

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

PAPER ID : 7306

Roll No.

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

DATA STRUCTURE USING C

Time : 3 Hours]

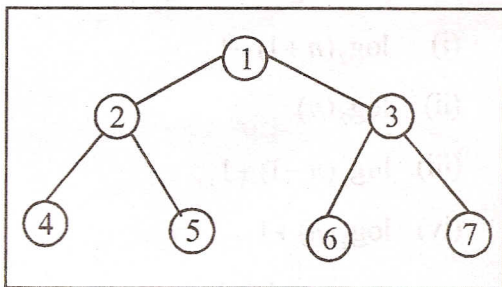
[Total Marks : 100

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. $2 \times 10 = 20$

1. (a) Consider the following tree :



If the post order traversal gives $a b - cd * +$
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) Prim's 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 defined as `int a[10][20]` in C. Devise 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 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.