Rajalakshmi Engineering College

Name: Navaneetha Krishnan
Email: 241901067@rajalakshmi.edu.in
Roll no: 241901067
Phone: 8939010233
Branch: REC
Department: I CSE (CS) FB
Batch: 2028
Degree: B.E - CSE (CS)

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 5_CY_Updated

Attempt : 1
Total Mark : 30
Marks Obtained : 30

Section 1 : Coding

1. Problem Statement

Kishore is studying data structures, and he is currently working on implementing a binary search tree (BST) and exploring its basic operations. He wants to practice creating a BST, inserting elements into it, and performing a specific operation, which is deleting the minimum element from the tree.

Write a program to help him perform the delete operation.

Input Format

The first line of input consists of an integer N, representing the number of elements Kishore wants to insert into the BST.

The second line consists of N space-separated integers, where each integer represents an element to be inserted into the BST.

Output Format

The output prints the remaining elements of the BST in ascending order (in-order traversal) after deleting the minimum element.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 6
5 3 8 2 4 6
Output: 3 4 5 6 8

Answer

```
// You are using GCC
#include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node *left;
    struct Node *right;
};

struct Node* createNode(int data) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = data;
    newNode->left = NULL;
    newNode->right = NULL;
    return newNode;
}

struct Node* insert(struct Node* root, int data) {
    if (root == NULL) {
        return createNode(data);
    }
    if (data < root->data) {
        root->left = insert(root->left, data);
```

```
    } else if (data > root->data) {
        root->right = insert(root->right, data);
    }
    return root;
}

struct Node* minValueNode(struct Node* node) {
    struct Node* current = node;
    while (current && current->left != NULL) {
        current = current->left;
    }
    return current;
}

struct Node* deleteNode(struct Node* root, int data) {
    if (root == NULL) {
        return root;
    }
    if (data < root->data) {
        root->left = deleteNode(root->left, data);
    } else if (data > root->data) {
        root->right = deleteNode(root->right, data);
    } else {
        if (root->left == NULL) {
            struct Node* temp = root->right;
            free(root);
            return temp;
        } else if (root->right == NULL) {
            struct Node* temp = root->left;
            free(root);
            return temp;
        }
        struct Node* temp = minValueNode(root->right);
        root->data = temp->data;
        root->right = deleteNode(root->right, temp->data);
    }
    return root;
}

void inOrder(struct Node* root) {
    if (root != NULL) {
        inOrder(root->left);
```

```
        printf("%d ", root->data);
        inOrder(root->right);
    }
}

int main() {
    int n, key;
    struct Node* root = NULL;
    scanf("%d", &n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &key);
        root = insert(root, key);
    }
    if (root != NULL) {
        struct Node* minNode = minValueNode(root);
        root = deleteNode(root, minNode->data);
    }
    inOrder(root);
    printf("\n");
    return 0;
}
```

Status : Correct ***Marks : 10/10***

2. Problem Statement

Arun is working on a Binary Search Tree (BST) data structure. His goal is to implement a program that reads a series of integers and inserts them into a BST. Once the integers are inserted, he needs to add a given integer value to each node in the tree and find the maximum value in the BST.

Your task is to help Arun implement this program.

Input Format

The first line of input consists of an integer N, representing the number of elements to be inserted into the BST.

The second line consists of N space-separated integers, each representing an element to be inserted into the BST.

The third line consists of an integer add, representing the value to be added to each node in the BST.

Output Format

The output prints the maximum value in the BST after adding the add value.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 5
10 5 15 20 25
5
Output: 30

Answer

```
// You are using GCC
  #include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node* left;
    struct Node* right;
};

struct Node* createNode(int value) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = value;
    newNode->left = newNode->right = NULL;
    return newNode;
}

struct Node* insert(struct Node* root, int value) {
    if (root == NULL)
        return createNode(value);
    if (value < root->data)
        root->left = insert(root->left, value);
    else
        root->right = insert(root->right, value);
```

```
    return root;
}

void addToEachNode(struct Node* root, int add) {
    if (root == NULL)
        return;
    root->data += add;
    addToEachNode(root->left, add);
    addToEachNode(root->right, add);
}

int findMax(struct Node* root) {
    while (root->right != NULL)
        root = root->right;
    return root->data;
}

int main() {
    int N, add;
    scanf("%d", &N);
    struct Node* root = NULL;
    for (int i = 0; i < N; i++) {
        int value;
        scanf("%d", &value);
        root = insert(root, value);
    }
    scanf("%d", &add);
    addToEachNode(root, add);
    int maxValue = findMax(root);
    printf("%d\n", maxValue);
    return 0;
}
```

Status : Correct **Marks : 10/10**

3. Problem Statement

John is building a system to store and manage integers using a binary search tree (BST). He needs to add a feature that allows users to search for a specific integer key in the BST using recursion.

Implement functions to create the BST and perform a recursive search for an integer.

Input Format

The first line of input consists of an integer representing, the number of nodes.

The second line consists of integers representing, the values of nodes, separated by space.

The third line consists of an integer representing, the key to be searched.

Output Format

The output prints whether the given key is present in the binary search tree or not.

Refer to the sample output for the exact format.

Sample Test Case

Input: 7
10 5 15 3 7 12 20
12
Output: The key 12 is found in the binary search tree

Answer

```
// You are using GCC
#include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node* left;
    struct Node* right;
};

struct Node* createNode(int value) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = value;
```

```
    newNode->left = newNode->right = NULL;
    return newNode;
}

struct Node* insert(struct Node* root, int value) {
    if (root == NULL)
        return createNode(value);
    if (value < root->data)
        root->left = insert(root->left, value);
    else
        root->right = insert(root->right, value);
    return root;
}

int search(struct Node* root, int key) {
    if (root == NULL)
        return 0;
    if (root->data == key)
        return 1;
    if (key < root->data)
        return search(root->left, key);
    return search(root->right, key);
}

int main() {
    int n, key;
    scanf("%d", &n);
    struct Node* root = NULL;
    for (int i = 0; i < n; i++) {
        int value;
        scanf("%d", &value);
        root = insert(root, value);
    }
    scanf("%d", &key);
    if (search(root, key))
        printf("The key %d is found in the binary search tree\n", key);
    else
        printf("The key %d is not found in the binary search tree\n", key);
    return 0;
}
```

Status : Correct **Marks : 10/10**