Date:2023-07-08

2022-2026-CSE-A

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

and Post-order

- 3. Pre-order traversal
- 4. Post-order traversal

Source Code:

BinarySearchTree.c

```
#include<stdio.h>
#include<stdlib.h>
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);
   }
   if (ele < node->data)
   node->left = insertNodeInBST(node->left,ele);
   else if (ele > node->data)
   node->right = insertNodeInBST(node->right,ele);
   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 = 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);
      }
   }
}
```

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:
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 an element to be inserted: 25 Successfully inserted. 1 1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 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 an element to be inserted: 63 Successfully inserted. 1 1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 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 an element to be inserted: 45 Successfully inserted. 1 1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 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 an element to be inserted: 28 Successfully inserted. 4 1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 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 not be inserted: 4 1.Insert 2.Inorder Traversal 3.Preorder Traversal 4.Postorder Traversal 5.Exit 3 Enter your option: 3 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 (post-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	1631 0436 2
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