LAB ASSIGNMENT : 11.3

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COURSE : AI ASSISTED CODING

BATCH : 01

QUESTIONS:

Task Description #1 – Stack class implementation
Task: Ask AI to implement a stack class with push(), pop(), peek() and is_empty() methods
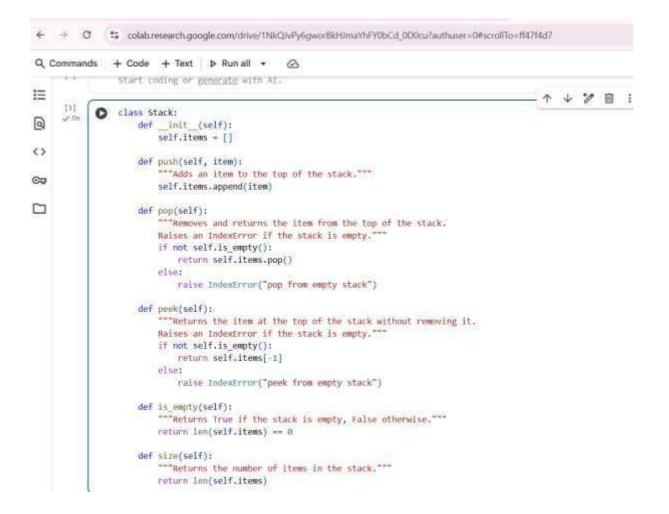
Task Description #2 – Queue Implementation
Task: Use AI to generate a Queue class with enqueue(), dequeue(), and is_empty().

Task Description #3 – Linked List Implementation
Task: Ask AI to create a singly linked list with insert_at_end(), insert_at_beginning(), and display().

Task Description #4 – Binary Search Tree (BST)
Task: Ask AI to generate a simple BST with insert() and inorder_traversal().

TASK-1

Start coding or generate with AI.

```python
class Stack:
    def __init__(self):
        self.items = []

    def push(self, item):
        """Adds an item to the top of the stack."""
        self.items.append(item)

    def pop(self):
        """Removes and returns the item from the top of the stack.
        Raises an IndexError if the stack is empty."""
        if not self.is_empty():
            return self.items.pop()
        else:
            raise IndexError("pop from empty stack")

    def peek(self):
        """Returns the item at the top of the stack without removing it.
        Raises an IndexError if the stack is empty."""
        if not self.is_empty():
            return self.items[-1]
        else:
            raise IndexError("peek from empty stack")

    def is_empty(self):
        """Returns True if the stack is empty, False otherwise."""
        return len(self.items) == 0

    def size(self):
        """Returns the number of items in the stack."""
        return len(self.items)
```

TASK-2

```python
class Queue:
    def __init__(self):
        self.items = []

    def enqueue(self, item):
        """Adds an item to the end of the queue."""
        self.items.append(item)

    def dequeue(self):
        """Removes and returns the item from the front of the queue.
        Raises an IndexError if the queue is empty."""
        if not self.is_empty():
            return self.items.pop(0) # Removes from the beginning
        else:
            raise IndexError("dequeue from empty queue")

    def is_empty(self):
        """Returns True if the queue is empty, False otherwise."""
        return len(self.items) == 0

    def size(self):
        """Returns the number of items in the queue."""
        return len(self.items)
```

Here's an example of how to use the `Queue` class:

TASK-3

```python
class Node:
    def __init__(self, data=None):
        self.data = data
        self.next = None

class LinkedList:
    def __init__(self):
        self.head = None

    def insert_at_beginning(self, data):
        """Inserts a new node with the given data at the beginning of the linked list."""
        new_node = Node(data)
        new_node.next = self.head
        self.head = new_node

    def insert_at_end(self, data):
        """Inserts a new node with the given data at the end of the linked list."""
        new_node = Node(data)
        if self.head is None:
            self.head = new_node
            return
        last_node = self.head
        while last_node.next:
            last_node = last_node.next
        last_node.next = new_node

    def display(self):
        """Prints the data of each node in the linked list."""
        current = self.head
        while current:
            print(current.data, end=" -> ")
            current = current.next
        print("None")
```

TASK-4

```python
class BST:
    def __init__(self):
        self.root = None

    def insert(self, key):
        """Inserts a new node with the given key into the BST."""
        if self.root is None:
            self.root = TreeNode(key)
        else:
            self._insert_recursive(self.root, key)

    def _insert_recursive(self, node, key):
        if key < node.key:
            if node.left is None:
                node.left = TreeNode(key)
            else:
                self._insert_recursive(node.left, key)
        elif key > node.key:
            if node.right is None:
                node.right = TreeNode(key)
            else:
                self._insert_recursive(node.right, key)
        # If key is equal, we don't insert duplicates in this simple BST

    def inorder_traversal(self):
        """Performs an inorder traversal of the BST and prints the keys."""
        self._inorder_traversal_recursive(self.root)
        print() # Add a newline at the end for cleaner output

    def _inorder_traversal_recursive(self, node):
        if node:
            self._inorder_traversal_recursive(node.left)
            print(node.key, end=" ")
            self._inorder_traversal_recursive(node.right)
```