//LE MINH HUU - KTMT K19A - 7/4/2022 - fix OK

/\*

DE BAI:

        Cho 1 c�y NPTK ch?a c�c s? nguy�n.

        Y�uc?u:

        �Bi?u di?n c�y b?i con tr?.

        �Nh?p d? li?u cho c�y.

        �Hi?n th? d? li?u tr�n c�y: theo th? t? tru?c, gi?a, sau.

        �T�m ki?m 1 d?nh c� kh�a x tr�n c�y

        �Th�m m?t kh�a x v�o c�y sao cho sau khi th�m c�y v?n l� c�y NPTK.

        �X�a d?nh c� kh�a x ra kh?i c�y cho sau khi x�a c�y v?n l� c�y NPTK.

\*/

#include <stdio.h>

#include <stdlib.h>

#include <conio.h>

typedef int TData;

//cau truc cua node

struct TNode{

    TData Data;

    TNode\* Left;

    TNode\* Right;

};

//cau truc cay

typedef TNode \*TTree;

//khoi tao cay rong

void MakeNullTree(TTree \*T){

    (\*T) = NULL;

}

//xac dinh con trai

TTree LeftChild(TTree n){

    if (n != NULL)

        return n->Left;

    else

        return NULL;

}

//xac dinh con phai

TTree RightChild(TTree n){

    if(n != NULL)

        return n->Right;

    else

        return NULL;

}

//duyet tien to

void PreOrder(TTree T){

    printf("%d  ", T->Data);

    if(LeftChild(T)!=NULL)

        PreOrder(LeftChild(T));

    if(RightChild(T)!=NULL)

        PreOrder(RightChild(T));

}

//duyet trung to

void InOrder(TTree T){

    if(LeftChild(T)!=NULL)

        InOrder(LeftChild(T));

    printf("%d  ", T->Data);

    if(RightChild(T)!=NULL)

        InOrder(RightChild(T));

}

//duyet hau to

void PosOrder(TTree T){

    if(LeftChild(T)!=NULL)

        PosOrder(LeftChild(T));

    if(RightChild(T)!=NULL)

        PosOrder(RightChild(T));

    printf("%d  ", T->Data);

}

//thu tuc them 1 khoa vao cay tim kiem nhi phan

void InsertNode(TTree \*Root, TData x){

    if(\*Root == NULL){//them nut moi chua khoa x

        (\*Root) = (TNode\*)malloc(sizeof(TNode));

        (\*Root)->Data = x;

        (\*Root)->Left = NULL;

        (\*Root)->Right = NULL;

    }

    //DE Y DOAN NAY NHA -  LE MINH HUU

    else if(x < (\*Root)->Data)

        InsertNode(&(\*Root)->Left, x);

    else if(x > (\*Root)->Data)

        InsertNode(&(\*Root)->Right, x);

}

//nhap cac node vao cay

void Tree(TTree\*k){

    int x;

    printf("nhap vao cac phan tu trong cay nhi phan tim kiem.\n");

    printf("nhap so 0 thi ket thuc: ");

    do{

        scanf("%d", &x);

        if(x != 0)

            InsertNode(&\*k,x);

    }while(x !=0);

}

//ham tim kiem nhi phan neu tim thay tra ve 1 nguoc lai 0

int Search(TTree Root, TData x){

    if (Root == NULL)

        return 0;

    else if(Root->Data ==x)

        return 1;

    else if(Root->Data <x)

        return Search(Root->Right,x);

    else

        return Search(Root->Left,x);

}

//xoa mot node x trong cay

int delKey(TTree &T, TData x)     // xoa nut co key x

{

    if (T==NULL) return 0;

    else if (T->Data > x) return delKey(T->Left, x);

    else if (T->Data < x) return delKey(T->Right, x);

    else // T->key == x

    {

        if (T->Left == NULL) T = T->Right;    // Node chi co cay con phai

        else if (T->Right == NULL) Ta = T->Left;   // Node chi co cay con trai

        else // Node co ca 2 con

        {

            TNode \*Q = T->Left;

            while (Q->Right != NULL)

            {

                Q = Q->Right;

            }

            T->Data = Q->Data;

            delKey(T->Left, Q->Data);

        }

    }

    return 1;

}

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int main(){

    TTree T;

    int n,x,a;

    MakeNullTree(&T);

    Tree(&T);

    printf("\ngia tri cua cay truoc khi duye NLR, \n");

    PreOrder(T);

    printf("\ngia tri cua cay truoc khi duye LNR, \n");

    InOrder(T);

    printf("\ngia tri cua cay truoc khi duye LRN, \n");

    PosOrder(T);

    printf("\nban muon tim phan tu gi trong cay? ");

    scanf("%d", &n);

    if(Search(T,n) == 0)

        printf("\nPhan tu %d khong co trong cay tim kiem.\n", n);

    else

        printf("\nPhan tu %d co trong cay nhi phan tim kiem.\n");

    printf("\nnhap gia tri can them: ");

    scanf("%d", &x);

    InsertNode(&T,x);

    printf("\ngia tri cua cay khi duyet LNR lai.\n");

    InOrder(T);

    printf("\nnhap gia tri can xoa: ");

    scanf("%d", &a);

    if (delKey(T, a))

         printf("Xoa thanh cong\n");

    InOrder(T);

    getch();

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    return 0;

}