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1. Given Program 1 and array[ ] in Figure B1, answer the following questions.

```
1   //Program 1
2   using namespace std;
3   int main() {
4   cout<<"Enter The Size Of Array:   ";
5   int size;
6   cin>>size;
7   int array[size], key,i;
8   // Taking Input In Array
9   for(intj=0;j<size;j++){
10  cout<<"Enter "<<j<<" Element: ";
11  cin>>array[j];
12  }
13  //Your Entered Array Is
14  for(int a=0;a<size;a++){
15  cout<<"array[  "<<a<<"  ]    =    ";
16  cout<<array[a]<<endl;
17  }
18  cout<<"Enter Key To Search  in Array";
19  cin>>key;
20      for(i=0;i<size;i++){
21  if(key==array[i]){
22    cout<<"Key Found At Index Number :  "<<i<<endl;
23    break;
24       }
25   }
26
27  if(i != size){
28  cout<<"KEY FOUND at index :  "<<i;
29  }
30  else{
31  cout<<"KEY NOT FOUND in Array  ";
32  }
33     return 0;
33  }
34
```

3	2	4	1	5

Figure B1: array [ ]

(a) Name the searching technique in Program 1.
Sequential Search

(b) What is the complexity time and number of comparisons when searching on array[ ] if the search_key is 10?
Complexity time: O(n)
Number of comparison: 5

2. Given a search function in Program 2. Answer all the following questions based on INPUT array shown in Figure B2.

```
//Program 2
int search( int  search key, int array size, const int INPUT[] )

{   bool found = false;
    int index = -1 //-1 means record not found
      int MIDDLE, LEFT = 0,
      RIGHT = arraysize-1;

 while ((LEFT <= RIGHT ) && (!found))
 {    MIDDLE = (LEFT + RIGHT )/ 2;    // Get middle index
      if (INPUT[MIDDLE] == search key)
      {     index = MIDDLE;
            found = true;
      }
      else if (INPUT[MIDDLE] > search key)
            RIGHT = MIDDLE - 1;    // search is focused on the left
                                   // side of list
      else
            LEFT = MIDDLE + 1;      // search is focused on the right
                                  / / side of the list
 } //end while

 return index;
}//end function
```

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
5	9	19	25	34	40	45	49	66	75	88	100

Figure B2: INPUT array

Trace the value of LEFT, RIGHT, MIDDLE, INPUT[MIDDLE] and found (as in Table B1) for binary search operation performed onto INPUT array with the key numbers being search as following:

1. Search Key=40
2. Search Key=100
3. Search Key=8

Table B1

LEFT	RIGHT	MIDDLE	INPUT[MIDDLE]	found
0	11	0	5	0
0	11	5	40	1
0	11	0	5	0
0	11	5	40	0
6	11	8	66	0
9	11	10	88	0
11	11	11	100	1
0	11	0	5	0
0	11	5	40	0
0	4	2	19	0
0	1	0	5	0
1	1	1	9	0
1	0			

3. Tree

d) Give the inorder, preorder and postorder traversal of the tree in Figure 7. [6 marks]

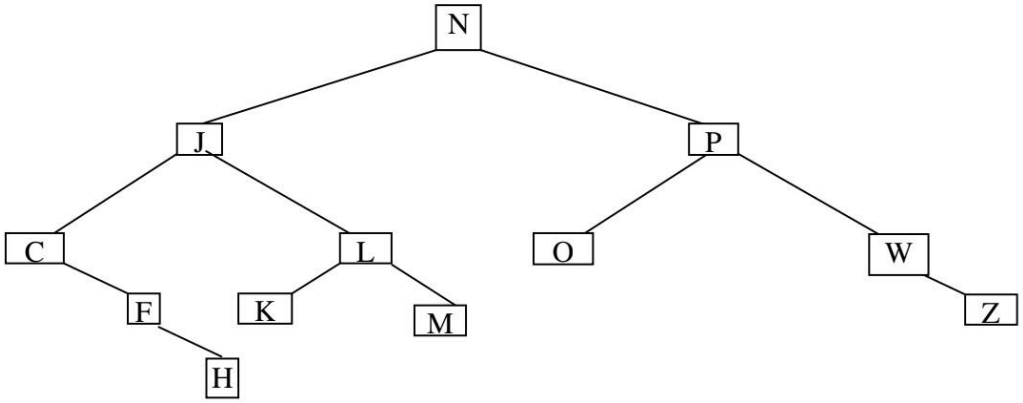


Figure 7: Binary Search Tree of char value

Inorder:C, F, H, J, K, L, M, N, O, P, W, Z

Preorder: N, J, C, F, H, L, K, M, P, O, W, Z

Postorder: H, F, C, K, M, L, J, O, Z, W, P, N

4. Tree

Given the following binary search tree in Figure 8, answer question 5 and 6.

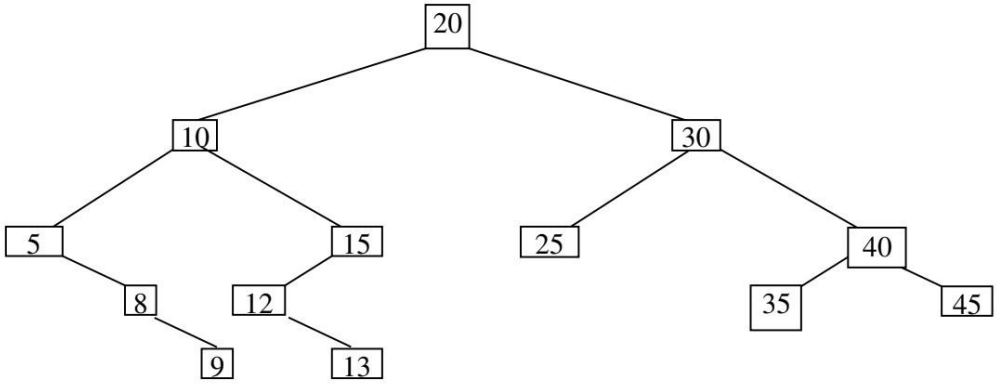


Figure 8: Binary Search Tree of int value

e) Redraw the tree in Figure 8 after nodes with values **18, 16, 19, 33 and 43** are inserted in sequence. [2 marks]

f) Redraw the tree in Figure 8 after the following nodes are deleted **in sequence**. Show the new tree after every deletion.

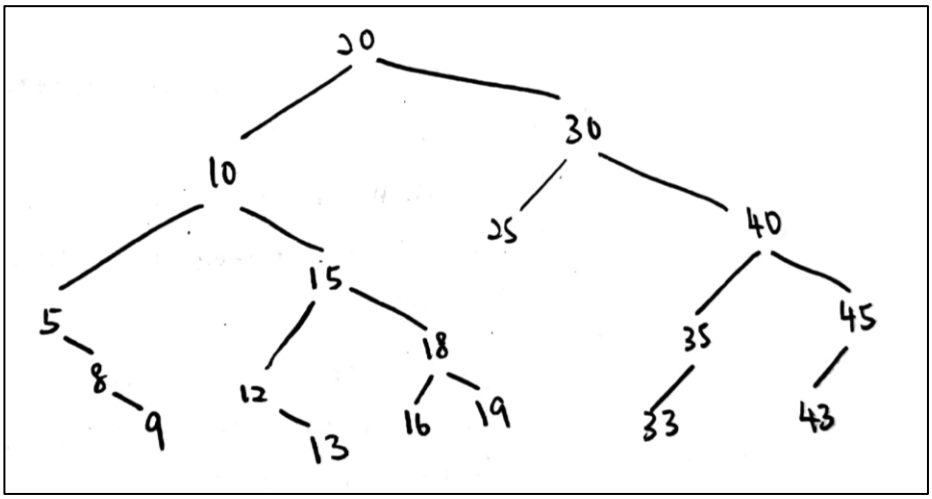
i) 25

ii) 20

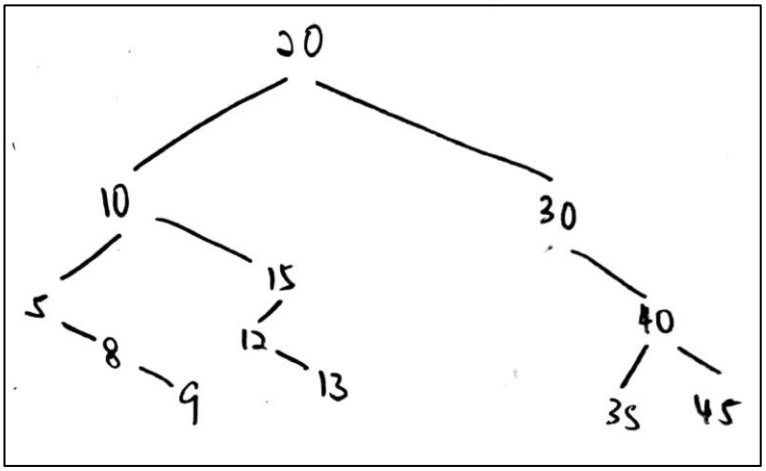
iii) 10

[4 marks]

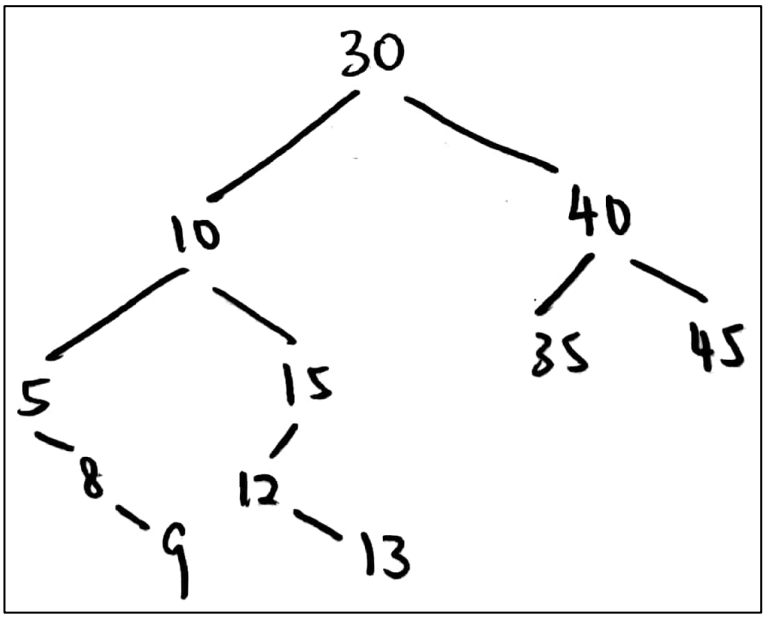
e)



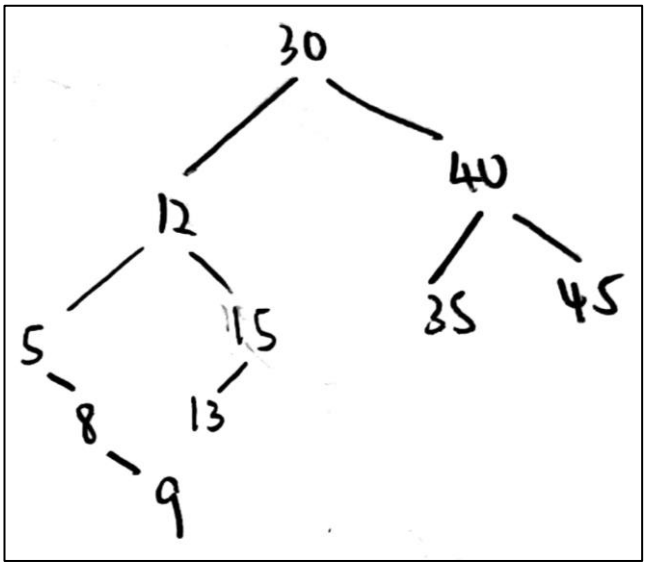
f) i)


20
10
30
5
15
40
8
12
35
45
9
13

ii)


30
10
40
5
15
35
45
8
12
9
13

iii)


30
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