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.

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.

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

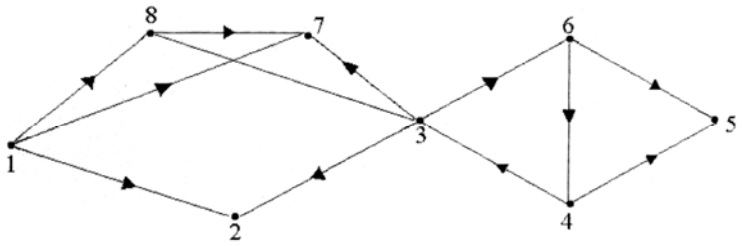
   Pre-order : 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50

   Now find the post-order traversal sequence. 7 + 3

   c) What is complete binary tree ? 1

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 :



7

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.