**WEEK 10**

**AVL**

#include <stdio.h>

#include <stdlib.h>

struct Node

{

int key;

struct Node \*left;

struct Node \*right;

int height;

};

typedef struct Node node;

int height(node \*n)

{

if (n==NULL)

return 0;

return n->height;

}

node \*findmin(node \*tree)

{ if(tree==NULL)

return NULL;

else if(tree->left==NULL)

return tree;

else

return findmin(tree->left);

}

int max(int a,int b)

{ return (a>b)?a:b;

}

node \*rightrotate(node \*y)

{ node \*x=y->left;

node \*t2=x->right;

x->right=y;

y->left=t2;

y->height=1+max(height(y->left),height(y->right));

x->height=1+max(height(x->left),height(x->right));

return x;

}

node \*leftrotate(node \*x)

{ node \*y=x->right;

node \*t2=y->left;

y->left=x;

x->right=t2;

x->height=1+max(height(x->left),height(x->right));

y->height=1+max(height(y->left),height(y->right));

return y;

}

int getbalance(struct Node \*n)

{

if (n == NULL)

return 0;

return height(n->left) - height(n->right);

}

node \*insert(node \*tree,int k)

{ if(tree==NULL)

{ node \*newnode=malloc(sizeof(node));

newnode->key=k;

newnode->left=NULL;

newnode->right=NULL;

newnode->height=1;

tree=newnode;

}

else if(k<tree->key)

tree->left=insert(tree->left,k);

else if(k>tree->key)

tree->right=insert(tree->right,k);

//else

//return tree;

tree->height=1+max(height(tree->left),height(tree->right));

int bal=getbalance(tree);

if(bal>1 && k<tree->left->key)

return rightrotate(tree);

if(bal<-1 && k>tree->right->key)

return leftrotate(tree);

if(bal>1 && k>tree->left->key)

{ tree->left=leftrotate(tree->left);

return rightrotate(tree); }

if(bal<-1 && k<tree->right->key)

{ tree->right=rightrotate(tree->right);

return leftrotate(tree); }

return tree;

}

node \*delete(node \*tree,int e)

{ node \*temp=malloc(sizeof(node));

if(e<tree->key)

tree->left=delete(tree->left,e);

else if(e>tree->key)

tree->right=delete(tree->right,e);

else if(tree->left && tree->right)

{ temp=findmin(tree->right);

tree->key=temp->key;

tree->right=delete(tree->right,temp->key);

}

else

{ temp=tree;

if(tree->left==NULL)

tree=tree->right;

else if(tree->right==NULL)

tree=tree->left;

free(temp);

}

if (tree == NULL)

return tree;

tree->height = 1 + max(height(tree->left),

height(tree->right));

int balance = getbalance(tree);

if (balance > 1 &&

getbalance(tree->left) >= 0)

return rightrotate(tree);

// Left Right Case

if (balance > 1 &&

getbalance(tree->left) < 0)

{

tree->left = leftrotate(tree->left);

return rightrotate(tree);

}

// Right Right Case

if (balance < -1 &&

getbalance(tree->right) <= 0)

return leftrotate(tree);

// Right Left Case

if (balance < -1 &&

getbalance(tree->right) > 0)

{

tree->right = rightrotate(tree->right);

return leftrotate(tree);

}

return tree;

}

void inorder(node \*tree)

{ if(tree!=NULL)

{ //printf("%d ",tree->key);

inorder(tree->left);

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

inorder(tree->right);}

}

int main()

{

node \*tree=NULL;

int n;

printf("ENTER TOT NO OF ELEMENTS");

scanf("%d",&n);

int e;

printf("ENETR ELEMENTS");

for(int i=0;i<n;i++)

{ scanf("%d",&e);

tree=insert(tree,e);}

//inorder(tree);

printf("ENETR ELE TO BE DELETED");

scanf("%d",&e);

tree = delete(tree,e);

inorder(tree);

return 0;

}