

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_MCQ

Attempt : 1  
Total Mark : 15  
Marks Obtained : 13

#### Section 1 : MCQ

1. Find the in-order traversal of the given binary search tree.

**Answer**

1, 2, 4, 13, 14, 18

**Status : Correct**

**Marks : 1/1**

2. While inserting the elements 71, 65, 84, 69, 67, 83 in an empty binary search tree (BST) in the sequence shown, the element in the lowest level is \_\_\_\_\_.

**Answer**

67

**Status :** Correct

**Marks :** 1/1

3. Find the postorder traversal of the given binary search tree.

**Answer**

1, 4, 2, 18, 14, 13

**Status :** Correct

**Marks :** 1/1

4. Which of the following operations can be used to traverse a Binary Search Tree (BST) in ascending order?

**Answer**

Inorder traversal

**Status :** Correct

**Marks :** 1/1

5. The preorder traversal of a binary search tree is 15, 10, 12, 11, 20, 18, 16, 19. Which one of the following is the postorder traversal of the tree?

**Answer**

19, 16, 18, 20, 11, 12, 10, 15

**Status :** Wrong

**Marks :** 0/1

6. Which of the following is the correct post-order traversal of a binary search tree with nodes: 50, 30, 20, 55, 32, 52, 57?

**Answer**

20, 32, 30, 52, 57, 55, 50

**Status :** Correct

**Marks :** 1/1

7. Find the pre-order traversal of the given binary search tree.

**Answer**

13, 2, 1, 4, 14, 18

**Status :** Correct

**Marks :** 1/1

8. While inserting the elements 5, 4, 2, 8, 7, 10, 12 in a binary search tree, the element at the lowest level is \_\_\_\_\_.

**Answer**

12

**Status :** Correct

**Marks :** 1/1

9. Find the post-order traversal of the given binary search tree.

**Answer**

10, 17, 20, 18, 15, 32, 21

**Status :** Correct

**Marks :** 1/1

10. Which of the following is the correct pre-order traversal of a binary search tree with nodes: 50, 30, 20, 55, 32, 52, 57?

**Answer**

50, 30, 20, 32, 55, 52, 57

**Status :** Correct

**Marks :** 1/1

11. Find the preorder traversal of the given binary search tree.

**Answer**

9, 2, 1, 6, 4, 7, 10, 14

**Status :** Correct

**Marks :** 1/1

12. Which of the following is the correct in-order traversal of a binary search tree with nodes: 9, 3, 5, 11, 8, 4, 2?

**Answer**

2, 4, 8, 5, 3, 11, 9

**Status :** Wrong

**Marks :** 0/1

13. How many distinct binary search trees can be created out of 4 distinct keys?

**Answer**

14

**Status :** Correct

**Marks :** 1/1

14. In a binary search tree with nodes 18, 28, 12, 11, 16, 14, 17, what is the value of the left child of the node 16?

**Answer**

14

**Status :** Correct

**Marks :** 1/1

15. Which of the following is a valid preorder traversal of the binary search tree with nodes: 18, 28, 12, 11, 16, 14, 17?

**Answer**

18, 12, 11, 16, 14, 17, 28

**Status :** Correct

**Marks :** 1/1

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_COD\_Question 1

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

John is learning about Binary Search Trees (BST) in his computer science class. He wants to create a program that allows users to delete a node with a given value from a BST and print the remaining nodes using an in-order traversal.

Implement a function to help him delete a node with a given value from a BST.

##### ***Input Format***

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

The second line consists of N space-separated integers, representing the values of the BST nodes.

The third line consists of an integer V, which is the value to delete from the BST.

### **Output Format**

The output prints the space-separated values in the BST in an in-order traversal, after the deletion of the specified value.

If the specified value is not available in the tree, print the given input values in-order traversal.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 5  
10 5 15 2 7  
15

Output: 2 5 7 10

### **Answer**

```
#include <stdio.h>
#include <stdlib.h>
```

```
struct TreeNode {
    int data;
    struct TreeNode* left;
    struct TreeNode* right;
};
```

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

```
// You are using GCC
```

```
struct TreeNode* insert(struct TreeNode* root, int key) {
    //Type your code here
```

```

if(root == NULL){
    return createNode(key);
}
if(key < root->data){
    root->left = insert(root->left,key);
}
else if(key > root->data){
    root->right = insert(root->right,key);
}
return root;
}

```

```

struct TreeNode* findMin(struct TreeNode* root) {
    //Type your code here
    while(root->left != NULL){
        root = root->left;
    }
    return root;
}

```

```

struct TreeNode* deleteNode(struct TreeNode* root, int key) {
    //Type your code here
    if(root == NULL){
        return root;
    }
    if(key < root->data){
        root->left = deleteNode(root->left,key);
    }
    else if(key > root->data){
        root->right = deleteNode(root->right,key);
    }
    else{
        if(root->left == NULL){
            struct TreeNode *temp = root->right;
            free(root);
            return temp;
        }
        else if(root->right == NULL){
            struct TreeNode *temp = root->left;
            free(root);
            return temp;
        }
    }
}

```

```

    }
    struct TreeNode *temp = findMin(root->right);
    root->data = temp->data;
    root->right = deleteNode(root->right,temp->data);
}
return root;
}

```

```

void inorderTraversal(struct TreeNode* root) {
    //Type your code here
    if(root == NULL){
        return;
    }
    inorderTraversal(root->left);
    printf("%d ",root->data);
    inorderTraversal(root->right);
}

```

```

int main()
{
    int N, rootValue, V;
    scanf("%d", &N);
    struct TreeNode* root = NULL;
    for (int i = 0; i < N; i++) {
        int key;
        scanf("%d", &key);
        if (i == 0) rootValue = key;
        root = insert(root, key);
    }
    scanf("%d", &V);
    root = deleteNode(root, V);
    inorderTraversal(root);
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10



# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_COD\_Question 2

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

Mike is learning about Binary Search Trees (BSTs) and wants to implement various operations on them. He wants to write a basic program for creating a BST, inserting nodes, and printing the tree in the pre-order traversal.

Write a program to help him solve this program.

##### ***Input Format***

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

The second line consists of N space-separated integers, representing the values to insert into the BST.

##### ***Output Format***

The output prints the space-separated values of the BST in the pre-order traversal.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 5

3 1 5 2 4

Output: 3 1 2 5 4

### **Answer**

```
#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;
}
```

// You are using GCC

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

```
        return root;
    }

    void printPreorder(struct Node* node) {
        //Type your code here
        if(node !=NULL){
            printf("%d ",node->data);
            printPreorder(node->left);
            printPreorder(node->right);
        }
    }

    int main() {
        struct Node* root = NULL;

        int n;
        scanf("%d", &n);

        for (int i = 0; i < n; i++) {
            int value;
            scanf("%d", &value);
            root = insert(root, value);
        }

        printPreorder(root);
        return 0;
    }
```

**Status :** Correct

**Marks : 10/10**

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_COD\_Question 3

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

You are required to implement basic operations on a Binary Search Tree (BST), like insertion and searching.

Insertion: Given a list of integers, construct a Binary Search Tree by repeatedly inserting each integer into the tree according to the rules of a BST.

Searching: Given an integer, search for its presence in the constructed Binary Search Tree. Print whether the integer is found or not.

Write a program to calculate this efficiently.

##### ***Input Format***

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

in the binary search tree.

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

The third line consists of an integer representing, the value that is to be searched.

### **Output Format**

The output prints, "Value <value> is found in the tree." if the given value is present, otherwise it prints: "Value <value> is not found in the tree."

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 7

8 3 10 1 6 14 23

6

Output: Value 6 is found in the tree.

### **Answer**

// You are using GCC

```
struct Node* insertNode(struct Node* root, int value) {
```

```
    //Type your code here
```

```
    if(root == NULL){  
        return createNode(value);  
    }
```

```
    if(value < root->data){  
        root->left = insertNode(root->left,value);  
    }
```

```
    else if(value > root->data){  
        root->right = insertNode(root->right,value);  
    }
```

```
    return root;  
}
```

```
struct Node* searchNode(struct Node* root, int value) {  
    //Type your code here
```

```
    if(root == NULL || root->data == value){  
        return root;  
    }
```

```
}  
if(value < root->data){  
    return searchNode(root->left,value);  
}  
return searchNode(root->right,value);  
}
```

**Status :** Correct

**Marks :** 10/10

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_COD\_Question 4

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

John, a computer science student, is learning about binary search trees (BST) and their properties. He decides to write a program to create a BST, display it in post-order traversal, and find the minimum value present in the tree.

Help him by implementing the program.

##### ***Input Format***

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

The second line consists of N space-separated integers data, which is the data to be inserted into the BST.

### **Output Format**

The first line of output prints the space-separated elements of the BST in post-order traversal.

The second line prints the minimum value found in the BST.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 3

5 10 15

Output: 15 10 5

The minimum value in the BST is: 5

### **Answer**

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

```
// You are using GCC
```

```
struct Node* insert(struct Node* root, int data) {  
    //Type your code here  
    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;
}

```

```

void displayTreePostOrder(struct Node* root) {
    //Type your code here
    if(root != NULL){
        displayTreePostOrder(root->left);
        displayTreePostOrder(root->right);
        printf("%d ",root->data);
    }
}

```

```

int findMinValue(struct Node* root) {
    //Type your code here
    while(root->left != NULL){
        root = root->left;
    }
    return root->data;
}

```

```

int main() {
    struct Node* root = NULL;
    int n, data;
    scanf("%d", &n);

    for (int i = 0; i < n; i++) {
        scanf("%d", &data);
        root = insert(root, data);
    }

```

```

    displayTreePostOrder(root);
    printf("\n");

```

```

    int minValue = findMinValue(root);
    printf("The minimum value in the BST is: %d", minValue);

    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_COD\_Question 5

Attempt : 1  
Total Mark : 10  
Marks Obtained : 10

#### Section 1 : Coding

##### 1. Problem Statement

In his computer science class, John is learning about Binary Search Trees (BST). He wants to build a BST and find the maximum value in the tree.

Help him by writing a program to insert nodes into a BST and find the maximum value in the tree.

##### ***Input Format***

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

The second line consists of N space-separated integers, representing the values of the nodes to insert into the BST.

##### ***Output Format***

The output prints the maximum value in the BST.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 5

10 5 15 2 7

Output: 15

### **Answer**

```
#include <stdio.h>
#include <stdlib.h>

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

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

// You are using GCC
struct TreeNode* insert(struct TreeNode* root, int key) {
    //Type your code here
    if(root == NULL){
        return createNode(key);
    }
    if(key < root->data){
        root->left = insert(root->left,key);
    }
    else if(key > root->data){
        root->right = insert(root->right,key);
    }
    return root;
}
```

```
}
```

```
int findMax(struct TreeNode* root) {  
    //Type your code here  
    while(root->right != NULL){  
        root = root->right;  
    }  
    return root->data;  
}
```

```
int main() {  
    int N, rootValue;  
    scanf("%d", &N);  
  
    struct TreeNode* root = NULL;  
  
    for (int i = 0; i < N; i++) {  
        int key;  
        scanf("%d", &key);  
        if (i == 0) rootValue = key;  
        root = insert(root, key);  
    }  
  
    int maxVal = findMax(root);  
    if (maxVal != -1) {  
        printf("%d", maxVal);  
    }  
    return 0;  
}
```

**Status :** Correct

**Marks :** 10/10

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 5\_PAH\_Updated

Attempt : 1  
Total Mark : 50  
Marks Obtained : 47.5

#### Section 1 : Coding

##### 1. Problem Statement

Joseph, a computer science student, is interested in understanding binary search trees (BST) and their node arrangements. He wants to create a program to explore BSTs by inserting elements into a tree and displaying the nodes using post-order traversal of the tree.

Write a program to help Joseph implement the program.

##### ***Input Format***

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

The second line consists of N space-separated integers data, which is the data to be inserted into the BST.

### **Output Format**

The output prints N space-separated integer values after the post-order traversal.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 4

10 15 5 3

Output: 3 5 15 10

### **Answer**

```
// You are using GCC
```

```
#include <stdio.h>
```

```
#include <stdlib.h>
```

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

```
struct node *creatnode(int data){  
    struct node *newnode = (struct node*)malloc(sizeof(struct node));  
    newnode->data = data;  
    newnode->left = newnode->right = NULL;  
    return newnode;  
}
```

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

```

        root->right = insert(root->right,data);
    }
    return root;
}

```

```

void display(struct node *root){
    if(root!=NULL){
        display(root->left);
        display(root->right);
        printf("%d ",root->data);
    }
}

```

```

int main(){
    int n;
    struct node *root=NULL;
    scanf("%d",&n);
    for(int i=0; i<n;i++){
        int data;
        scanf("%d",&data);
        root = insert(root,data);
    }
    display(root);
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Viha, a software developer, is working on a project to automate searching for a target value in a Binary Search Tree (BST). She needs to create a program that takes an integer target value as input and determines if that value is present in the BST or not.

Write a program to assist Viha.

### **Input Format**

The first line of input consists of integers separated by spaces, which represent the elements to be inserted into the BST. The input is terminated by entering -1.



The second line consists of an integer target, which represents the target value to be searched in the BST.

### **Output Format**

If the target value is found in the BST, print "[target] is found in the BST".

Else, print "[target] is not found in the BST"

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 5 3 7 1 4 6 8 -1  
4

Output: 4 is found in the BST

### **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 = 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 *search(struct node *root,int key){
    if(root == NULL || root->data == key){
        return root;
    }
    if(key < root->data){
        return search(root->left,key);
    }
    return search(root->right,key);
}

```

```

int main(){
    struct node *root = NULL;
    int data;
    do{
        scanf("%d",&data);
        root = insert(root,data);
    }while(data != -1);
    int n;
    scanf("%d",&n);
    struct node *result = search(root,n);
    if(result == NULL){
        printf("%d is not found in the BST",n);
    }
    else{
        printf("%d is found in the BST",n);
    }
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Yogi is working on a program to manage a binary search tree (BST) containing integer values. He wants to implement a function that removes nodes from the tree that fall outside a specified range defined by a minimum and maximum value.

Help Yogi by writing a function that achieves this.

### ***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, representing the elements to be inserted into the BST.

The third line consists of two space-separated integers min and max, representing the minimum value and the maximum value of the range.

### ***Output Format***

The output prints the remaining elements of the BST in an in-order traversal, after removing nodes that fall outside the specified range.

Refer to the sample output for formatting specifications.

### ***Sample Test Case***

Input: 5  
10 5 15 20 12  
5 15  
Output: 5 10 12 15

### ***Answer***

```
#include <stdio.h>
#include <stdlib.h>
```

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

```
struct node* createNode(int data) {
    struct node* newNode = (struct node*)malloc(sizeof(struct node));
    newNode->data = data;
    newNode->left = 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* trimBST(struct node* root, int min, int max) {
    if (root == NULL)
        return NULL;
```

```
    root->left = trimBST(root->left, min, max);
    root->right = trimBST(root->right, min, max);
```

```
    if (root->data < min) {
        struct node* rightChild = root->right;
        free(root);
        return rightChild;
    }
    if (root->data > max) {
        struct node* leftChild = root->left;
        free(root);
        return leftChild;
    }
    return root;
}
```

```
void inorder(struct node* root) {
    if (root == NULL)
        return;
    inorder(root->left);
```

```

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

    int main() {
        int N;
        scanf("%d", &N);

        struct node* root = NULL;
        for (int i = 0; i < N; i++) {
            int val;
            scanf("%d", &val);
            root = insert(root, val);
        }

        int min, max;
        scanf("%d %d", &min, &max);

        root = trimBST(root, min, max);

        if (root != NULL)
            inorder(root);
        printf("\n");

        return 0;
    }

```

**Status :** Partially correct

**Marks :** 7.5/10

#### 4. Problem Statement

Aishu is participating in a coding challenge where she needs to reconstruct a Binary Search Tree (BST) from given preorder traversal data and then print the in-order traversal of the reconstructed BST.

Since Aishu is just learning about tree data structures, she needs your help to write a program that does this efficiently.

##### **Input Format**

The first line consists of an integer  $n$ , representing the number of nodes in the BST.

The second line of input contains n integers separated by spaces, which represent the preorder traversal of the BST.

### **Output Format**

The output displays n space-separated integers, representing the in-order traversal of the reconstructed BST.

Refer to the sample output for the formatting specifications.

### **Sample Test Case**

Input: 6

10 5 1 7 40 50

Output: 1 5 7 10 40 50

### **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 = 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;
}

```

```

void display_inorder(struct node *root){
    if(root != NULL){
        display_inorder(root->left);
        printf("%d ",root->data);
        display_inorder(root->right);
    }
}

```

```

int main(){
    int n;
    scanf("%d",&n);
    struct node *root = NULL;
    for(int i=0;i<n;i++){
        int data;
        scanf("%d",&data);
        root = insert(root,data);
    }
    display_inorder(root);
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

## 5. Problem Statement

Arun is exploring operations on binary search trees (BST). He wants to write a program with an unsorted distinct integer array that represents the BST keys and construct a height-balanced BST from it.

After constructing, he wants to perform the following operations that can alter the structure of the tree and traverse them using a level-order traversal:

InsertionDeletion

Your task is to assist Arun in completing the program without any errors.

### **Input Format**

The first line of input consists of an integer N, representing the number of initial keys in the BST.

The second line consists of N space-separated integers, representing the initial keys.

The third line consists of an integer X, representing the new key to be inserted into the BST.

The fourth line consists of an integer Y, representing the key to be deleted from the BST.

### **Output Format**

The first line of output prints "Initial BST: " followed by a space-separated list of keys in the initial BST after constructing it in level order traversal.

The second line prints "BST after inserting a new node X: " followed by a space-separated list of keys in the BST after inserting X n level order traversal.

The third line prints "BST after deleting node Y: " followed by a space-separated list of keys in the BST after deleting Y n level order traversal.

Refer to the sample output for formatting specifications.

### **Sample Test Case**

Input: 5  
25 14 56 28 12  
34  
12

Output: Initial BST: 25 14 56 12 28  
BST after inserting a new node 34: 25 14 56 12 28 34  
BST after deleting node 12: 25 14 56 28 34

### **Answer**

```
#include <stdio.h>
```



```
#include <stdlib.h>
```

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

```
struct node* createNode(int data) {  
    struct node* newNode = (struct node*)malloc(sizeof(struct node));  
    newNode->data = data;  
    newNode->left = 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 key) {  
    if (root == NULL) return root;  
  
    if (key < root->data)  
        root->left = deleteNode(root->left, key);  
    else if (key > root->data)  
        root->right = deleteNode(root->right, key);  
    else {  
        if (root->left == NULL) {  
            struct node* temp = root->right;  
            free(root);  
            return temp;  
        }  
        if (root->right == NULL) {  
            struct node* temp = root->left;  
            free(root);  
            return temp;  
        }  
        struct node* temp = minValueNode(root->right);  
        root->right = deleteNode(root->right, temp->data);  
        root->data = temp->data;  
        root->left = deleteNode(root->left, temp->left->data);  
        root->right = deleteNode(root->right, temp->right->data);  
    }  
}
```

```

        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;
}

```

```

int height(struct node* root) {
    if (root == NULL) return 0;
    int lh = height(root->left);
    int rh = height(root->right);
    return (lh > rh ? lh : rh) + 1;
}

```

```

void printLevel(struct node* root, int level) {
    if (root == NULL) return;
    if (level == 1)
        printf("%d ", root->data);
    else {
        printLevel(root->left, level - 1);
        printLevel(root->right, level - 1);
    }
}

```

```

void levelOrder(struct node* root) {
    int h = height(root);
    for (int i = 1; i <= h; i++)
        printLevel(root, i);
}

```

```

int main() {
    int N;
    scanf("%d", &N);
    int arr[20];
}

```

```
for (int i = 0; i < N; i++)
    scanf("%d", &arr[i]);

int X, Y;
scanf("%d", &X);
scanf("%d", &Y);
struct node* root = NULL;
for (int i = 0; i < N; i++)
    root = insert(root, arr[i]);

printf("Initial BST: ");
levelOrder(root);
printf("\n");

root = insert(root, X);
printf("BST after inserting a new node %d: ", X);
levelOrder(root);
printf("\n");

root = deleteNode(root, Y);
printf("BST after deleting node %d: ", Y);
levelOrder(root);
printf("\n");

return 0;
}
```

**Status :** Correct

**Marks :** 10/10

# Rajalakshmi Engineering College

Name: Bala murugan  
Email: 241901014@rajalakshmi.edu.in  
Roll no: 241901014  
Phone: 9962293932  
Branch: REC  
Department: I CSE (CS) FA  
Batch: 2028  
Degree: B.E - CSE (CS)

Scan to verify results



## 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 , *right;
};
```

```
struct node *createnode(int data){
    struct node *newnode = (struct node*)malloc(sizeof(struct node));
    newnode->data = data;
    newnode->left = 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 *deletenode(struct node *root){
    if(root == NULL){
        return NULL;
    }
    if(root->left == NULL){
        struct node *temp = root->right;
        free(root);
        return temp;
    }
    root->left = deletenode(root->left);
    return root;
}

```

```

void display(struct node *root){
    if(root == NULL){
        return;
    }
    display(root->left);
    printf("%d ",root->data);
    display(root->right);
}

```

```

int main(){
    int n;
    scanf("%d",&n);
    struct node *root = NULL;
    for(int i=0;i<n;i++){
        int data;
        scanf("%d",&data);
        root = insert(root,data);
    }
    root = deletenode(root);
    display(root);
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

Edward has a Binary Search Tree (BST) and needs to find the k-th largest element in it.

Given the root of the BST and an integer k, help Edward determine the k-th largest element in the tree. If k exceeds the number of nodes in the BST, return an appropriate message.

### ***Input Format***

The first line of input consists of integer n, the number of nodes in the BST.

The second line consists of the n elements, separated by space.

The third line consists of the value of k.

### ***Output Format***

The output prints the kth largest element in the binary search tree.

For invalid inputs, print "Invalid value of k".

Refer to the sample output for formatting specifications.

### ***Sample Test Case***

Input: 7  
8 4 12 2 6 10 14  
1

Output: 14

### ***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 = 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;
}
```

```
int count =0;
void find(struct node * root ,int k){
    if(root==NULL || count>=k){
        return;
    }
    find(root->right,k);
    count++;
    if(count == k){
        printf("%d",root->data);
        return;
    }
    find(root->left,k);
}
```

```
int main(){
    int n;
    scanf("%d",&n);
    struct node *root = NULL;
    for(int i=0;i<n;i++){
        int data;
```



```

scanf("%d",&data);
root =insert(root,data);
}
int t;
scanf("%d",&t);
if(t>n||t<=0){
    printf("Invalid value of k");
}
else{
    find(root,t);
}
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 , *right;
};
```

```
struct node *createnode(int data){
    struct node *newnode = (struct node*)malloc(sizeof(struct node));
    newnode->data = data;
    newnode->left = 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 *search(struct node *root, int key){
    if(root == NULL || root->data == key){
        return root;
    }
}
```

```
    if(key < root->data){
        return search(root->left,key);
    }
    return search(root->right,key);
}

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

**Status :** Correct

**Marks : 10/10**