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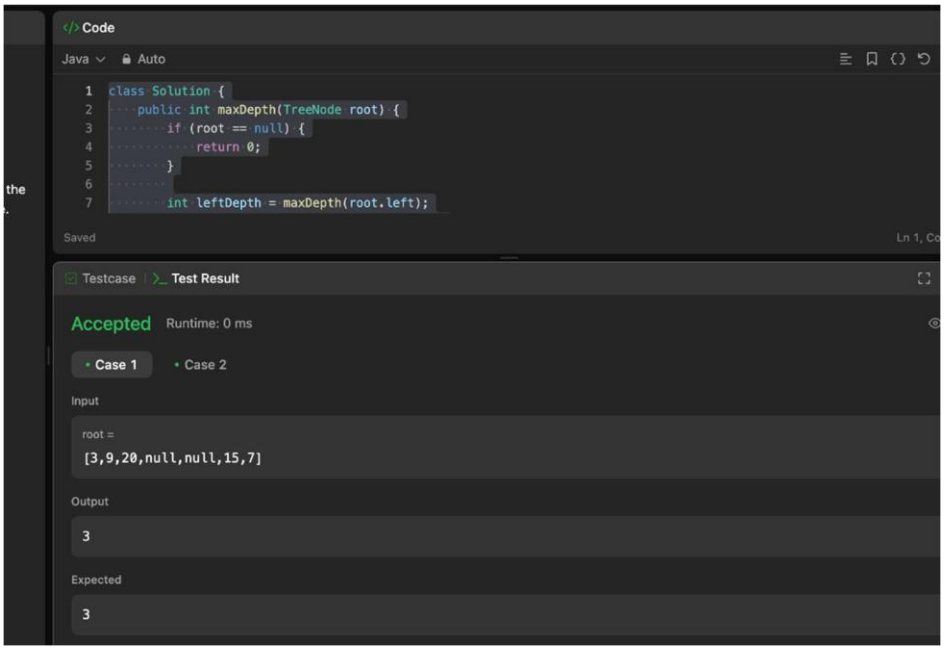
Section 703(B)

Problem 1

Aim:

Maximum Depth of Binary Tree Code:

```
class Solution {
   public int maxDepth(TreeNode root) {
if (root == null) {            return 0;
        }

        int leftDepth = maxDepth(root.left);
        int rightDepth = maxDepth(root.right);

        return Math.max(leftDepth, rightDepth) + 1;
    }
} Output:
```



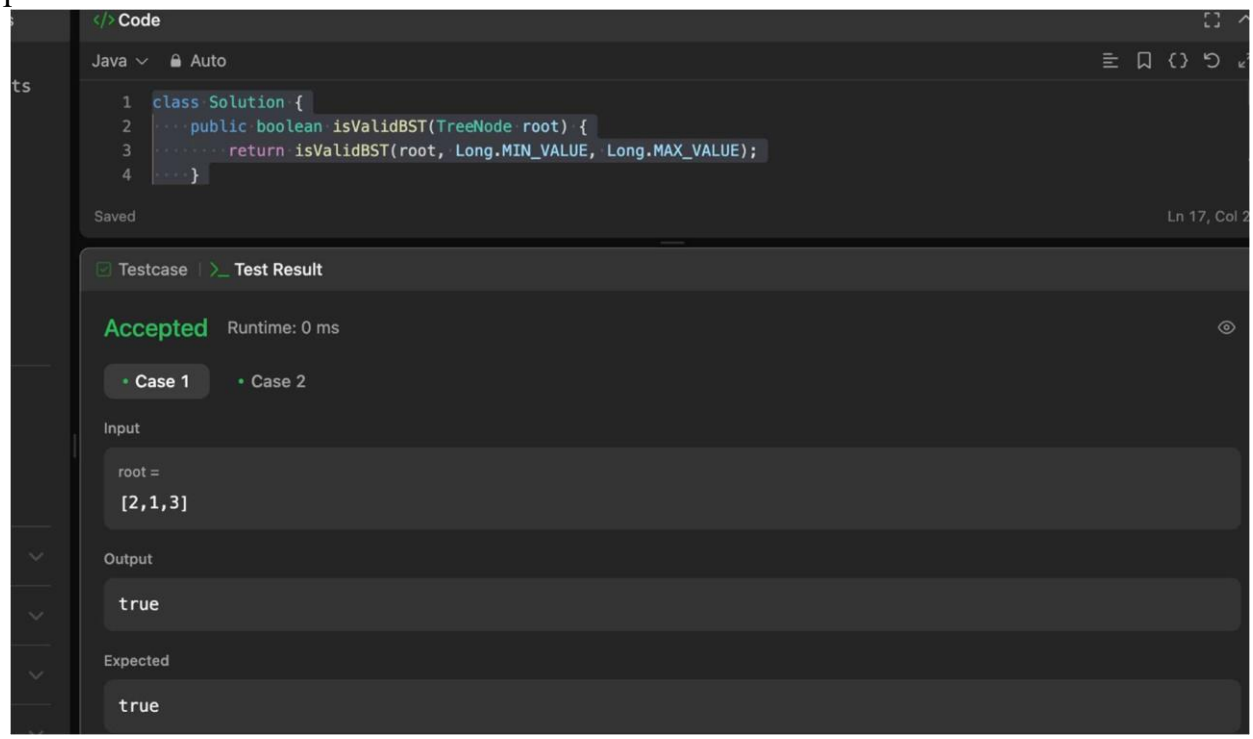
Problem 2

Aim:

Validate Binary Search Tree Code:

```
class Solution {
    public boolean isValidBST(TreeNode root) {
        return isValidBST(root, Long.MIN_VALUE, Long.MAX_VALUE);
    }

    private boolean isValidBST(TreeNode node, long min, long max) {
if (node == null) {             return true;
        }

        if (node.val <= min || node.val >= max) {
return false;
        }

        return isValidBST(node.left, min, node.val) && isValidBST(node.right, node.val, max);
    }
}
```

Output:



Problem 3

Aim: Symmetric Tree

Code :

```
class Solution {
    public boolean isSymmetric(TreeNode root) {
if (root == null) {            return true;
        }
        return isMirror(root.left, root.right);
    }

    private boolean isMirror(TreeNode t1, TreeNode t2) {
if (t1 == null && t2 == null) {            return true;
        }
        if (t1 == null || t2 == null) {
return false;
        }

        return (t1.val == t2.val)
&& isMirror(t1.left, t2.right)
            && isMirror(t1.right, t2.left);
    }
}
```

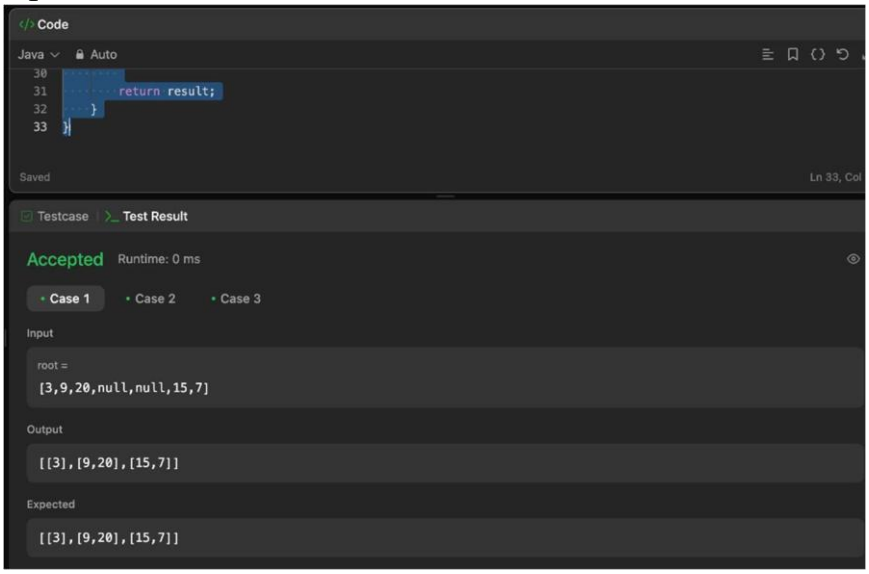
Output:

Problem 4

Aim: Binary Tree Level Order Traversal Code:

```
import java.util.*;

class Solution {
   public List<List<Integer>> levelOrder(TreeNode root) {
List<List<Integer>> result = new ArrayList<>();
        if (root == null) {
        return result;
        }

       Queue<TreeNode> queue = new LinkedList<>();
queue.offer(root);

       while (!queue.isEmpty()) {
int levelSize = queue.size();
          List<Integer> currentLevel = new ArrayList<>();

          for (int i = 0; i < levelSize; i++) {
TreeNode currentNode = queue.poll();
             currentLevel.add(currentNode.val);

             if (currentNode.left != null) {
                queue.offer(currentNode.left);
             }
             if (currentNode.right != null) {
                queue.offer(currentNode.right);
             }
          }
          result.add(currentLevel);
       }

       return result;
   }
}
```

Output:



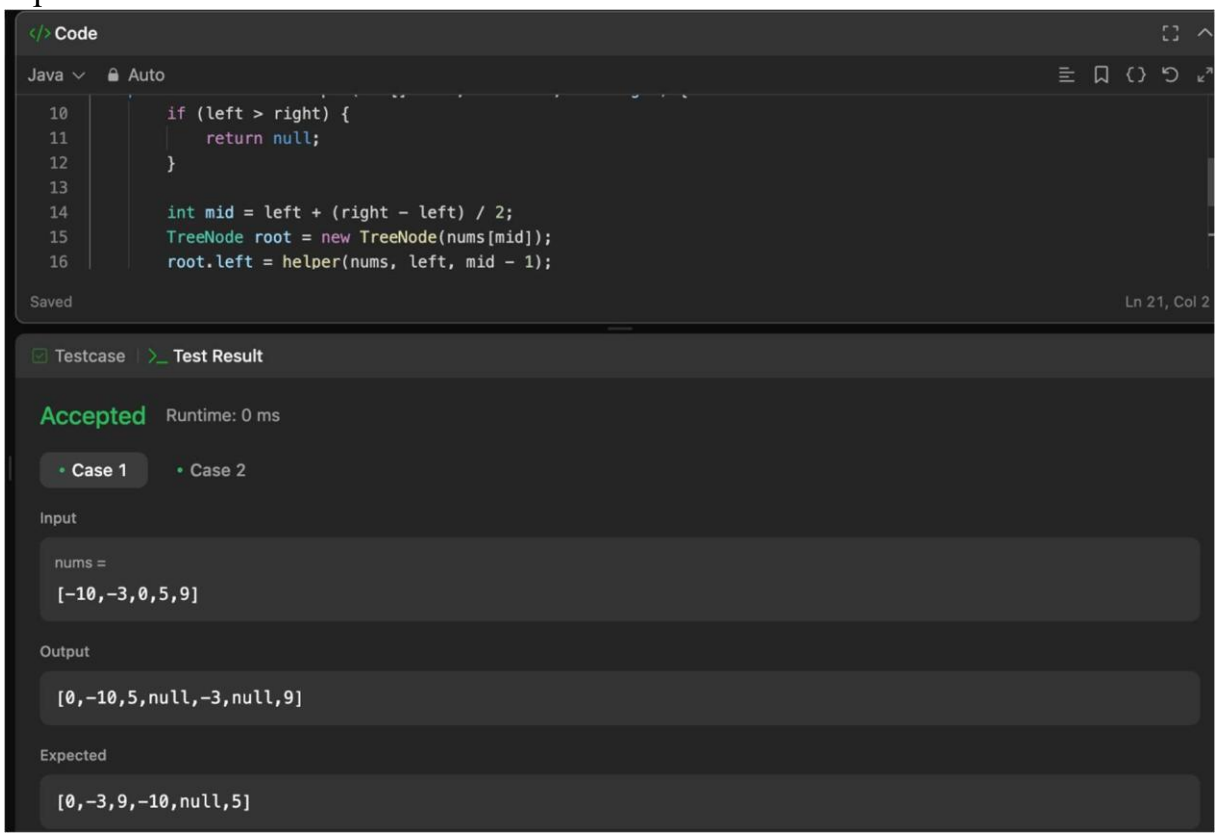
Problem 5

Aim:

Convert Sorted Array to Binary Search Tree Code:

```
class Solution {
    public TreeNode sortedArrayToBST(int[] nums) {
        if (nums == null || nums.length == 0) {
            return null;
        }
        return helper(nums, 0, nums.length - 1);
    }

    private TreeNode helper(int[] nums, int left, int right) {
if (left > right) {             return null;
        }

        int mid = left + (right - left) / 2;
        TreeNode root = new TreeNode(nums[mid]);
root.left = helper(nums, left, mid - 1);
        root.right = helper(nums, mid + 1, right);

        return root;
    }
}
```

Output:



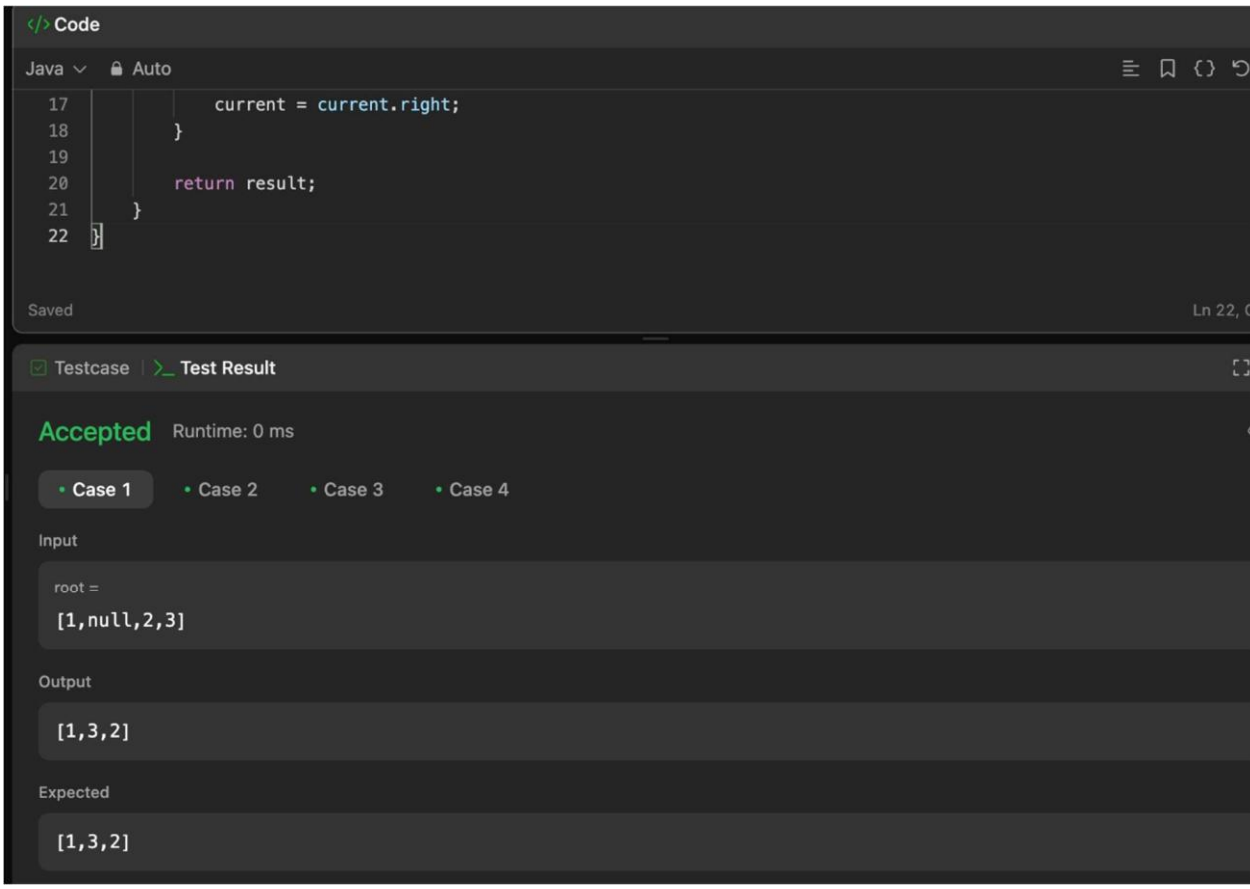
Problem 6

Aim:

Binary Tree Inorder Traversal Code:

```
import java.util.*;

class Solution {
    public List<Integer> inorderTraversal(TreeNode root) {
        List<Integer> result = new ArrayList<>();
        Stack<TreeNode> stack = new Stack<>();
        TreeNode current = root;

        while (current != null || !stack.isEmpty()) {
while (current != null) {
stack.push(current);
                current = current.left;
            }

            current = stack.pop();
result.add(current.val);              current
= current.right;
        }

        return result;
    }
}
```

Output:

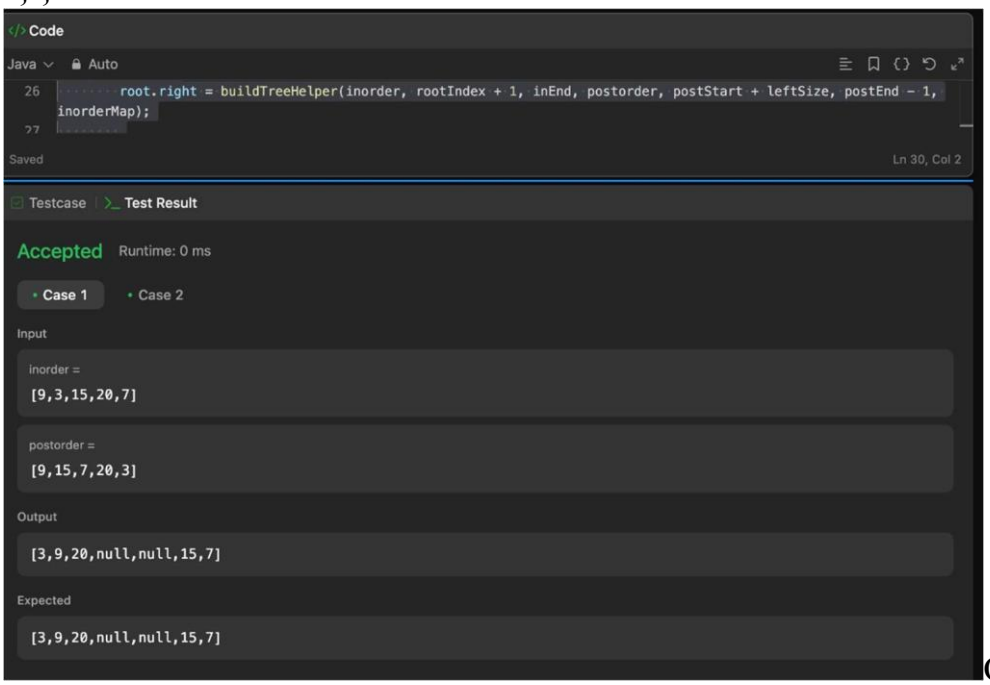


Problem 7

Aim:

Construct Binary Tree from Inorder and Postorder Traversal Code:

```
import java.util.*;
class Solution {     public TreeNode buildTree(int[] inorder,
int[] postorder) {
        if (inorder == null || postorder == null || inorder.length != postorder.length) {
return null;
        }
        Map<Integer, Integer> inorderMap = new HashMap<>();
for (int i = 0; i < inorder.length; i++) {
inorderMap.put(inorder[i], i);
        }
        return buildTreeHelper(inorder, 0, inorder.length - 1, postorder, 0, postorder.length - 1, inorderMap);
    }
    private TreeNode buildTreeHelper(int[] inorder, int inStart, int inEnd, int[] postorder, int postStart, int
postEnd, Map<Integer, Integer> inorderMap) {        if (inStart > inEnd || postStart > postEnd) {           return
null;
        }
         int rootVal = postorder[postEnd];
TreeNode root = new TreeNode(rootVal);          int
rootIndex = inorderMap.get(rootVal);          int
leftSize = rootIndex - inStart;
root.left = buildTreeHelper(inorder, inStart, rootIndex - 1, postorder, postStart, postStart + leftSize - 1,
inorderMap);
        root.right = buildTreeHelper(inorder, rootIndex + 1, inEnd, postorder, postStart + leftSize, postEnd
- 1, inorderMap);
return root;
    } }
```



Output:

Problem 8

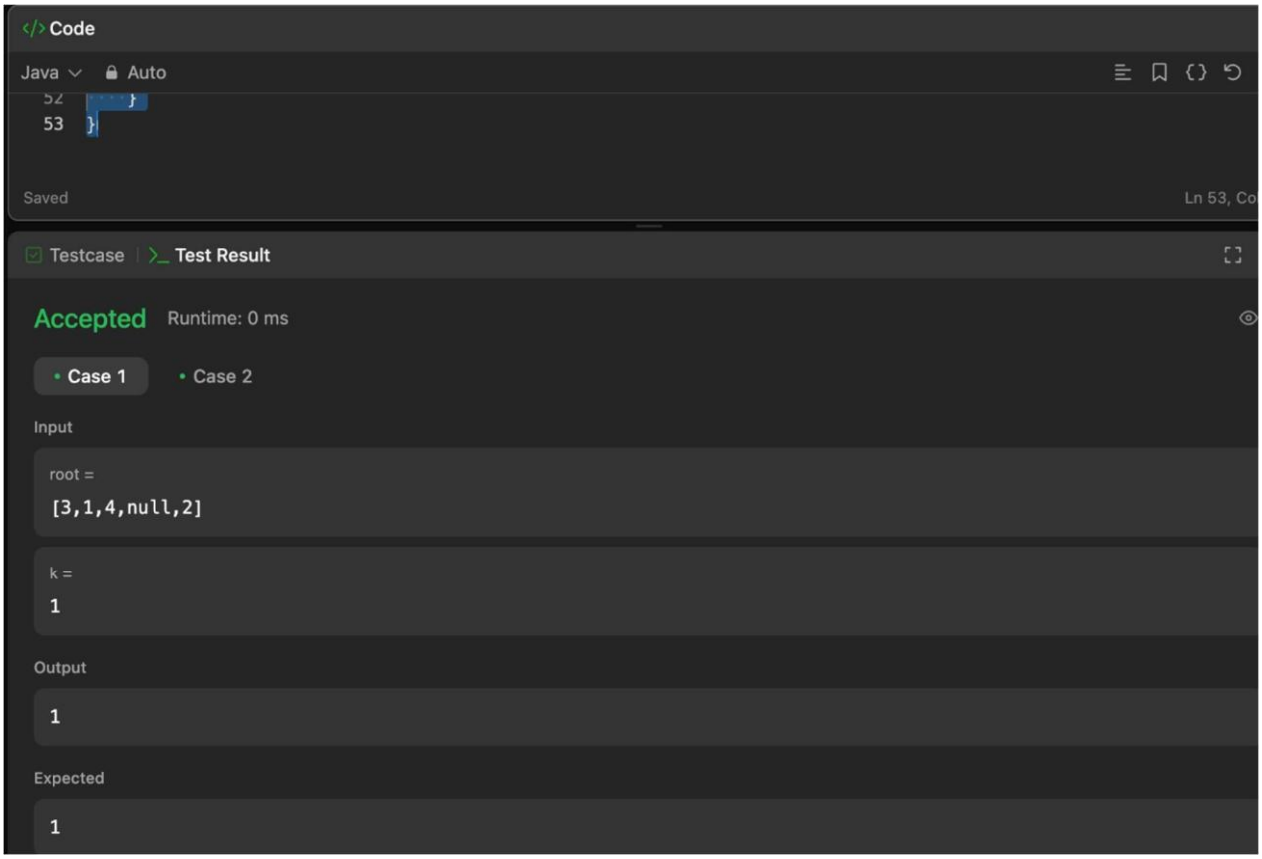
Aim:

Kth Smallest element in a BST Code:

```
import java.util.*;
```

```
class Solution {     public TreeNode buildTree(int[] inorder, int[] postorder) {         if
(inorder == null || postorder == null || inorder.length != postorder.length) {
return null;
        }
        Map<Integer, Integer> inorderMap = new HashMap<>();         for
(int i = 0; i < inorder.length; i++) {             inorderMap.put(inorder[i],
i);
        }
        return buildTreeHelper(inorder, 0, inorder.length - 1, postorder, 0, postorder.length - 1, inorderMap);
    }

    private TreeNode buildTreeHelper(int[] inorder, int inStart, int inEnd, int[] postorder, int
postStart, int postEnd, Map<Integer, Integer> inorderMap) {         if (inStart > inEnd || postStart >
postEnd) {             return null;
        }

        int rootVal = postorder[postEnd];
        TreeNode root = new TreeNode(rootVal);
int rootIndex = inorderMap.get(rootVal);         int
leftSize = rootIndex - inStart;

        root.left = buildTreeHelper(inorder, inStart, rootIndex - 1, postorder, postStart, postStart + leftSize -
1, inorderMap);          root.right = buildTreeHelper(inorder, rootIndex + 1, inEnd, postorder, postStart +
leftSize, postEnd - 1, inorderMap);

        return root;
    }

    public int kthSmallest(TreeNode root, int k) {
        Stack<TreeNode>  stack  =  new  Stack<>();
TreeNode current = root;         int count = 0;

        while (current != null || !stack.isEmpty()) {
            while (current != null) {
stack.push(current);                 current =
current.left;
            }

            current = stack.pop();
count++;             if (count ==
k) {                 return
current.val;
            }

            current = current.right;
        }

        return -1; // Should not reach here if k is valid
    }
}
```

Output:



Problem 9

Aim:

Populating Next Right Pointers in Each Node Code:

```
class Solution {
    public Node connect(Node root) {
if (root == null) {            return null;
        }

        Node leftmost = root;

        while (leftmost.left != null) {
            Node current = leftmost;
```

```
            while (current != null) {
                // Connect left child to right child
                current.left.next = current.right;

                // Connect right child to the left child of next node
if (current.next != null) {
                    current.right.next = current.next.left;
                }

                // Move to the next node in the current level
current = current.next;
            }

            // Move to the next level
            leftmost = leftmost.left;
        }

        return root;
    }
}
```

Output: