each question. All questions carry equal marks.    $10 \times 5 = 50$

3.  (a) What is a sparse matrix ? How sparse matrices can be represented efficiently in memory ?

(b) What is a Data Type ? Differentiate between primitive data type, abstract data type, and polymorphic data type.

(c) Convert the given infix expression to equivalent postfix notation :

$$a + b/(c - d) + \text{exg} - h .$$

4. (a) Write an algorithm for adding and deleting in circular queue.

(b) Write a program in C to delete a specific element in a single linked list.

(c) Doubly linked list takes more space than singly linked list for storing one extra address. In what condition could be a doubly linked list be more beneficial than singly linked list ?

5. (a) What is tree data structure ? Explain the different ways of traversing a tree.

(b) Explain the significance of threaded binary tree.

(c) Write a program in C for binary search. Analyze its running time.

6. (a) Perform Heap sort on the following list of integers :

23, 5, 47, 58, 4, 52, 15, 48, 26, 3, 11, 4, 7.

(b) Explain the procedure of insertion and deletion in Binary search tree.

(c) Define AVL tree. Explain the different types of rotation done in AVL tree.

7. (a) What are the different ways in which the graph is represented in computer memory ?

(b) What is Minimal Spanning Tree ? Write an algorithm to find the MST.

(c) Write short notes on any two of the following :

(i) Sequential Files

(ii) Indexing

(iii) B+ Tree Index Files.