The following program illustrates the Insertion along with searching in a Binary Search Tree.

Searching in a Binary Search Tree can be performed by the following two ways:

1. Recursive search
2. Iterative search

#include<stdio.h>

#include<stdlib.h>

struct BSTNode

{

/\*

\* this is the basic structure representing a node of the Tree

\*/

**int** key; // key stores the data part of the node.

struct BSTNode \*left,\*right,\*parent;

/\*

\* the left pointer points to the left child

\* right pointer points to the right child

\* parent points to the parent of this node.

\*/

};

struct BST

{

/\*

\* Any binary search tree can be identified alone by its root.

\*/

struct BSTNode \*root;

};

struct BSTNode\*makeNode(**int** key)

{

struct BSTNode\*newNode;

newNode=(struct BSTNode\*)malloc(sizeof(struct BSTNode));

newNode->key=key;

newNode->left=newNode->right=newNode->parent=NULL;

**return** newNode;

}

**void** inorderTraversal(struct BSTNode\*root)

{

**if**(root==NULL)

**return**;

inorderTraversal(root->left);

printf("%d ",root->key);

inorderTraversal(root->right);

}

**void** BSTInsert(struct BST\*T,struct BSTNode\*newNode)

{

struct BSTNode\*currentNode,\*previousNode;

**if**(T->root==NULL)

T->root=newNode;

**else**

{

currentNode=T->root;

**while**(currentNode!=NULL)

{

previousNode=currentNode;

**if**(currentNode->key > newNode->key)

currentNode=currentNode->left;

**else**

currentNode=currentNode->right;

}

**if**(newNode->key < previousNode->key)

previousNode->left=newNode;

**else**

previousNode->right=newNode;

newNode->parent=previousNode;

}

}

/\*

the following search functions searches and returns node with key value k

if no such node is found it returns null.

Note that the search functionality is implemented in the sub tree rooted at x.

\*/

struct BSTNode\*iterativeBSTSearch(struct BSTNode\*x,**int** k)

{

**while**(x!=NULL && x->key!=k)

**if**(x->key < k)

x=x->right;

**else**

x=x->left;

**return** x;

}

struct BSTNode\*recursiveBSTSearch(struct BSTNode\*x,**int** k)

{

**if**(x==NULL || k==x->key)

**return** x;

**else** **if**(x->key < k)

**return** recursiveBSTSearch(x->right,k);

**else**

**return** recursiveBSTSearch(x->left,k);

}

**int** main()

{

struct BSTNode\*x;

struct BST\*T;

T=(struct BST\*)malloc(sizeof(struct BST\*));

T->root=NULL;

struct BSTNode \*\*nodeArray;

nodeArray=(struct BSTNode\*\*)malloc(sizeof(struct BstNode\*)\*10);

nodeArray[0]=makeNode(500);

nodeArray[1]=makeNode(200);

nodeArray[2]=makeNode(700);

nodeArray[3]=makeNode(100);

nodeArray[4]=makeNode(300);

nodeArray[5]=makeNode(400);

nodeArray[6]=makeNode(600);

nodeArray[7]=makeNode(0);

nodeArray[8]=makeNode(900);

nodeArray[9]=makeNode(800);

BSTInsert(T,nodeArray[0]);

BSTInsert(T,nodeArray[1]);

BSTInsert(T,nodeArray[2]);

BSTInsert(T,nodeArray[3]);

BSTInsert(T,nodeArray[4]);

BSTInsert(T,nodeArray[5]);

BSTInsert(T,nodeArray[6]);

BSTInsert(T,nodeArray[7]);

BSTInsert(T,nodeArray[8]);

BSTInsert(T,nodeArray[9]);

x=recursiveBSTSearch(nodeArray[0],600);

**if**(x==NULL)

printf("No Node found with given key value\n");

**else**

printf("Node found with given key value\n");

x=iterativeBSTSearch(nodeArray[0],600);

**if**(x==NULL)

printf("No Node found with given key value\n");

**else**

printf("Node found with given key value\n");

x=recursiveBSTSearch(nodeArray[0],650);

**if**(x==NULL)

printf("No Node found with given key value\n");

**else**

printf("Node found with given key value\n");

x=iterativeBSTSearch(nodeArray[0],650);

**if**(x==NULL)

printf("No Node found with given key value\n");

**else**

printf("Node found with given key value\n");

**return** 0;

}