Rajalakshmi Engineering College

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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 post-order traversal of the given binary search tree.

Answer

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

Status : Wrong ***Marks : 0/1***

2. 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, 30, 32, 52, 57, 55, 50

Status : Wrong ***Marks : 0/1***

3. 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***

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

Answer

1, 4, 2, 18, 14, 13

Status : Correct ***Marks : 1/1***

5. 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***

6. 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***

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

Answer

1, 2, 4, 13, 14, 18

Status : Correct ***Marks : 1/1***

8. 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, 3, 4, 5, 8, 9, 11

Status : Correct ***Marks : 1/1***

9. 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***

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

Answer

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

Status : Correct ***Marks : 1/1***

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

Answer

14

Status : Correct ***Marks : 1/1***

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

Answer

13, 2, 1, 4, 14, 18

Status : Correct ***Marks : 1/1***

13. 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***

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. 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

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

Status : Correct ***Marks : 1/1***

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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) {
```

```
    if(root==NULL){
        return createNode(key);
    }
    else 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) {
    while(root && root->left !=NULL){
        root=root->left;
    }
    return root;
}

struct TreeNode* deleteNode(struct TreeNode* 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 && root->right == NULL){
            free(root);
            return NULL;
        }
        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) {
    if(root!=NULL){
        inorderTraversal(root->left);
        printf("%d\t",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**

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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) {
    Node*newnode=(Node*)malloc(sizeof(Node));
    if(root==NULL){
    newnode->data=value;
    newnode->left=NULL;
    newnode->right=NULL;
    root=newnode;}
    else 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) {
    if(node!=NULL){
        printf("%d\t",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***

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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

```
#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=NULL;
   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);
    int values[n];
    for (int i=0;i<n;i++){
        scanf("%d",&values[i]);
    }
    scanf("%d",&key);

    struct node*root=NULL;
    for(int i=0;i<n;i++){
        root=insert(root,values[i]);
    }

    if(search(root,key)){
        printf("Value %d is found in the tree.\n",key);
    }
    else
    printf("Value %d is not found in the tree.\n");
    return 0;
}
```

Status : Correct

Marks : 10/10

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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) {
    Node*newnode=(Node*)malloc(sizeof(Node));
    if(root==NULL){
        newnode->data=data;
        newnode->left=NULL;
        newnode->right=NULL;
        root=newnode;
```

```
    }
    else 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) {
    if(root!=NULL){
        displayTreePostOrder(root->left);
        displayTreePostOrder(root->right);
        printf("%d\t",root->data);

    }
}

int findMinValue(struct Node* root) {
    struct Node*current=root;
    while(current->left!=NULL){
        current=current->left;
    }
    return current->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

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

int findMax(struct TreeNode* root) {
```

```
    struct TreeNode*current=root;
    while(current->right!=NULL)
    {
        current=current->right;
    }
    return current->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***

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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

Emily is studying binary search trees (BST). She wants to write a program that inserts characters into a BST and then finds and prints the minimum and maximum values.

Guide her with the program.

Input Format

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

The second line consists of N space-separated characters.

Output Format

The first line of output prints "Minimum value: " followed by the minimum value

of the given inputs.

The second line prints "Maximum value: " followed by the maximum value of the given inputs.

Refer to the sample outputs for formatting specifications.

Sample Test Case

Input: 5
Z E W T Y
Output: Minimum value: E
Maximum value: Z

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=NULL;
   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;
```

```
}
char findmin(struct node*root){
    while(root->left!=NULL){
        root=root->left;
    }
    return root->data;
}

char findmax(struct node*root){
    while(root->right!=NULL){
        root=root->right;
    }
    return root->data;
}


int main(){
    int n;

    struct node*root=NULL;
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        char value;
        scanf(" %c ",&value);
        root=insert(root,value);
    }
    printf("Minimum value: %c\n",findmin(root));
    printf("Maximum value: %c\n",findmax(root));
    return 0;
}
```

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

2. Problem Statement

Dhruv is working on a project where he needs to implement a Binary Search Tree (BST) data structure and perform various operations on it.

He wants to create a program that allows him to build a BST, traverse it in

different orders (inorder, preorder, postorder), and exit the program when needed.

Help Dhruv by designing a program that fulfils his requirements.

Input Format

The first input consists of the choice.

If the choice is 1, enter the number of elements N and the elements inserted into the tree, separated by a space in a new line.

If the choice is 2, print the in-order traversal.

If the choice is 3, print the pre-order traversal.

If the choice is 4, print the post-order traversal.

If the choice is 5, exit.

Output Format

The output prints the results based on the choice.

For choice 1, print "BST with N nodes is ready to use" where N is the number of nodes inserted.

For choice 2, print the in-order traversal of the BST.

For choice 3, print the pre-order traversal of the BST.

For choice 4, print the post-order traversal of the BST.

For choice 5, the program exits.

If the choice is greater than 5, print "Wrong choice".

Refer to the sample output for the formatting specifications.

Sample Test Case

Input: 1
5
12 78 96 34 55
2
3
4
5
Output: BST with 5 nodes is ready to use
BST Traversal in INORDER
12 34 55 78 96
BST Traversal in PREORDER
12 78 34 55 96
BST Traversal in POSTORDER
55 34 96 78 12

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

void preorder(struct node*root){
   if(root){
      printf("%d ",root->data);
      preorder(root->left);
      preorder(root->right);

   }
}

void postorder(struct node*root){
   if(root){

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

}

void freetree(struct node*root){
   if(root==NULL)return;
   freetree(root->left);
   freetree(root->right);
   free(root);
}

int main(){
   struct node*root=NULL;
   int choice,n,value;
   while(1){
      scanf("%d",&choice);
      if(choice==1){
         scanf("%d",&n);
         freetree(root);
```

```
            root=NULL;
            for(int i=0;i<n;i++){
                scanf("%d",&value);
                root=insert(root,value);
            }
            printf("BST with %d nodes is ready to use\n",n);
        }
        else if(choice==2){
            printf("BST Traversal in INORDER\n");
            inorder(root);
            printf("\n");
        }
        else if(choice==3){
            printf("BST Traversal in PREORDER\n");
            preorder(root);
            printf("\n");
        }
        else if(choice==4){
            printf("BST Traversal in POSTORDER\n");
            postorder(root);
            printf("\n");
        }
        else if(choice==5)
        break;
        else{
            printf("Wrong choice\n");
        }
    }
    return 0;
}
```

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

3. 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

```
#include<stdio.h>
#include<stdlib.h>
typedef struct node{
   int data;
   struct node*left,*right;
}node;

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

node*insert(node*root,int data){
```

```
    if(root==NULL){
        return newnode(data);
    }
    if(data<root->data){
        root->left=insert(root->left,data);

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


void findlargest(node*root,int k,int *count,int*result){
    if(root==NULL || *count>=k)
    return;
    findlargest(root->right,k,count,result);
    (*count)++;
    if(*count==k){
        *result=root->data;
        return;
    }
    findlargest(root->left,k,count,result);
}


int main(){
    int n,k;
    scanf("%d",&n);
    if(n<=0){
        printf("Invalid vale of k\n");
        return 0;
    }
    node*root=NULL;
    for(int i=0;i<n;i++){
        int val;
        scanf("%d",&val);
        root=insert(root,val);
    }
    scanf("%d",&k);
    if(k<=0 || k>n){
        printf("Invalid value of k\n");
```

```
    return 0;
    }
    int count=0,result=-1;
    findlargest(root,k,&count,&result);
    printf("%d\n",result);
    return 0;
}
```

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

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Scan to verify results

NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 5_PAH_Updated

Attempt : 1
Total Mark : 50
Marks Obtained : 50

Section 1 : Coding

1. 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

```
#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->right=NULL;
   newnode->left=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 target){
    if(root==NULL){
        return 0;
    }
    if(root->data==target){
        return 1;
    }
    if(target<root->data)
    return search(root->left,target);
    else
    return search(root->right,target);
}


int main(){
    struct node*root=NULL;
    int num;
    while(scanf("%d",&num)&& num!=-1){
        root=insert(root,num);
    }
    int target;
    scanf("%d",&target);

    if(search(root,target))
    printf("%d is found in the BST\n",target);
    else
    printf("%d is not found in the BST\n",target);
    return 0;
}
```

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

2. 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;
   struct node*right;
};

struct node*createnode(int value){
```

```
    struct node*newnode=(struct node*)malloc(sizeof(struct node));
    newnode->data=value;
    newnode->left=NULL;
    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 inorder(struct node*root){
    if(root!=NULL){
        inorder(root->left);
        printf("%d ",root->data);
        inorder(root->right);
    }
}


struct node*removenode(struct node*root,int min,int max){
    if(root==NULL)
    return NULL;
root->left=removenode(root->left,min,max);
root->right=removenode(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;
}



int main(){
    int N,i,value,min,max;
    struct node*root=NULL;
    scanf("%d",&N);
    for(i=0;i<N;i++){
        scanf("%d",&value);
        root=insert(root,value);
    }
    scanf("%d %d",&min,&max);
    root=removenode(root,min,max);
    inorder(root);
    printf("\n");
    return 0;

}
```

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

3. 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

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

struct node{
   int data;
   struct node*left=NULL;
   struct node*right=NULL;
};

struct node*createnode(int value){
   struct node*newnode=(struct node*)malloc(sizeof(struct node));
   newnode->data=value;
   newnode->left=NULL;
   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 postorder(struct node*root){
    if(root==NULL){
        return;
    }
    postorder(root->left);
    postorder(root->right);
    printf("%d ",root->data);
}

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

}
```

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

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

```
#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=NULL;
   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 inorder(struct node*root){
    if(root==NULL)
    return;
    inorder(root->left);
     printf("%d ",root->data);
    inorder(root->right);

}

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

```
    struct node*right;
};

struct node*createnode(int value){
    struct node*newnode=(struct node*)malloc(sizeof(struct node));
    newnode->data=value;
    newnode->left=NULL;
    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;
}

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

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

void levelorder(struct node*root){
    int h=height(root);
    for(int i=1;i<=h;i++){
        print(root,i);
    }
    printf("\n");
}
```

```
int main(){
    int n,x,y;
    scanf("%d",&n);
    struct node*root=NULL;
    for(int i=0;i<n;i++){
        int val;
        scanf("%d",&val);
        root=insert(root,val);
    }
    scanf("%d",&x);
    scanf("%d",&y);
    printf("Initial BST: ");
    levelorder(root);
    root=insert(root,x);
    printf("BST after inserting a new node %d: ",x);
    levelorder(root);

    root=deletenode(root,y);
    printf("BST after deleting node %d: ",y);
    levelorder(root);
    return 0;
}
```

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