S.No: 23	Exp. Name: *Program to insert into BST and traversal using In-order, Pre-order and Post-order*	Date:2023-06-18

Aim:

Write a program to create a binary search tree of integers and perform the following operations using linked list.

    1. Insert a node
    2. In-order traversal
    3. Pre-order traversal
    4. Post-order traversal

Source Code:

BinarySearchTree.c

```c
#include<stdio.h>
#include<stdlib.h>
struct node
{
    int data;
    struct node *left,*right;
};
typedef struct node *BSTNODE;
BSTNODE newnodelnBST(int item)
{
    BSTNODE temp=(BSTNODE)malloc(sizeof(struct node));
    temp->data=item;
    temp->left=temp->right=NULL;
    return temp;
}
void inorderlnBST(BSTNODE root)
{
    if(root!=NULL)
    {
        inorderlnBST(root->left);
        printf("%d ",root->data);
        inorderlnBST(root->right);
    }
}
void preorderlnBST(BSTNODE root)
{
    if(root!=NULL)
    {
        printf("%d ",root->data);
        preorderlnBST(root->left);
        preorderlnBST(root->right);
    }
}
void postorderlnBST(BSTNODE root)
{
    if(root!=NULL)
    {
        postorderlnBST(root->left);
        postorderlnBST(root->right);
        printf("%d ",root->data);
```

```c
    }
}
BSTNODE insertNodelnBST(BSTNODE node,int ele)
{
    if(node==NULL)
    {
        printf("Successfully inserted.\n");
        return newnodelnBST(ele);
    }
    if(ele<node->data)
    node->left=insertNodelnBST(node->left,ele);
    else if(ele>node->data)
    node->right=insertNodelnBST(node->right,ele);
    else
    printf("Element already exists in BST.\n");
    return node;
}
void main()
{
    int x,op;
    BSTNODE root=NULL;
    while(1)
    {
        printf("1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal
5.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
            case 1:
            printf("Enter an element to be inserted : ");
            scanf("%d",&x);
            root=insertNodelnBST(root,x);
            break;
            case 2:
            if(root==NULL)
            {
                printf("Binary Search Tree is empty.\n");
            }
            else
            {
                printf("Elements of the BST (in-order traversal): ");
                inorderlnBST(root);
                printf("\n");
            }
            break;
            case 3:
            if(root==NULL)
            {
                printf("Binary Search Tree is empty.\n");
            }
            else
            {
                printf("Elements of the BST (pre-order traversal): ");
                preorderlnBST(root);
                printf("\n");
```

```
        }
        break;
        case 4:
        if(root==NULL)
        {
            printf("Binary Search Tree is empty.\n");
        }
        else
        {
            printf("Elements of the BST (post-order traversal): ");
            postorderlnBST(root);
            printf("\n");
        }
        break;
        case 5:
        exit(0);
        }
    }
}
```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 100
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 20
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 200
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 10
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 30
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 150
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 300
Successfully inserted. 2

1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 2
Enter your option : 2
Elements of the BST (in-order traversal): 10 20 30 100 150 200 300 3
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 3
Enter your option : 3
Elements of the BST (pre-order traversal): 100 20 10 30 200 150 300 4
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 4
Enter your option : 4
Elements of the BST (post-order traversal): 10 30 20 150 300 200 100 5
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 5
Enter your option : 5

Test Case - 2
User Output
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 25
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 63
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 89
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 45
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 65
Successfully inserted. 1
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 1
Enter your option : 1
Enter an element to be inserted : 28
Successfully inserted. 4
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 4
Enter your option : 4
Elements of the BST (post-order traversal): 28 45 65 89 63 25 3
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 3
Enter your option : 3
Elements of the BST (pre-order traversal): 25 63 45 28 89 65 2
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 2
Enter your option : 2
Elements of the BST (in-order traversal): 25 28 45 63 65 89 5
1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 5
Enter your option : 5