

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech(ECE-NEW)/SEM-5/EC-504B/2012-13**

**2012**

**DATA STRUCTURE & 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) The best case time complexity of Bubble sort technique is
    - a)  $O(n)$
    - b)  $O(n \log n)$
    - c)  $O(n^2)$
    - d)  $O(\log n)$ .
  - ii) Maximum number of edges in a  $n$ -node undirected graph without self loop is
    - a)  $n^2$
    - b)  $n - 2$
    - c)  $\frac{n(n-1)}{2}$
    - d)  $\frac{n(n+1)}{2}$ .
  - iii) The ratio of items present in a hash table to the total size is called
    - a) balance factor
    - b) load factor
    - c) item factor
    - d) weight factor.

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- iv) In array representation of Binary tree, if the index number of a child node is 6 then the index number of the parent node is
  - a) 4
  - b) 6
  - c) 2
  - d) 5.
- v) Which data structure is used for depth first traversal of a graph ?
  - a) Array
  - b) Linked list
  - c) Stack
  - d) Queue
- vi) The rear and front end of a linear queue is used for
  - a) deletion, insertion
  - b) searching, sorting
  - c) insertion, deletion
  - d) none of these.
- vii) In an AVL the balancing is needed when balancing factor of any node becomes
  - a) 1 or - 1
  - b) 0 or - 1
  - c) - 2 or 2
  - d) - 1 or 0.
- viii) In C language malloc ( ) returns
  - a) integer pointer
  - b) null pointer
  - c) float pointer
  - d) void pointer.
- ix) Insertion in stack is done in
  - a) front
  - b) rear
  - c) top
  - d) bottom.
- x) The adjacency matrix of an undirected graph is
  - a) unit matrix
  - b) asymmetric matrix
  - c) symmetric matrix
  - d) none of these.

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**GROUP – B****( Short Answer Type Questions )**Answer any *three* of the following.  $3 \times 5 = 15$ 

2. Explain  $f(n) = O(g(n))$ . Is  $2^{n+1} = O(2^n)$ .
3. Find the time complexity of the following algorithm :  

```
for (i = 0; i < n; i++)
    for (j = i; j < n; j++)
        for (k = j; k < n; k++)
            s++;
```
4. Define recurrence. Find the time complexity of  $T(n) = T(\sqrt{n}) + 1$ ,  $T(n)$  is constant for  $n \leq 2$ .
5. What do you mean by recursion ? Write a C code to implement Tower of Hanoi problem using recursion.
6. Define sparse matrix. How is sparse matrix efficient for storing data elements ? Explain diagrammatically.

**GROUP – C****( Long Answer Type Questions )**Answer any *three* of the following.  $3 \times 15 = 45$ 

7. a) What do you mean by hashing ? What is hash function ? Explain any five popular hash functions. What is hash table ?  $2 + 1 + 5 + 2$   
 b) Explain Dijkstra's algorithm for finding the shortest path in a given graph.  $5$
8. a) What is a binary tree ? Define level and depth of a tree.  $2 + 2$   
 b) Construct a binary tree whose nodes in in-order and pre-order are given as follows :  
 In-order : 10, 15, 17, 18, 20, 25, 30, 35, 38, 40, 50  
 Pre-order : 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50  
 Now find the post-order traversal sequence.  $7 + 3$   
 c) What is complete binary tree ?  $1$

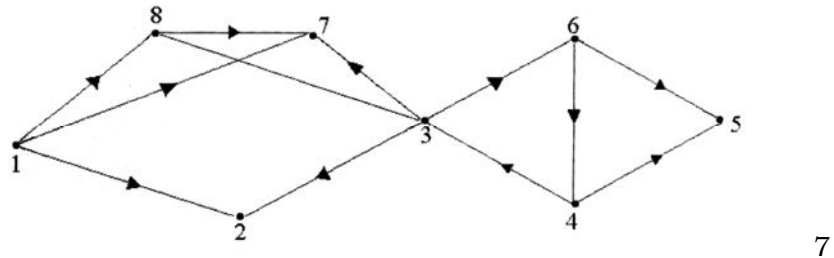
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9. a) Write the algorithm for BFS & DFS with example. 4 + 4  
 b) Show the result of running BFS and DFS on the directed graph given below using vertex 3 as source. Show the status of the data structure used at each stage :



10. a) Convert the following infix expressions into its equivalent postfix expressions; 5

$$A * (B + D) / E - F * (G + H / K)$$

- b) What is quick sort ? Write the algorithm for quick sort. Sort the following array using quick sort method :

24 56 47 35 10 90 82 31 2 + 5 + 3

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

- i) B Tree
  - ii) Time Complexity, Big O notation
  - iii) Merge Sort
  - iv) Threaded Binary Tree
  - v) Depth First Traversal.
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