This question paper contains **4+2** printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : **5037**

Unique Paper Code : **234261** **D**

Name of the Paper : **Data Structure [CSPT-202]**

Name of the Course : **B.Sc. Mathematical Sciences/B.Sc. Physical Sciences**

Semester : **II**

Duration : **3 Hours** Maximum Marks : **75**

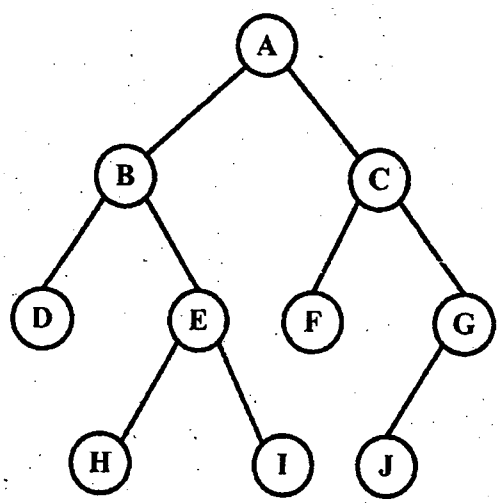
(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Attempt any *Five* of question No. **2** to **8**.

Parts of a question must be answered together.

1. (*a*) Perform the preorder and Inorder traversal of the following binary tree : 4



P.T.O.

(*b*) Consider the following circular queue which is capable of accommodating maximum 6 elements.

Front = 2 Rear = 4

Queue: —, —, L,M,N, —

Describe the status of the queue as the following operations take place :

(*i*) Add O,P,Q

(*ii*) Delete Two elements

(*iii*) Add R

(*iv*) Delete one element. 4

(*c*) Convert the following infix expression to postfix expression. Show the status of the stack at each step : 5

$$A \wedge B * C/(D * E - F).$$

(*d*) Apply selection sort algorithm on the following list of numbers. Show the outcome after each iteration : 5

82, 42, 49, 8, 25, 52, 36, 93, 59.

(*e*) Mention whether True/False : 5

(*i*) Queue works on the principle of FIFO.

(*ii*) Efficiency of Binary Search algorithm is log(*n*).

(*iii*) Recurssion is a process in which a problem is defined in terms of itself.

(*iv*) In a doubly linked list the two pointers in a node point to the first and last node of the linked list.

(*v*) In a tree, nodes are arranged in hierarchical order and so there is only one way in which these nodes can be tranversed.

(*f*) List *two* applications of stacks. Give reasons why stack would be preferable to array. 2

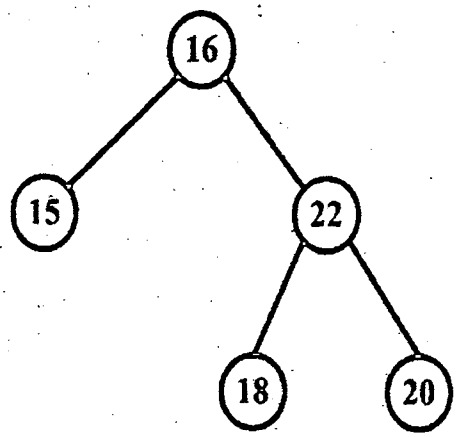
2. (*a*) Write a program in C++ to sort a list of numbers using Bubble sort. 5

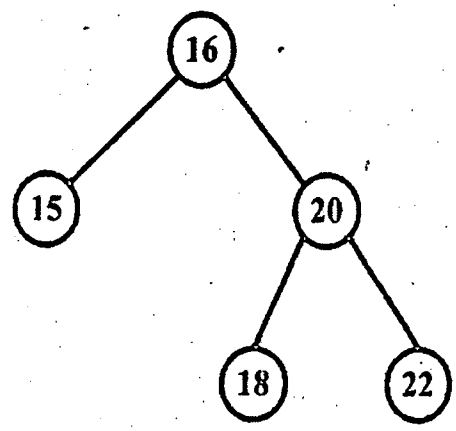
(*b*) Compare the two implementations of stack i.e. the array implementation and linked implementation; giving advantages and disadvantages of linked lists. 5

3. (*a*) What is a queue ? How do you represent it ? 2

(*b*) Write a function to insert a node after a node 'P' in a singly linked list. 4

(*c*) (*i*) Which *one* of the trees given below is a valid Binary search tree and which *one* is not. 1





(*ii*) Compare an iterative process with a recursive process. 2

(*iii*) ..... is a data structure which represents hierarchial relationship among its elements. 1

4. (*a*) Define the following terms : 3

(*i*) Tree

(*ii*) Stack

(*iii*) Data structure.

(*b*) Write a program to accomplish the following stack operations : 7

(*i*) PUSH

(*ii*) POP

(*iii*) Is empty

(*iv*) Is full.

5. (*a*) Show the states of the stack at each step while evaluating the given post fix expression : 5

7532 ^ * 922 ^ – / + 64 * +.

(*b*) Write a program to find the desired element in an array using binary search. Is it efficient than sequential search ? 5

6. (*a*) What is a priority queue ? Which data structure is more efficient for doing insertion and deletion in this queue ? 3

(*b*) Construct a binary search tree from the given inorder and preorder traversals :

Preorder : A B D G H E I C F J K

Inorder : G D H B E I A C J F K

What is the postorder traversal of the tree ? 5+2

7. (*a*) Write a function QUEDEL ( ) in C++ to display and delete an element from a dynamically allocated queue containing nodes of the following given structure : 6

```
Struct NODE
{ int itemno;
  Char itemname[10];
  NODE * next;
};
```

(*b*) Consider the following code :

```
Fun1 (x)
{
    If(x < 5)
        return (3 * x)
    Else
        return (2 * fun 1 (x – 5) + 7)
}
```

What would be returned if fun 1 is called as fun 1(10) ? 4

8. (*a*) Write a function for deleting the node from a single linked list which has a value N. 5

(*b*) Write the algorithm to evaluate a postfix expression using a stack. 5