**NAME**: MIRUTHULA.B

**REG NO:** 231501100

**EX NO 9** IMPLEMENTATION OF BINARY SEARCH TREE

#include <stdio.h>

#include<stdlib.h>

struct tree

{

int data;

struct tree \*left;

struct tree \*right;

}\*root=NULL;

// Fucntion declarations

void insert();

void delete(struct tree \*,int);

struct tree \* inorder\_succ(struct tree \*);

void inorder(struct tree \*);

void search();

int main()

{

int ans=1,key;

struct tree \*ptr=NULL;

int choice;

do

{

printf("Enter your choice:-\n1.Insert\n2.Delete\n3.Display\n4.Search\n");

scanf("%d",&choice);

switch(choice)

{

case 1:

insert();

break;

case 2:

printf("\nEnter the value to be deleted\n");

scanf("%d",&key);

ptr=root;

delete(ptr,key);

break;

case 3:

ptr=root;

inorder(ptr);

break;

case 4:

search();

break;

}

printf("\nWant to continue?\nPress 1.YES \t 0.NO\n");

scanf("%d",&ans);

} while(ans==1);

}

void insert()

{

int Flag=0,key;

struct tree \*parent,\*ptr=root;

printf("Enter the value to be inserted\n");

scanf("%d",&key);

while(ptr!=NULL && Flag==0) // loop to reach the node where the newnode has to be inserted.

{

if(key<ptr->data)

{

parent=ptr;

ptr=ptr->left;

}

else if(key>ptr->data)

{

parent=ptr;

ptr=ptr->right;

}

else if(key==ptr->data)

{

Flag=1;

}

}

//creating newnode using malloc and setting the data and links of new node.

struct tree \*newnode=malloc(sizeof(struct tree));

newnode->left=newnode->right=NULL;

newnode->data=key;

if(parent==NULL)

{

root=newnode;

}

else

{

if(key<parent->data)

parent->left=newnode;

else

parent->right=newnode;

}

}

void inorder(struct tree \*ptr) //displaying the data as per inorder traversal

{

if(ptr!=NULL)

{

inorder(ptr->left);

printf("%d->",ptr->data);

inorder(ptr->right);

}

}

void search()//function to search the given key

{

int Flag=0,key;

struct tree \*parent,\*ptr=root;

printf("Enter the key to be searched\n");

scanf("%d",&key);

while(ptr!=NULL && Flag==0)

{

if(key<ptr->data)

{

parent=ptr;

ptr=ptr->left;

}

else if(key>ptr->data)

{

parent=ptr;

ptr=ptr->right;

}

else if(key==ptr->data)

{

Flag=1;

printf("%d found",ptr->data );

}

}

if(Flag==0)

printf("Required Key not found");

}

void delete(struct tree \*ptr,int key)// function to delete the given key.

{

struct tree \*parent=NULL;

int Flag=0;

while(ptr!=NULL && Flag==0)// loop to reach the node to be deleted.

{

if(key<ptr->data)

{

parent=ptr;

ptr=ptr->left;

}

else if(key>ptr->data)

{

parent=ptr;

ptr=ptr->right;

}

else if(key==ptr->data)

{

Flag=1;

}

}

if(Flag==0)

printf("Required Key does not exist");

else

{

if(ptr->left==NULL && ptr->right==NULL ) //if the node to be deleted in the leaf node.

{

if(parent==NULL)//condition for if node to be deleted is the root node.

{

root=NULL; //root will become NULL

}

else if (key<parent->data)

parent->left =NULL;

else

parent->right=NULL;

free(ptr);

}

else if(ptr->left==NULL || ptr->right==NULL )//if the node to e deleted has one child.

{

if(parent==NULL)//if the node to be deleted is the root node.

{

if(ptr->right==NULL)

root=ptr->left; //root will change to ptr->left

else

root=ptr->right;//root will change to ptr->right

}

else if(key<parent->data)

{

if (ptr->left!=NULL)

parent->left=ptr->left;

else

parent->left=ptr->right;

}

else if(key>parent->data)

{

if (ptr->left!=NULL)

parent->right=ptr->left;

else

parent->right=ptr->right;

}

}

else if(ptr->left!=NULL && ptr->right!=NULL )//if the node to be deleted has two children.

{

struct tree\*new\_ptr;

new\_ptr=inorder\_succ(ptr->right);//inorder\_succ() function to find the inorder successor of

the node to be deleted.

int save=new\_ptr->data; //new\_ptr is the inorder\_successor.new\_ptr->data is preserved in

variable save.

delete(ptr,new\_ptr->data);//call the delete function to delete the inorder successor

ptr->data=save;// replace the data of ptr(node to bbe deleted) by data of inorder

successor(save).

}

}

//return root;//return root

}

struct tree \* inorder\_succ(struct tree \*pt)//function to find inorder successor of the given node

{

while(pt->left!=NULL)

{

pt=pt->left;

}

return pt;

}

OUTPUT:

