Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/FT (NEW)/SEM-6/CS-615/2013

2013
DATA STRUCTURE AND ALGORITHM

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 time complexity of linear search algorithm over an array of n elements is

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

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

ii) Which of the following operations is performed more efficiently by doubly linked list than by linear linked list ?

a) Deleting a node whose location is given

b) Searching an unsorted list for a given item

c) Inserting a node after the node with a given location

d) Traversing the list to process each node.

iii) Consider that n elements are to be sorted. The worst case time complexity of Bubble sort is

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

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

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

a) Queue b) deque

c) stack d) tree.

v) Which of the following procedure is the slowest ?

a) Quick sort b) Insertion sort

c) Merge sort d) Bubble sort.

vi) Which of the following statements is false ?

a) Every tree is a bipartite graph

b) A tree contains a cycle

c) A tree with n nodes contains n-1 edges

d) A tree is a connected graph.

vii) A full binary tree with n leaves contains

a) N nodes b) $\log_2 n$ nodes

c) $2n$-1 nodes d) 2^n nodes.

viii) The minimum number of fields with each node of doubly linked list is

a) 1 b) 2

c) 3 d) 4.

ix) The inorder and preorder traversals of a binary tree is

a) DEBFGCA b) DEFGBCA

c) EDBGFCA d) EDBFGCA.

x) Sparse matrices have

a) Higher dimension

b) many zero entries

c) many non-zero entries

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) What are the conditions for Binary Search algorithm ?
   b) What are the advantages and disadvantages of linked list over array ? 2 + 3
3. a) What is hashing ? Why is it used ?
   b) Explain the chaining method of collision resolution in hashing ? 2 + 3
4. a) Compare sequential versus direct access file structures.
   b) Explain multi-index file structure. 3 + 2
5. a) Compare doubly linked list and circular linked list.
   b) What is priority queue ? 2 + 3
6. Write an algorithm to insert an item in circular queue.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Write an algorithm of Merge Sort and explain with an example.
   b) Compare the complexity of bubble sort & insertion sort.
   c) Explain with a suitable example of the principal operation of Quick sort.
   d) Find the complexity of Quick sort algorithm.

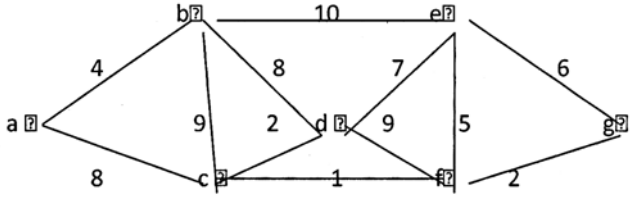
   5 + 3 + 5 + 2
8. a) Define B-tree. What is Height Balanced tree ?
   b) How can the polynomial $6x^6 + 4x^3 - 2x + 10$ be represented by a linked list ?

c) Construct an AVL tree of the following elements :
1, 5, 6, 2, 8, 11, 20
Then insert 10 and 15 from the resultant tree so that the tree remains balanced. Show the balanced factor of each node and clearly mention the different rotations.

d) What is linear probing (2 + 3) + 2 + (3 + 3) + 2

9. a) Convert the following infix expression into equivalent postfix expression using Stack :
$(A + B * C - (D - E))/(F + G * H)$

b) What do you mean by minimum cost spanning tree ? What is the minimum cost spanning tree of the given graph using Kruskal's algorithm ?



c) What is adjacency matrix representation of the above graph ? 5 + (2 + 5) + 3

10. a) What is circular queue ?

b) Give an algorithm to search for an element in an array using binary search.

c) What is input restricted dequeue ?

d) Write an algorithm to convert an infix expression to postfix expression using Stack. 2 + 5 + 2 + 6

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

a) Threaded binary tree

b) BFS vs DFS

c) Insertion in B-tree

d) Binary Search tree

e) Prim's Algorithm.