

1. Develop a C program to implement the Tree
Traversals (Inorder, preorder, postorder)

```
#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;
}
```

```
Void inorderTraversal (struct Node* root) {
    If preorder
        If (root == NULL)
            return;
        inorderTraversal (root->left);
        printf ("%d", root->data);
        inorderTraversal (root->right);
}
```

3

```

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

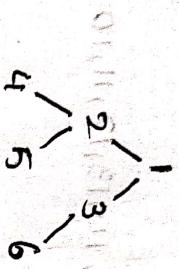
void postorderTraversal (struct Node* root) {
    if (root == NULL)
        return;
    postorderTraversal (root->left);
    postorderTraversal (root->right);
    printf ("%d ", root->data);
}

int main() {
    struct Node* root = createNode(1);
    root->left = createNode(2);
    root->right = createNode(3);
    root->left->left = createNode(4);
    root->left->right = createNode(5);
    root->right->right = createNode(6);
    printf ("Inorder traversal:");
    inorderTraversal (root);
    printf ("\n");
    printf ("Preorder traversal : ");
    preorderTraversal (root);
    printf ("\n");
}

```

```
printf("Postorder Traversal : ");
postorderTraversal(root);
printf("\n");
return 0;
}
```

Input : creating the tree



Output :

Inorder Traversal: 4 2 5 1 3 6

Preorder Traversal: 1 2 4 5 3 6

Postorder Traversal: 4 5 2 6 3 1

2.

Construct AVL tree for the following elements
3, 2, 1, 4, 5, 6, 7 followed by 10 to 16 in reverse order.

Sol:

To construct an AVL tree for the given elements.
Elements to Insert

- First sequence: 3, 2, 1, 4, 5, 6, 7
- Second sequence (reverse order): 16, 15, 14, 13, 12, 11, 10.

Steps to Construct the AVL Tree:

1. Insert 3:

3

2. Insert 2:

3
|
2

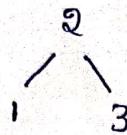
* Balance factor for node 3 is 1, so no rotation needed.

3. Insert 1

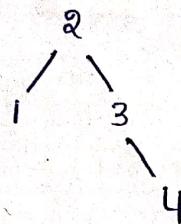
3
|
2
|
1

* Balance factor for node 3 is 2, and node 2 is 1, so
we need a right rotation at node 3.

* After rotation, the tree becomes:

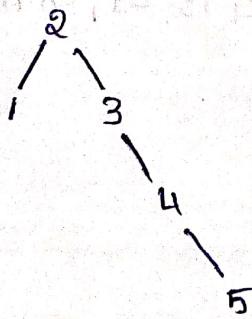


4. Insert 4:



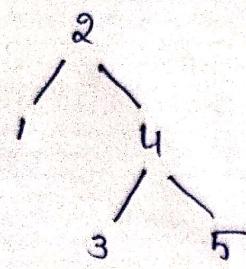
* Balance factor for node 2 is 0, so, no rotation needed.

5. Insert 5.

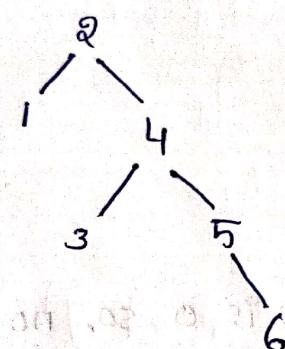


* Balancing factor for node 3 is -2, and node 4 is -1, so we need a left rotation at node 3.

* After rotation :

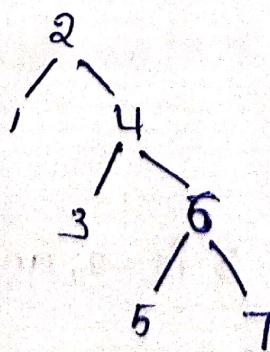


Insert 6 :



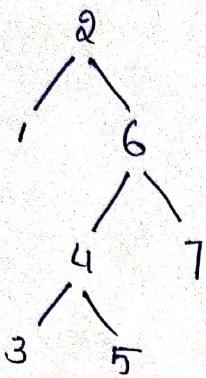
* Balance factor for node 4 is -1, so no rotation needed.

Insert 7 :



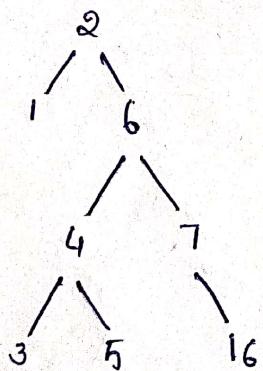
* Balance factor for node 4 is -2 and node 6 is -1,
So we need left rotation at node 4.

After rotation:



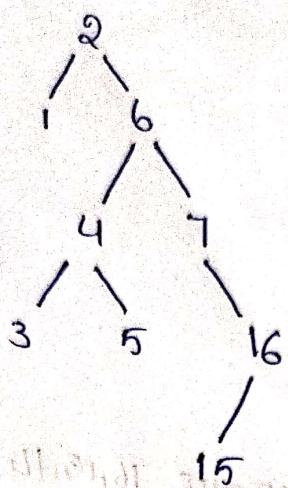
Next, we will insert the elements 16, 15, 14, 13, 12, 11, 10 in reverse order.

8. Insert 16.



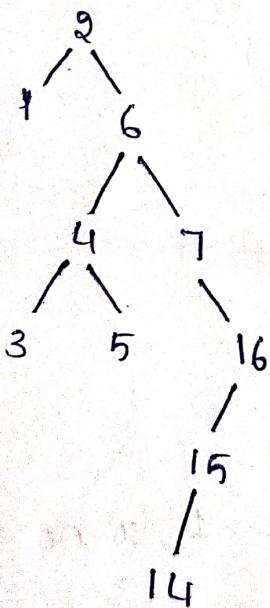
* Balance factor for node 7 is -1, so no rotation needed.

9. Insert 15:



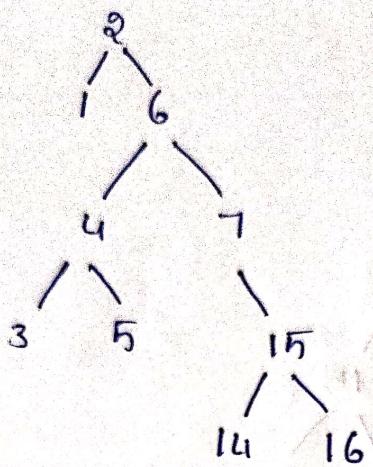
* Balance factor for node 16 is 1, so no rotation needed.

10. Insert 14.

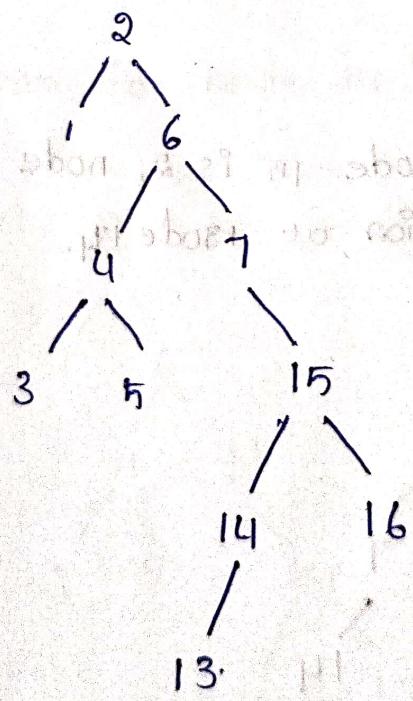


* Balance factor for node 16 is 2, node 15 is 1, so we need a right rotation at node 15.

After rotation.

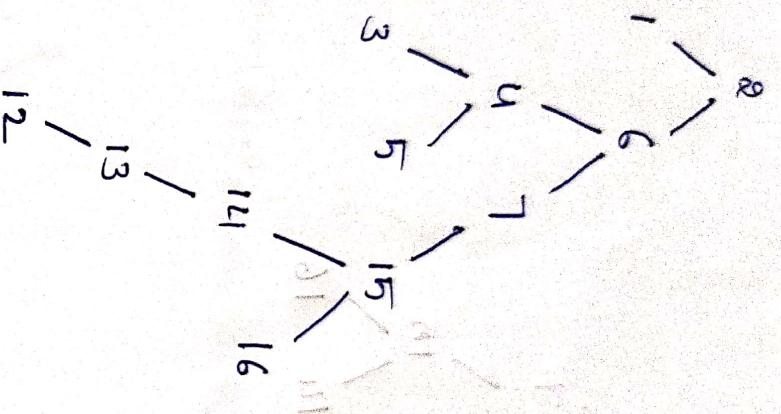


11. Insert 13:

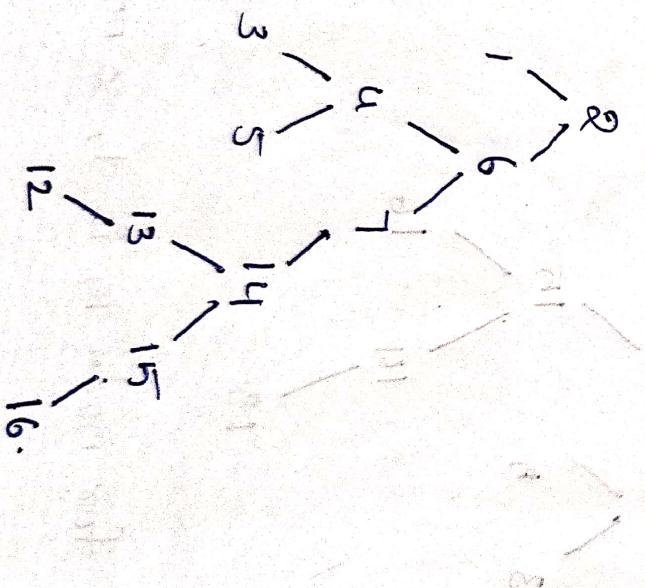


* Balance factor for node 15 is 1, so no rotation needed.

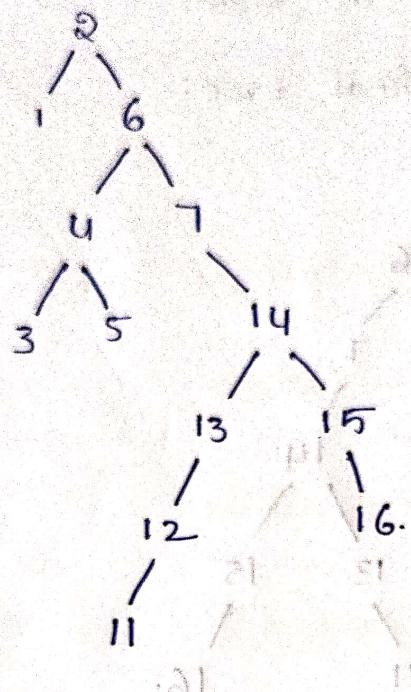
12. Insert 12



* Balance factor for node 15 is 2, node 16 is 1, so we need a right rotation at node 13.

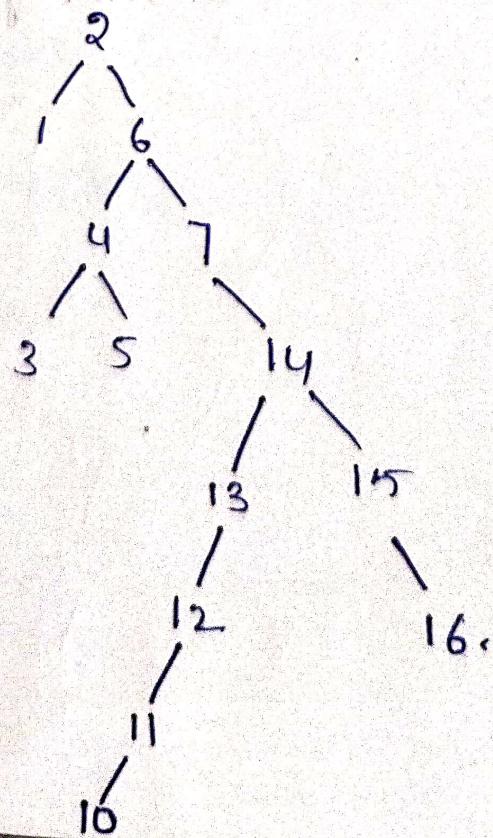


13. Insert 11.



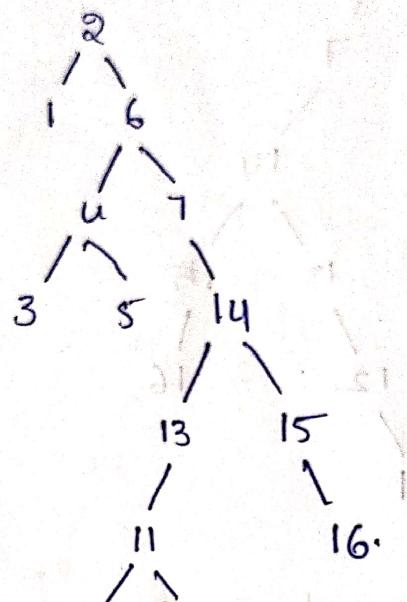
* Balance factor for node 14 is 1, so no rotation needed.

14. Insert 10;



* Balance factor for node 14 is 2, node 13 is 1, so we need a right rotation at node 11.

After rotation, the final tree:-



This AVL tree is now balanced with given sequence of insertions.