*Name* : .....

*Roll No.* : .....

*Invigilator's Signature* : .....

**CS/B.Tech(BT)/SEM-3/CS-315/2009-10**

**2009**

# DATA STRUCTURE & 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 of the following : $10 \times 1 = 10$

   i) Maximum number of edges in a $n$-node undirected connected graph without self loop is

   a) $n^2$ b) $\frac{n(n-1)}{2}$

   c) $n-2$ d) $\frac{n(n+1)(n)}{2}$ .

   ii) Having address of the node to be deleted from double linked list, the node can be deleted

   a) without traversing the list

   b) only after traversing the list from the head

   c) only traversing the list from the tail

   d) none of these.

iii) In quick-sort, a desirable choice of pivot for partitioning the list will be

a) first element of the list

b) last element of the list

c) median of the list

d) a randomly chosen element of the list.

iv) In array representation of Binary tree, if the index number of a child node is 6 then the index number of it's parent node is

a) 2 b) 3

c) 4 d) 5.

v) What traversal techniques list the nodes of a binary search tree in ascending order ?

a) Postorder b) Inorder

c) Preorder d) None of these.

vi) Which of the following methods has the best average case complexity for searching ?

a) Hashing b) Sequential

c) Random d) Binary.

vii) The prefix expression for the following infix expression is a * ( b + c ) / e – f

a) /* a + bc – ef b) –/* + abcef

c) –/* a + bcef d) none of these.

viii) The following sequence of operations is performed on a stack :

push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.

The sequence of popped out values are

a) 2, 2, 1, 2, 1 b) 2, 2, 1, 1, 2

c) 2, 1, 2, 2, 1 d) 2, 1, 2, 2, 2.

ix) Let 'q' be the queue of integers defined as follows :

```
#define MAXQ 500
struct queue
    {
    int items [MAXQ];
    int front,rear;
    }q;
```

to insert an element in queue, we may write operation

a) `++q.items[q.rear]= x;`

b) `q.items[q.rear]++= x;`

c) `q.items[++q.rear]= x;`

d) none of these.

x) Which one is not correct ?

a) Pointers are used for dynamically allocated memory

b) Dynamic memory allocation is performed when storage requirement is not predictable.

c) Data access in dynamic allocated storage is faster than static allocated storage.

d) None of these.

## GROUP – B

### ( Short Answer Type Questions )

Answer any *three* of the following. 3 × 5 = 15

2. a) Convert the following infix expression into equivalent postfix expression using stack.

( A + B ) * C – ( D – E ) / ( F + G )

b) What is double linked list ? 3 + 2

3. Write an algorithm for inorder traversal of a threaded binary tree.

4. Write an algorithm for sorting list of numbers in ascending order using insertion sort technique.

5. Compare Sequential versus Direct access file structure.

6. Determine the reach ability of the vertices from starting vertex 1 for the following directed graph using DFS algorithm.

**GROUP – C**

( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) What is Divide and Conquer strategy of problem solving ? Explain with a suitable example. How merge sort can be solved using Divide and Conquer strategy ? 2 + 3

   b) Write the Insertion sort algorithm and also find also find its time complexity. 4 + 1

   c) Trace the quick sort algorithm to sort the list of numbers :

      4, 5, 8, 3, 1, 4, 2. 5

8. a) Define Hashing.

   b) Explain with a suitable example the collision resolution scheme using liner probing with open addressing.

   c) What is the difference between index file system and index sequential file system ?

   d) Explain the Direct File Organization technique.

   2 + 4 + 2 + 7

9. a) Write the Prim's algorithm to find out the minimum cost spanning tree of a graph.

b) Find out the minimum cost spanning tree for the following graph using Prim's algorithm. 6 + 9

10. a) What is adjacency matrix ? Explain with one example.

b) Write the BFS algorithm.

c) Find the simple path from node *A* to node *F* for the following graph using BFS algorithm. 4 + 5 + 6

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

a) Circular Queue

b) Index sequential file organization

c) Tower of Hanoi problem and implementation

d) Binary search tree

e) Spanning tree.