

Problem 4,5: Write a program for

1. Morris Inorder Traversal of a Binary Tree.
2. Morris Preorder Traversal of a Binary Tree.

```
class TreeNode:
```

```
    def __init__(self, val):
```

```
        self.val = val
```

```
        self.left = None
```

```
        self.right = None
```

```
def morris_inorder(root):
```

```
    curr = root
```

```
    while curr:
```

```
        if not curr.left:
```

```
            print(curr.val, end=" ")
```

```
            curr = curr.right
```

```
        else:
```

```
            predecessor = curr.left
```

```
            while predecessor.right and predecessor.right != curr:
```

```
                predecessor = predecessor.right
```

```
            if not predecessor.right:
```

```
                predecessor.right = curr
```

```
            curr = curr.left
```

```
        else:
```

```
            predecessor.right = None
```

```
            print(curr.val, end=" ")
```

```
            curr = curr.right
```

```
def morris_preorder(root):
```

```
    curr = root
```

```
    while curr:
```

```
        if not curr.left:
```

```

        print(curr.val, end=" ")

        curr = curr.right
    else:
        predecessor = curr.left
        while predecessor.right and predecessor.right != curr:
            predecessor = predecessor.right

        if not predecessor.right:
            predecessor.right = curr
            print(curr.val, end=" ")
            curr = curr.left
        else:
            predecessor.right = None
            curr = curr.right

```

```

root = TreeNode(1)
root.left = TreeNode(2)
root.right = TreeNode(3)
root.left.left = TreeNode(4)
root.left.right = TreeNode(5)
root.right.left = TreeNode(6)
root.right.right = TreeNode(7)

```

```

print("Morris Inorder Traversal:")
morris_inorder(root)
print()

```

```

print("Morris Preorder Traversal:")
morris_preorder(root)
print()

```


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```
12         print(curr.val, end=" ")
13         curr = curr.right
14     else:
15         predecessor = curr.left
16         while predecessor.right and predecessor.right != curr:
17             predecessor = predecessor.right
```

input

Morris Inorder Traversal:
4 2 5 1 6 3 7
Morris Preorder Traversal:
1 2 4 5 3 6 7
...Program finished with exit code 0
Press ENTER to exit console.