Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (BT-OLD)/SEM-3/CS-315/2011-12

2011

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 any *ten* of the following : $10 \times 1 = 10$

   i) Suppose the following 8 numbers are inserted in order, into an empty BST :

   52, 31, 39, 20, 68, 35, 60, 40

   The final height of the BST will be

   a) 3 b) 4

   c) 5 d) 9.

   ii) A tree is called a binary tree because

   a) it is useful in binary search algorithm

   b) each node can have utmost two children

   c) each node can store a maximum of two values

   d) each node can store values of two different types.

iii) Example of a non-linear data structure is

a) Array b) Linked-list

c) Graph d) None of these.

iv) Best possible run-time complexity for any searching algorithm is

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

c) $O(\log \log n)$ d) $O(n)$.

v) In a complete graph number of edges with 8 vertices is

a) 56 b) 28

c) 16 d) 24.

vi) What traversal technique lists the nodes of a binary search tree in ascending order ?

a) Post-order b) In-order

c) Pre-order d) None of these.

vii) Which of the following sorting procedures is the slowest ?

a) Quick sort b) Heap sort

c) Merge sort d) Bubble sort.

viii) In *C* language malloc( ) returns

a) integer pointer b) structure pointer

c) null pointer d) void pointer.

ix) In array representation of binary tree, if the index number of a child node is 6 then the index number of its parent node is

a) 2 b) 3

c) 4 d) 5.

x) Suppose S1 = DATA and S2 = STRUCTURE. What will be the output of S1/S2 ?

a) DATASTRUCTURE

b) DATA STRUCTURE

c) DATA

d) STRUCTURE.

xi) In tree construction which is the suitable efficient data structure ?

a) Linked list b) Stack

c) Queue d) Array.

xii) The worst-case complexity of quick sort is

a) $O(n_2)$ b) $O(n \log n)$

c) $O(n)$ d) $O(n_3)$.

GROUP – B

(Short Answer Type Questions)

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

2. Find out the output of the following program with proper explanation. If there is any error in the program then point it out with proper explanation :

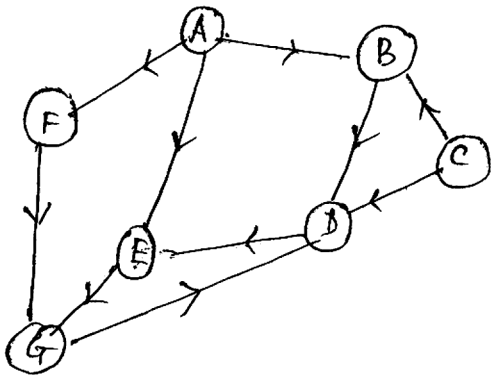
```
void main( )
{
int a [5] = { 1, 2, 3, 4, 5 }, i = 0, * p;
for ( p = a + 4; i < 5; i ++ )
    printf( "%d", p[i] );
}
```

3. "Binary search technique cannot be implemented using Linked list." Is the statement valid ? Briefly explain.

4. Prove that maximum number of nodes possible in a binary tree of height h is $2^h - 1$.

5. a) Draw a graph with 5 vertices each of degree 4. 2

   b) Find the incidence matrix for the directed graph given below : 3



6. a) What is the use of header node in a header linked list ? 2

   b) Let a polynomial $P(x) = 2x^8 - 3x^5 + 4x^3 - 2$. Represent this polynomial using circular header linked list. State the role of header node in representing this polynomial. 3

GROUP – C

(Long Answer Type Questions)

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

7. a) What is dequeue ?

   b) Write down the insertion and deletion algorithms for circular queue.

   c) What will be the empty criteria in that case ?

   3 + 5 + 5 + 2

8. a) Write the procedure to add two polynomials and show by block diagram, how the following polynomial will be added.

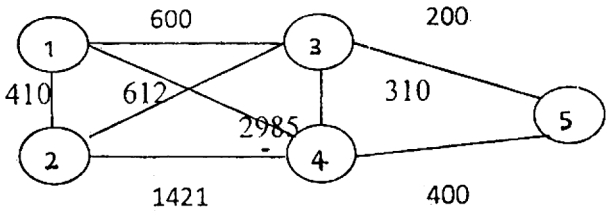
   $5X^5 + 3X^3 + 7X,\ 4X^5 + 4X^4 + X^3 + 3X^2 + 8X + 2$

   b) Convert from infix to postfix using stack

   $((A + B) * C) \$ (B * D)$. 8 + 6 + 1

9. a) Discuss Kruskal's Algorithm for obtaining a spanning tree of minimum cost.

   b) Convert the given graph with weighted edges to minimal spanning tree, using Kruskal's algorithm.



   c) Comment about the complexity of this algorithm.

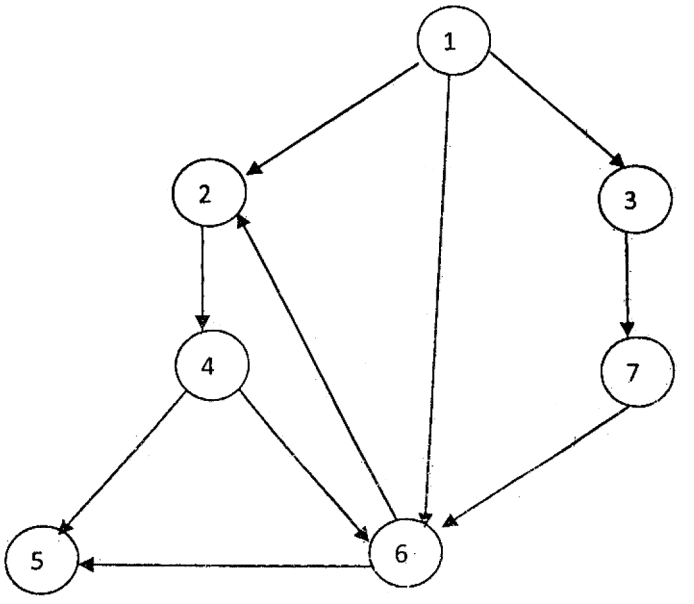
   8 + 5 + 2

10. a) For the following :

find :

i) BFS Traversal

ii) DFS Traversal



b) Compare between these two available traversal techniques on graph.

c) Explain the principles of operation of Heap Sort with suitable examples. 3 + 3 + 3 + 6

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

a) Spanning tree

b) B-tree

c) Priority queue

d) Complexity of an Algorithm

e) Advantage of Hashing.