Program- Threaded Binary Tree

```
#include<iostream>
#include<cstdlib>
#define MAX_VALUE 65536
using namespace std;
class N
{
   public:
   int k;
   N *l, *r;
   bool leftTh, rightTh;
};
class ThreadedBinaryTree
{
   private:
   N *root;
   public:
   ThreadedBinaryTree()
{
   root= new N();
   root->r= root->l= root;
   root->leftTh = true;
   root->k = MAX_VALUE;
 }
 void insert(int key)
 {
   N *p = root;
   for (;;)
```

```
  {
     if (p->k< key)
  {
     if (p->rightTh)
     break;
     p = p->r;
  }
     else if (p->k > key)
  {
     if (p->leftTh)
     break;
     p = p->l;
  }
     else
     {
     return;
  }
}
     N *temp = new N();
     temp->k = key;
     temp->rightTh= temp->leftTh= true;
     if (p->k < key)
  {
  temp->r = p->r;
  temp->l= p;
  p->r = temp;
   p->rightTh= false;
  }
  else
```

```
    {
       temp->r = p;
       temp->l = p->l;
       p->l = temp;
        p->leftTh = false;
    }
    }
        void displayTree()
    {
       N *temp = root, *p;
       for (;;)
    {
       p = temp;
       temp = temp->r;
       if (!p->rightTh)
     {
       while (!temp->leftTh)
        {
           temp = temp->l;
       }
    }
        if (temp == root)
        break;
       cout<<temp->k<<" ";
    }
       cout<<endl;
}
};
int main()
```

```
{
 ThreadedBinaryTree tbt;
 cout<<"ThreadedBinaryTree";
 char ch;
 int c, v;
 while(1)
 {
 cout<<"1. Insert "<<endl;
 cout<<"2. Display"<<endl;
 cout<<"3. Exit"<<endl;
 cout<<"Enter Your Choice: ";
 cin>>c;
   switch (c)
   {
      case 1 :
      cout<<"Enter integer element to insert: ";
      cin>>v;
      tbt.insert(v);
       break;
      case 2:
      cout<<"Display tree:";
      tbt.displayTree();
      break;
      case 3:
      exit(1);
       default:
      cout<<"Invalid type! ";
   }
}
```

```
 return 0;
}
```

Output:

```
ThreadedBinaryTree1. Insert
2. Display
3. Exit
Enter Your Choice: 1
Enter integer element to insert: 12
1. Insert
2. Display
3. Exit
Enter Your Choice: 1
Enter integer element to insert: 13
1. Insert
2. Display
3. Exit
Enter Your Choice: 2
Display tree:12 13
1. Insert
2. Display
3. Exit
Enter Your Choice: 2
Display tree:12 13
1. Insert
2. Display
3. Exit
Enter Your Choice: 2
Display tree:12 13
```

1. Insert

2. Display

3. Exit

Enter Your Choice: 1

Enter integer element to insert: 1

1. Insert

2. Display

3. Exit

Enter Your Choice: 1

Enter integer element to insert: 2

1. Insert

2. Display

3. Exit

Enter Your Choice: 2

Display tree:1 2 12 13

1. Insert

2. Display

3. Exit

Enter Your Choice: 3