S.No: 22	Exp. Name: ***Program to insert into BST and traversal using In-order, Pre-order and Post-order***	Date:2023-05-18

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

```
#include<stdio.h>
#include<stdlib.h>
#include "InsertAndTraversals.c"

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 = insertNodeInBST(root,x);
               break;
         case 2:
               if(root == NULL) {
                  printf("Binary Search Tree is empty.\n");
               }
               else {
                  printf("Elements of the BST (in-order traversal): ");
                  inorderInBST(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): ");
                  preorderInBST(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): ");
                   postorderInBST(root);
                   printf("\n");
                   }
                break;
          case 5:
                exit(0);
      }
   }
}
```

InsertAndTraversals.c

```
struct node {
   int data;
   struct node *left, *right;
};

typedef struct node *BSTNODE;

BSTNODE newNodeInBST(int item) {
   BSTNODE temp =  (BSTNODE)malloc(sizeof(struct node));
   temp->data = item;
   temp->left = temp->right = NULL;
   return temp;
}

void inorderInBST(BSTNODE root) {
   if(root!=NULL)
   {
      inorderInBST(root->left);
      printf("%d ",root->data);
      inorderInBST(root->right);
   }
}

void preorderInBST(BSTNODE root) {
    if(root!=NULL)
    {
      printf("%d ",root->data);
      preorderInBST(root->left);
      preorderInBST(root->right);
    }
}

void postorderInBST(BSTNODE root) {
    if(root!=NULL)
    {
      postorderInBST(root->left);
      postorderInBST(root->right);
      printf("%d ",root->data);
    }
}
```

```
BSTNODE insertNodeInBST(BSTNODE node, int ele) {
    if(node==NULL)
    {
      printf("Successfully inserted.\n");
      return newNodeInBST(ele);
    }
    else if(ele<node->data)
    {
      node->left=insertNodeInBST(node->left,ele);
    }
    else if(ele>node->data)
    {
      node->right=insertNodeInBST(node->right,ele);
    }
    else
    {
      printf("Element already exits in BST\n");
    }
    return node;
}
```

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 : 54
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. 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 : 62
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): 28 54 62 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): 54 28 62 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 62 54 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 :  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
```