



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech(BT)(N)/SEM-5/CS-515/2012-13**

**2012**

**DATA STRUCTURE & ALGORITHM (JAVA & 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) If you want to sort many large objects or structures, it would be most efficient to place
- a) them in an array & sort the array
  - b) pointers to them in an array and sort the array
  - c) them in a link list & sort the linked list
  - d) references to them in an array and sort the array.



- ii) Running out of memory may occur due to
- a) no-recursive function call
  - b) recursive function call
  - c) use of more global variable
  - d) none of these.
- iii) The best case time complexity of Bubble sort technique is
- a)  $O(n)$
  - b)  $O(n^2)$
  - c)  $O(n \log n)$
  - d)  $O(\log n)$ .
- iv) Which of the following data structures may give overflow error, even though the current  $n$  elements in it are less than its size ?
- a) Simple queue
  - b) Circular queue
  - c) Stack
  - d) None of these.
- v) A single array  $A[1 \dots \text{MAXSIZE}]$  is used to implement two stacks. The two stacks grow from opposite ends of the array. Variables  $\text{top1}$  and  $\text{top2}$  ( $\text{top1} < \text{top2}$ ) point to the location of the topmost element in each of the stacks. If the space is to be used efficiently, the condition for 'stack full' is
- a)  $(\text{top1} = \text{MAXSIZE}/2)$  and  $(\text{top2} = \text{MAXSIZE}/2+1)$
  - b)  $\text{top1} + \text{top2} = \text{MAXSIZE}$
  - c)  $(\text{top1} = \text{MAXSIZE}/2)$  or  $(\text{top2} = \text{MAXSIZE})$
  - d)  $\text{top1} = \text{top2} - 1$ .

e index number o



- x) BFS constructs
- a) a minimal cost spanning tree of a graph
  - b) a depth first spanning tree of a graph
  - c) a breadth first spanning tree of a graph
  - d) none of these.

**GROUP – B**

**( Short Answer Type Questions )**

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

2. a) Convert the following infix expression into equivalent postfix expression using stack :
- $$(A + B) * C - (D - E) / (F + G)$$
- b) What is dequeue ?  $4 + 1$
3. Discuss different types of Linked lists in Data Structure.
4. Write the algorithm to insert a new node at the specified position in a singly linked list.
5. Make a binary expression tree of the given expression :
- $$a + (b + c) + (d - e) * f / (g - h)$$
6. Define different types of data structure.



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

$3 \times 15 = 45$

7. a) Write an algorithm for bubble sort.
- b) Using bubble sort technique sort the given numbers in ascending order :  
16, 20, 7, 18, 11.
- c) Explain with a suitable example, the principal operation of Insertion Sort.  $4 + 6 + 5$
8. a) Show the stages in growth of an order-4 B-tree when the following keys are inserted in the order given :  
84, 82, 29, 99, 65, 12, 50, 28, 58, 71, 92, 75.
- b) Define Hashing.
- c) Briefly explain the different commonly used hash functions.
- d) Make an AVL tree from the given nodes :  
B, F, I, N, L, P, J, A, H, D.  $5 + 2 + 3 + 5$
9. a) The inorder & preorder traversal sequence of nodes in a binary tree are given below :

Inorder :	D	G	B	A	H	E	I	C	F
Preorder :	A	B	D	G	C	E	H	I	F

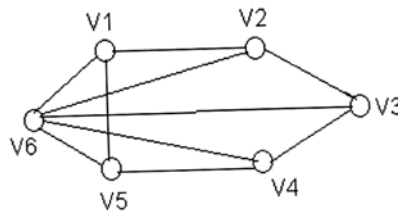
Draw the binary tree. State briefly the logic used to construct the tree.



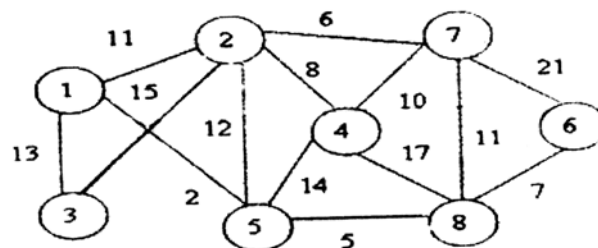
- b) What is Complete Binary Tree ?
- c) What is the difference between Complete Binary Tree and Extended Binary Tree ?
- d) Write the algorithm for insert and delete an element in an array.

5 + 2 + 3 + 5

10. a) Represent the graph ( figure ) using (i) Adjacency Matrix, (ii) Adjacency List.
- b) Starting from the vertex V1 show BFS traversal of the graph ( figure ).



- c) Construct a Minimum Spanning Tree of the following graph using Prim's algorithm.



5 + 5 + 5



11. Write short notes on any *three* of the following :  $3 \times 5$

- a) Quick sort
- b) Different types of files
- c) File access method
- d) Binary search tree
- e) Kruskal Algorithm.

=====