AI ASSISTED CODING

LAB ASSIGNMENT: 11.2

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H.NO: 2403A52064

B.NO: 03

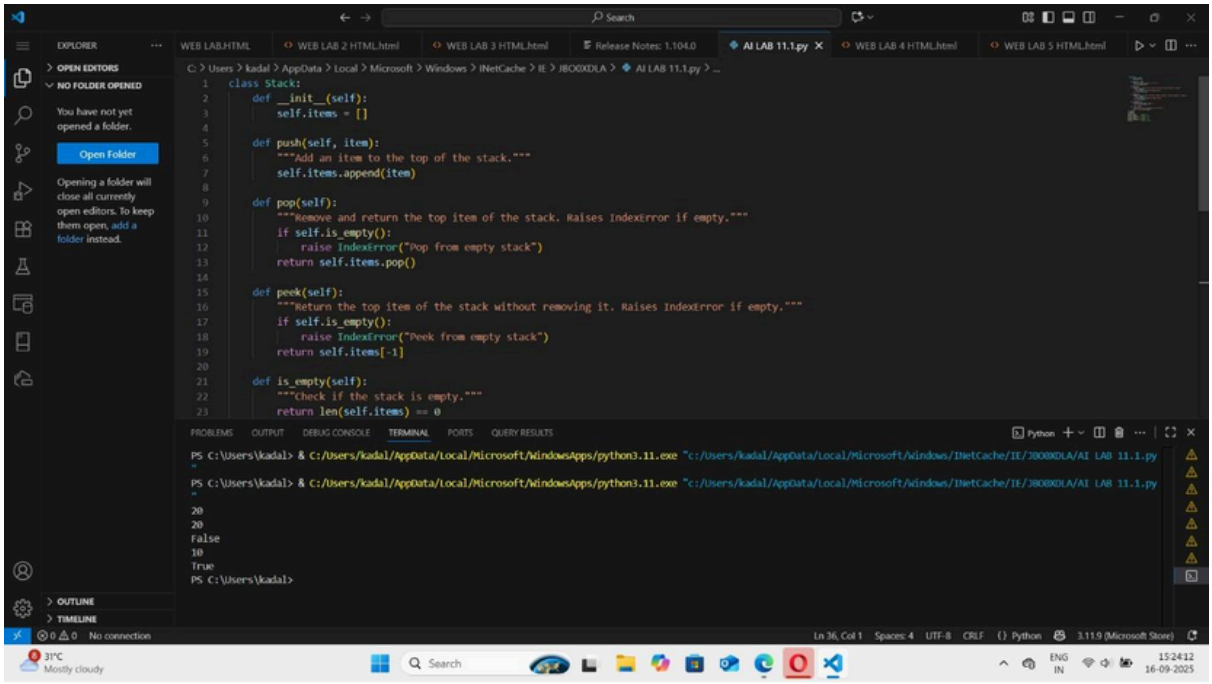
TASK: Stack Implementation

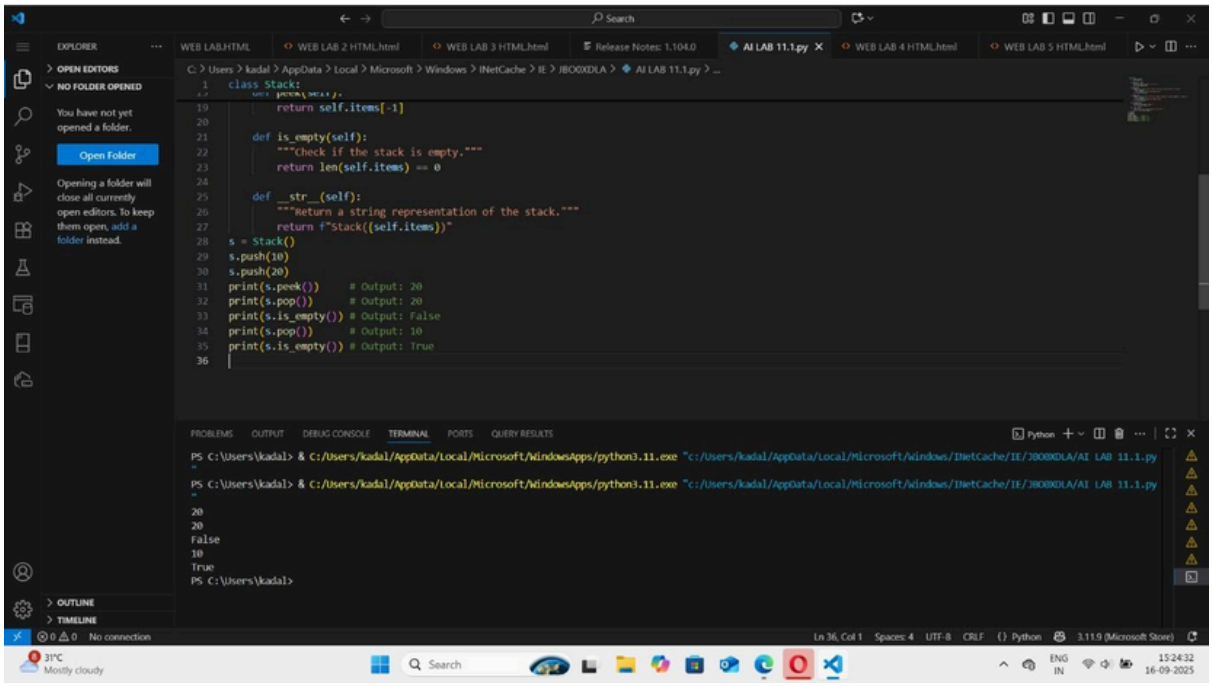
Task: Use AI to generate a Stack class with push, pop, peek, and is_empty methods. Sample Input Code: class Stack: pass.

PROMPT:

Generate python code and stack Implementation
Task: Use AI to generate a Stack class with push, pop, peek, and is_empty methods. Sample Input Code: class Stack: pass.

CODE & OUTPUT:





EXPLAINATION:

A **stack** is a linear data structure that follows the **LIFO** principle — **Last In, First Out**. Think of it like a stack of plates:

- You add (push) a plate to the top.
- You remove (pop) the top plate first.
- You can peek at the top plate without removing it.
- You can check if the stack is empty.

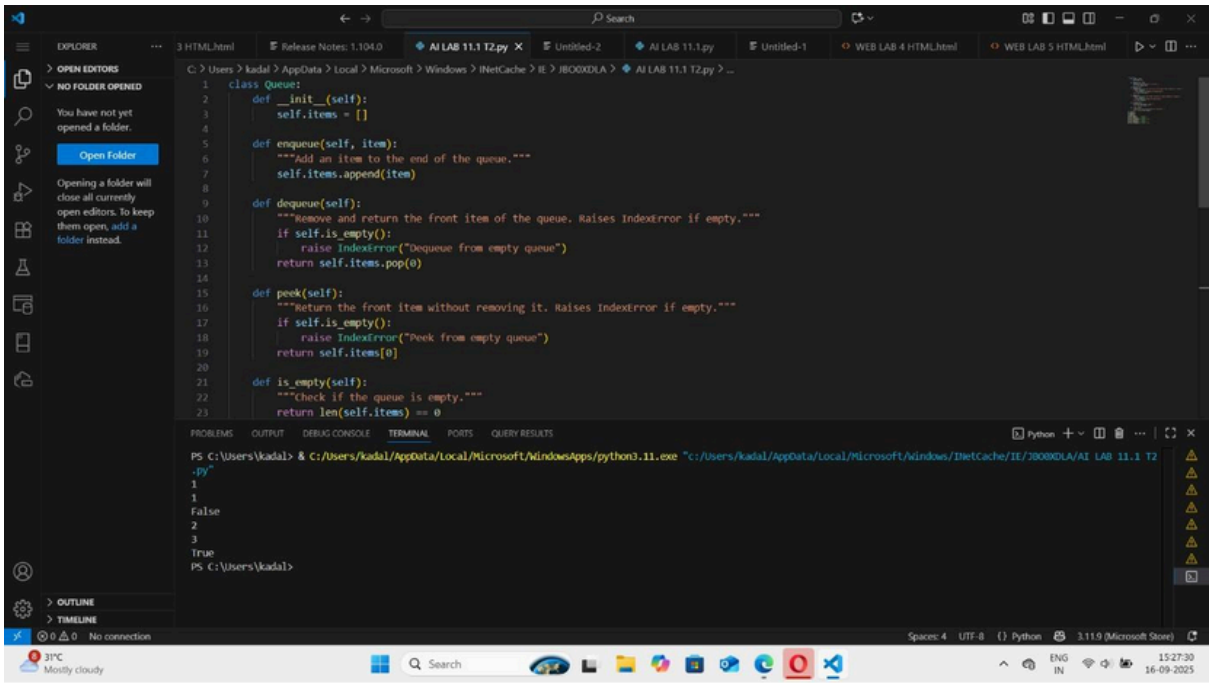
TASK 2:

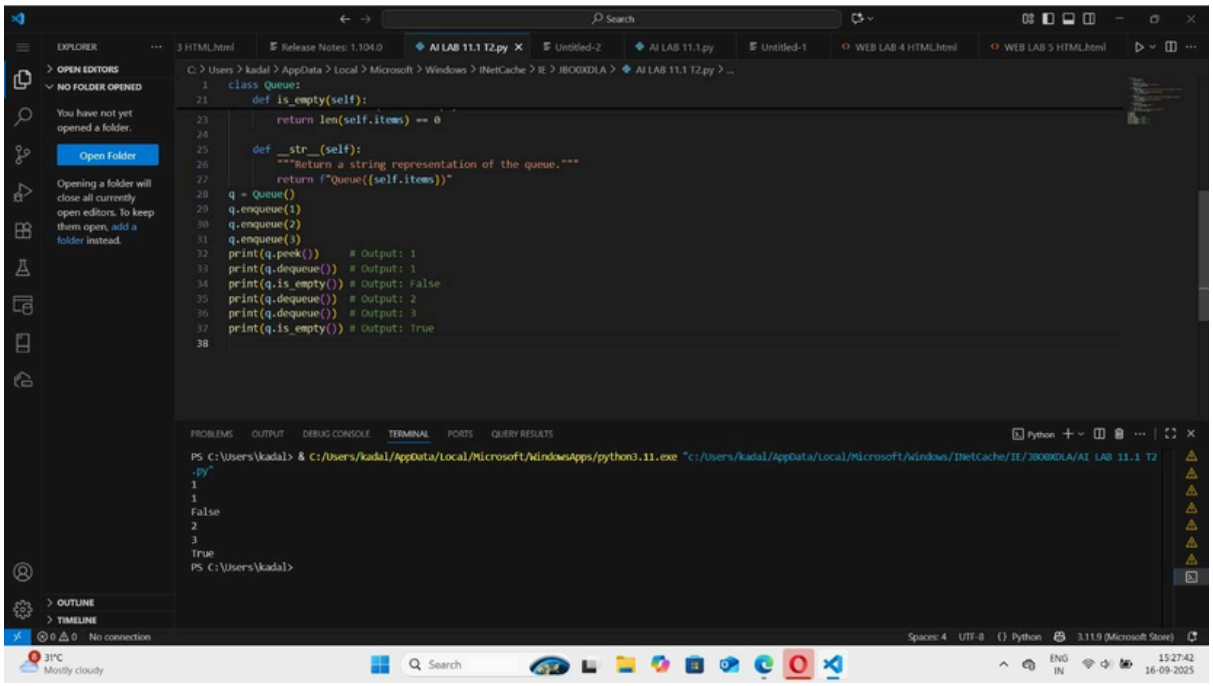
Queue Implementation
Task: Use AI to implement a Queue using Python lists.
Sample Input Code:
class Queue: pass.

PROMPT:

Generate python code and queue Implementation
Task: Use AI to implement a Queue using Python lists.
Sample Input Code:
class Queue: pass.

CODE & OUTPUT:





EXPLAINATION:

🔍 Explanation

Method	Description	Time Complexity
`__init__`	Initializes an empty list to store queue elements	O①
`enqueue()`	Adds an item to the end of the list (rear of the queue)	O①
`dequeue()`	Removes and returns the first item (front of the queue)	O(n)
`peek()`	Returns the first item without removing it	O①
`is_empty()`	Checks if the queue is empty	O①

⚠️ Note: `dequeue()` uses `pop(0)`, which is O(n) because it shifts all remaining elements. For better performance, you can use `collections.deque`.

TASK 3:

Linked List

Task: Use AI to generate a Singly Linked List with insert and display methods.

Sample Input Code:

class Node: pass.

PROMPT:

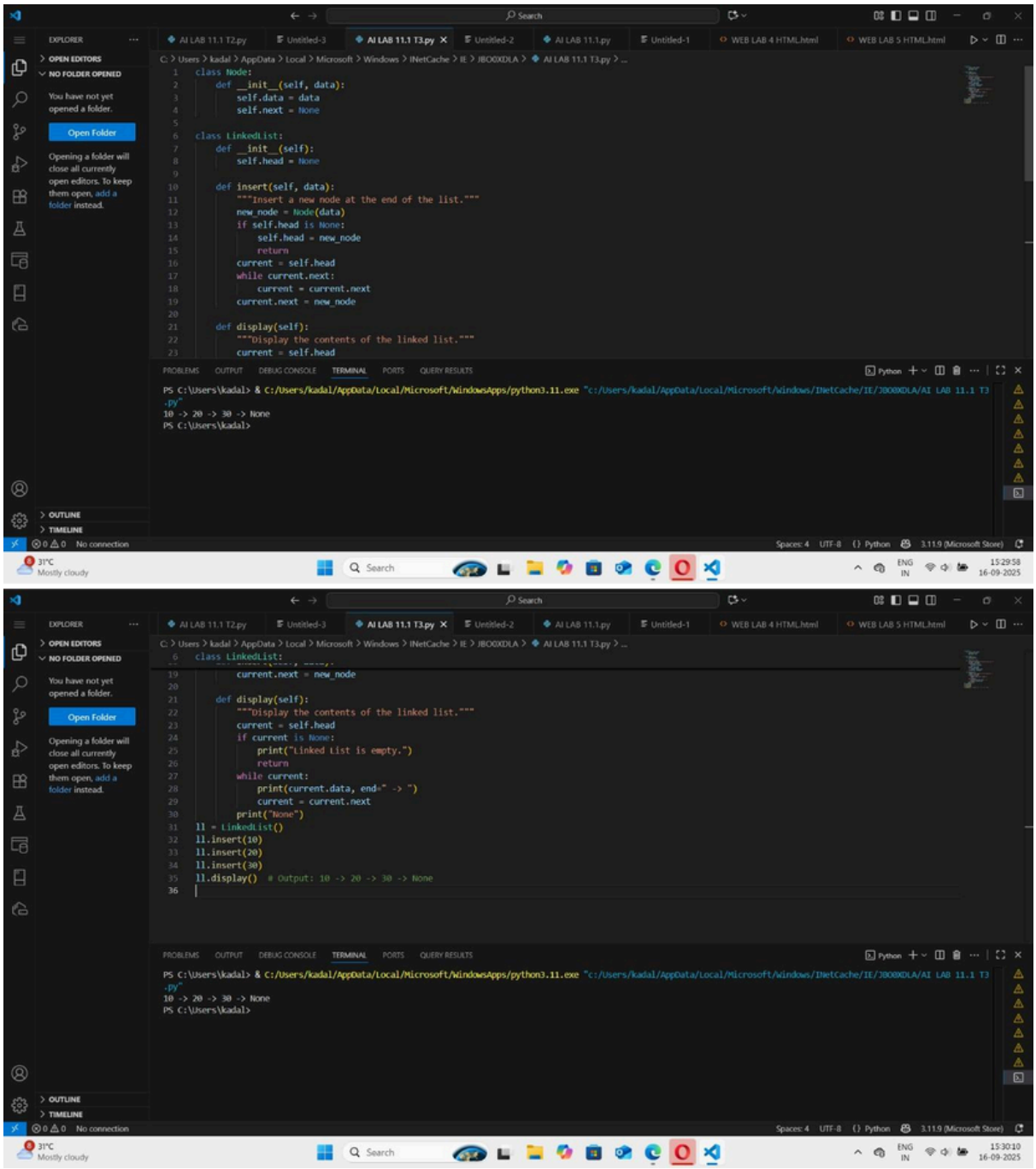
Generate python code and linked List

Task: Use AI to generate a Singly Linked List with insert and display methods.

Sample Input Code:

class Node: pass.

CODE & OUTPUT:



EXPLAINATION:

- Represents each element in the list.
- `data` : stores the value.
- `next` : points to the next node (or `None` if it's the last).

🧩 `LinkedList` Class

- Manages the chain of nodes.
- `head` : reference to the first node.

🔧 `insert(data)`

- Creates a new node.
- If the list is empty, sets it as the head.
- Otherwise, traverses to the end and links the new node.

TASK 4:

Binary Search Tree (BST)
Task: Use AI to create a BST with insert and inorder traversal methods.
Sample Input Code:
class BST: pass.

PROMPT:

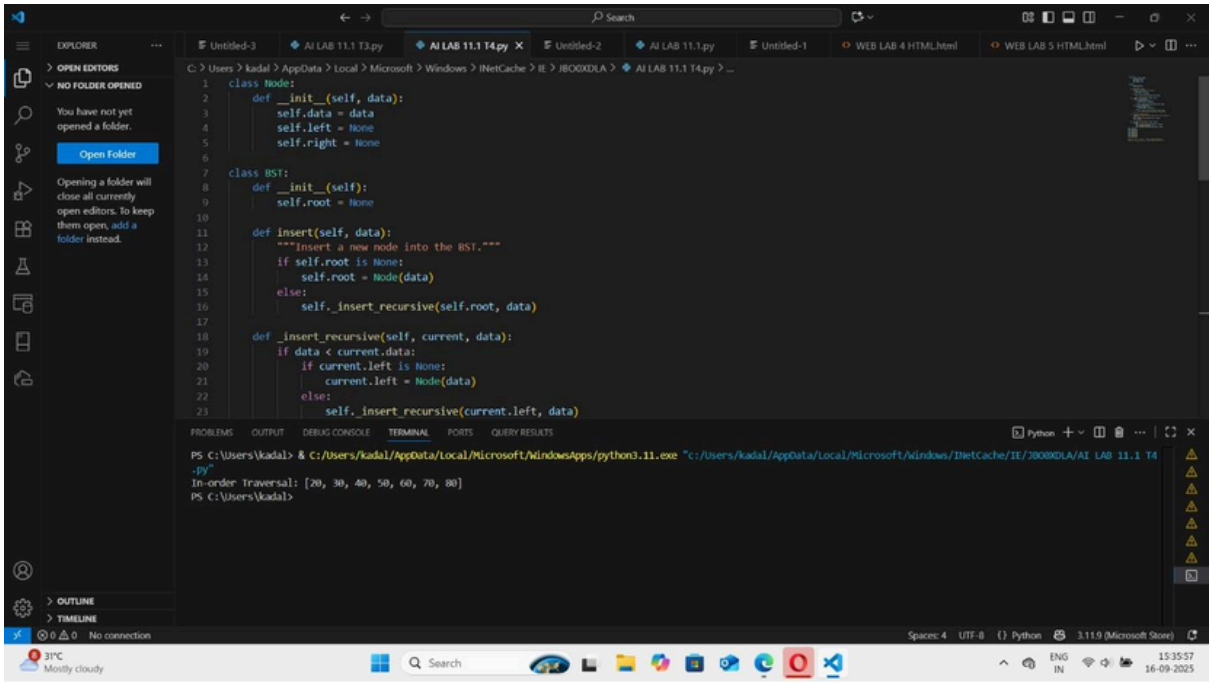
Generate python code and binary Search Tree (BST)

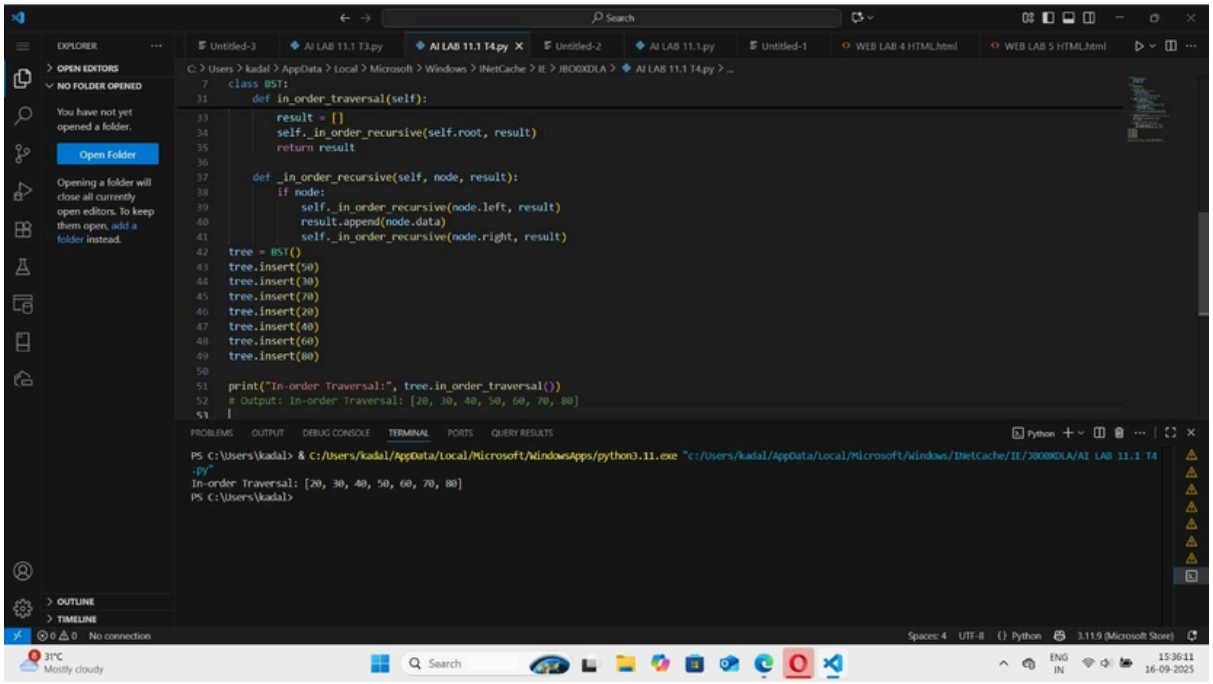
Task: Use AI to create a BST with insert and inorder traversal methods.

Sample Input Code:

class BST: pass.

CODE & OUTPUT:





EXPLAINATION:

- Adds a new value to the tree.
- If the tree is empty, it becomes the root.
- Otherwise, it uses `_insert_recursive()` to find the correct position:
  - If `data < current.data`: go left.
  - If `data > current.data`: go right.
  - If equal: skip (no duplicates).

👀 `in_order_traversal()`

- Returns a sorted list of values.
- Uses `_in_order_recursive()`:
  - Traverse left subtree.
  - Visit current node.
  - Traverse right subtree.

TASK 5:

Hash Table

Task: Use AI to implement a hash table with basic insert, search, and delete methods.

Sample Input Code: class HashTable: pass.

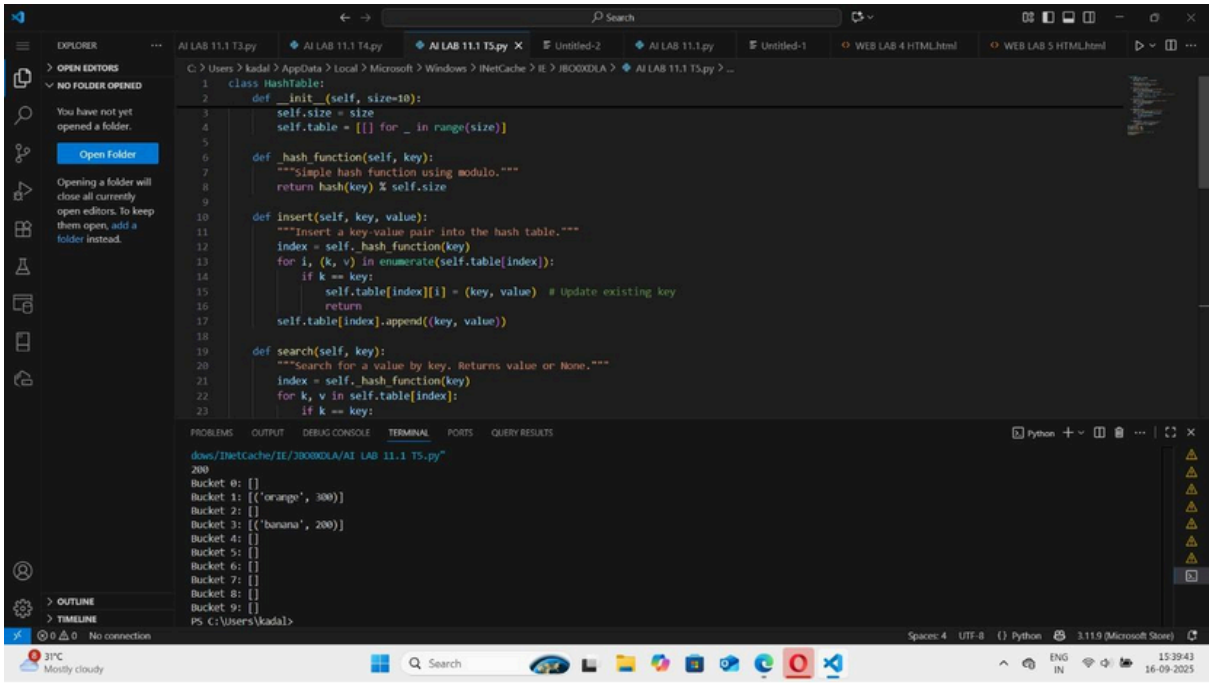
PROMPT:

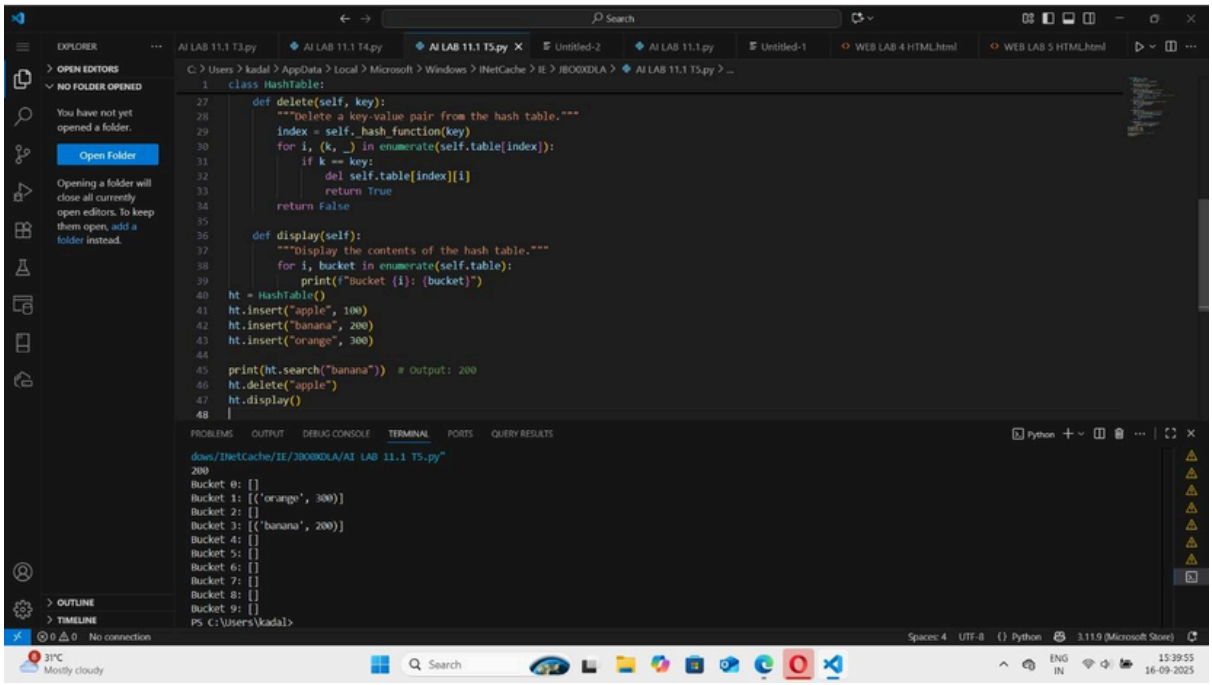
Generate python code and hash Table Task: Use AI to implement a hash table with

basic insert, search, and delete methods.

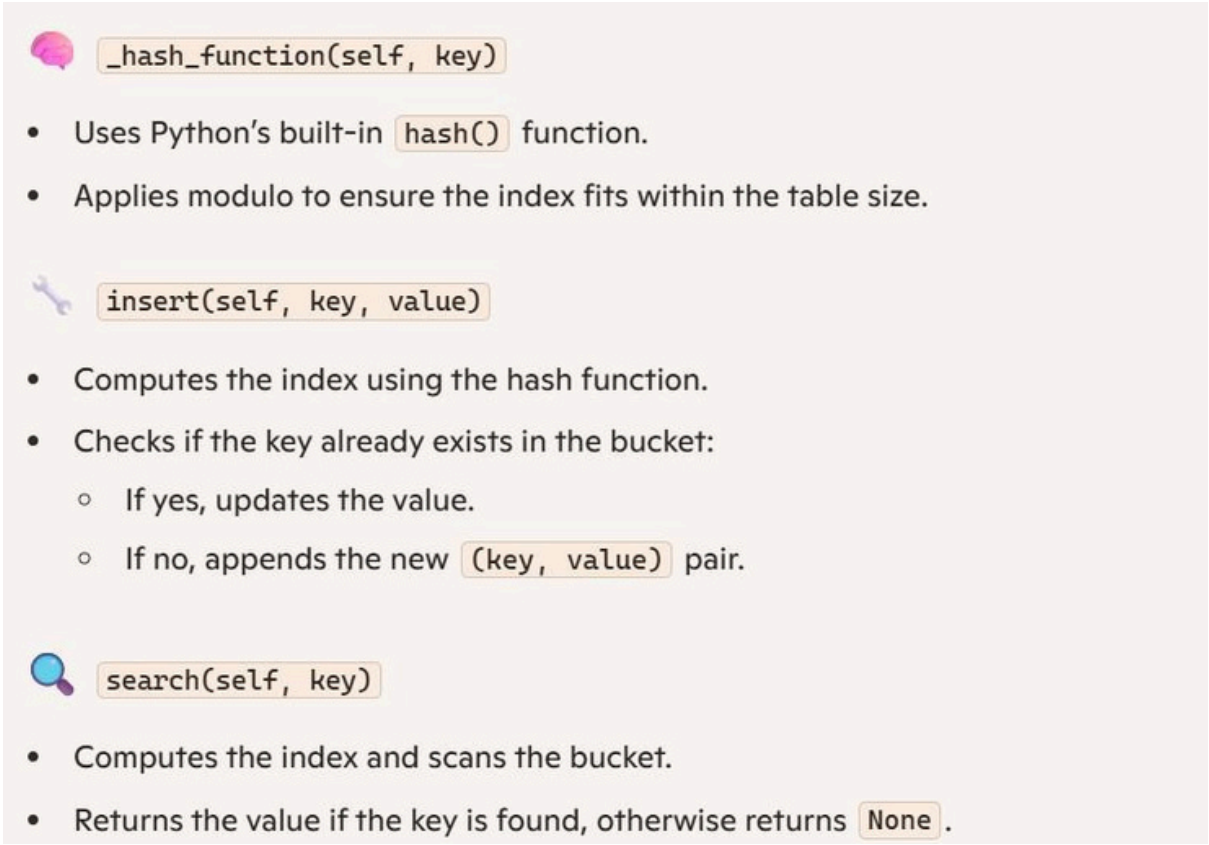
Sample Input Code: class HashTable: pass.

CODE & OUTPUT:





EXPLAINATION:



🧠 `_hash_function(self, key)`

- Uses Python's built-in `hash()` function.
- Applies modulo to ensure the index fits within the table size.

🔧 `insert(self, key, value)`

- Computes the index using the hash function.
- Checks if the key already exists in the bucket:
  - If yes, updates the value.
  - If no, appends the new `(key, value)` pair.

🔍 `search(self, key)`

- Computes the index and scans the bucket.
- Returns the value if the key is found, otherwise returns `None`.

TASK 6:

Graph Representation

Task: Use AI to implement a graph using an adjacency list.

Sample Input Code: class

Graph:

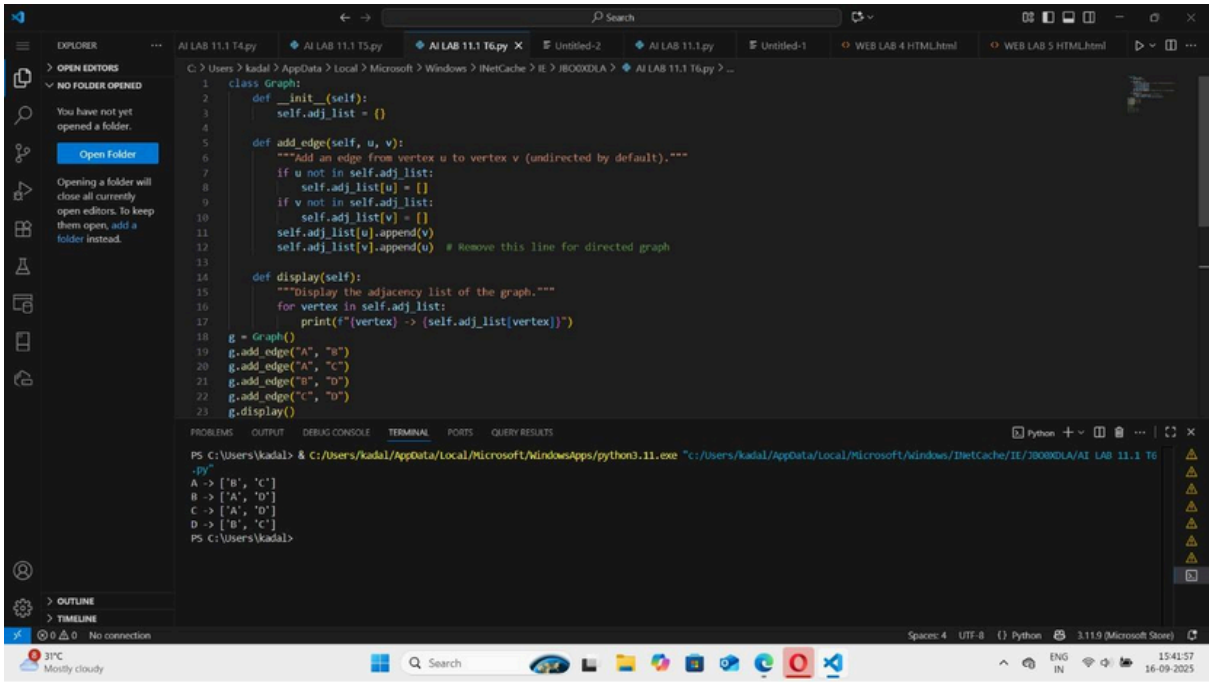
pass.

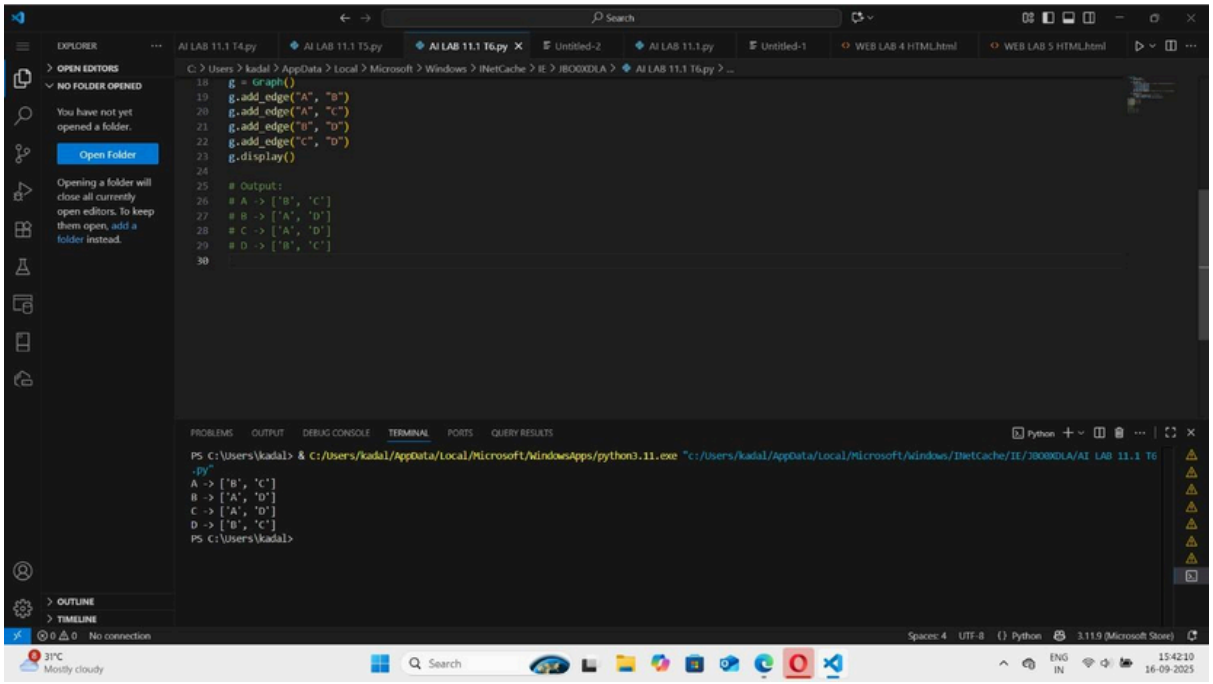
PROMPT:

Generate python code and graph Representation

Task: Use AI to implement a graph using an adjacency list.
Sample Input Code:
class Graph: pass.

CODE & OUTPUT:





EXPLAINATION:

- Initializes an empty list called `heap`.
- This list will store tuples of `(priority, item)`.

🔧 `insert(priority, item)`

- Uses `heapq.heappush()` to add a tuple to the heap.
- The heap maintains order based on the **priority** (lowest number = highest priority).

🗑️ `remove()`

- Uses `heapq.heappop()` to remove and return the item with the **lowest priority value**.
- Raises an error if the queue is empty.

👀 `peek()`

- Returns the item with the highest priority without removing it.

TASK 7:

Priority Queue

Task: Use AI to implement a priority queue using Python's heapq module.

Sample Input Code: class PriorityQueue: pass.

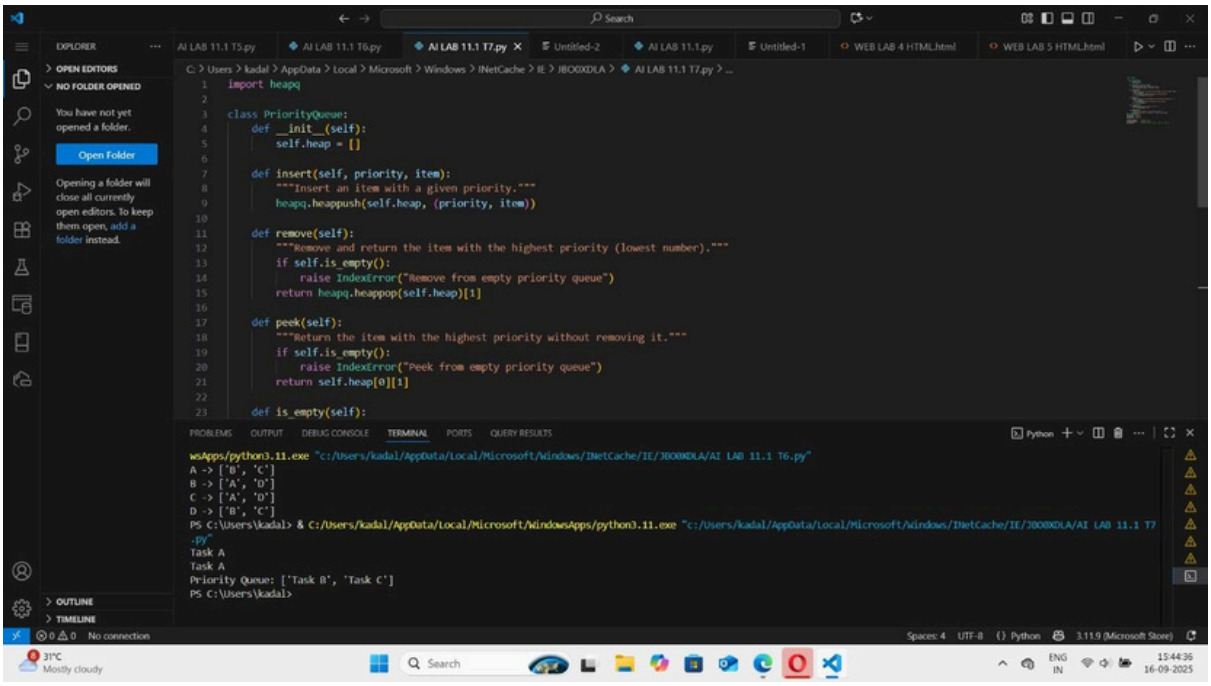
PROMPT:

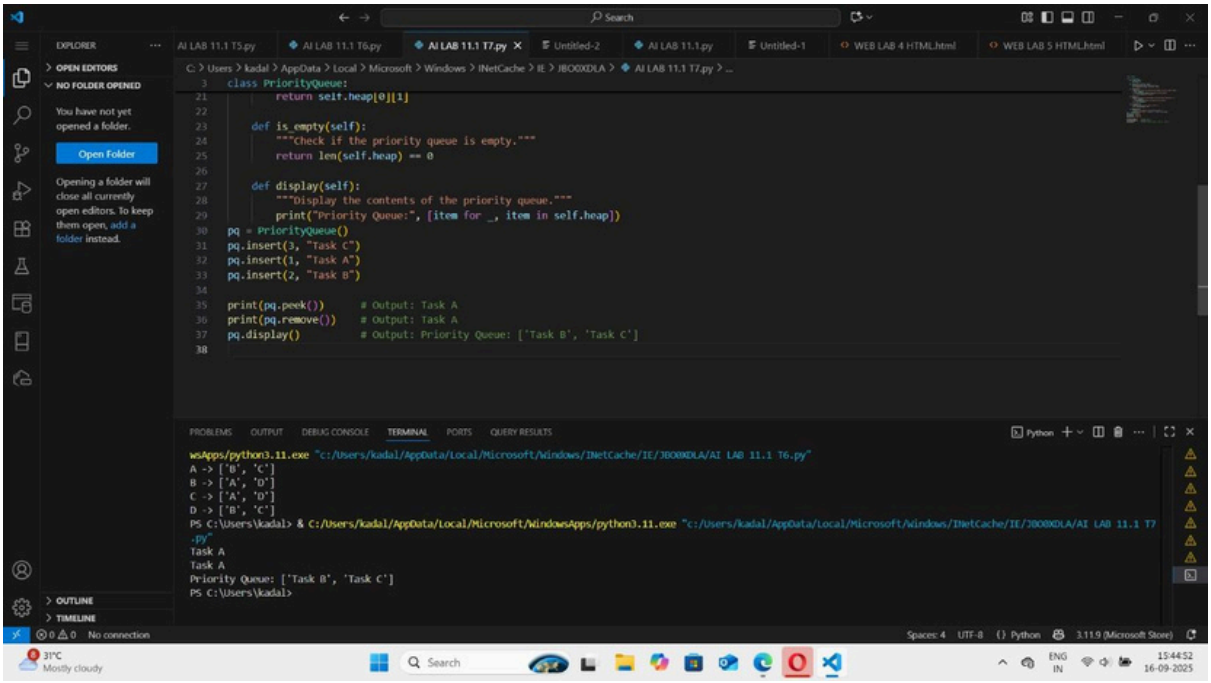
Generate a python code and priority Queue

Task: Use AI to implement a priority queue using Python’s heapq module.

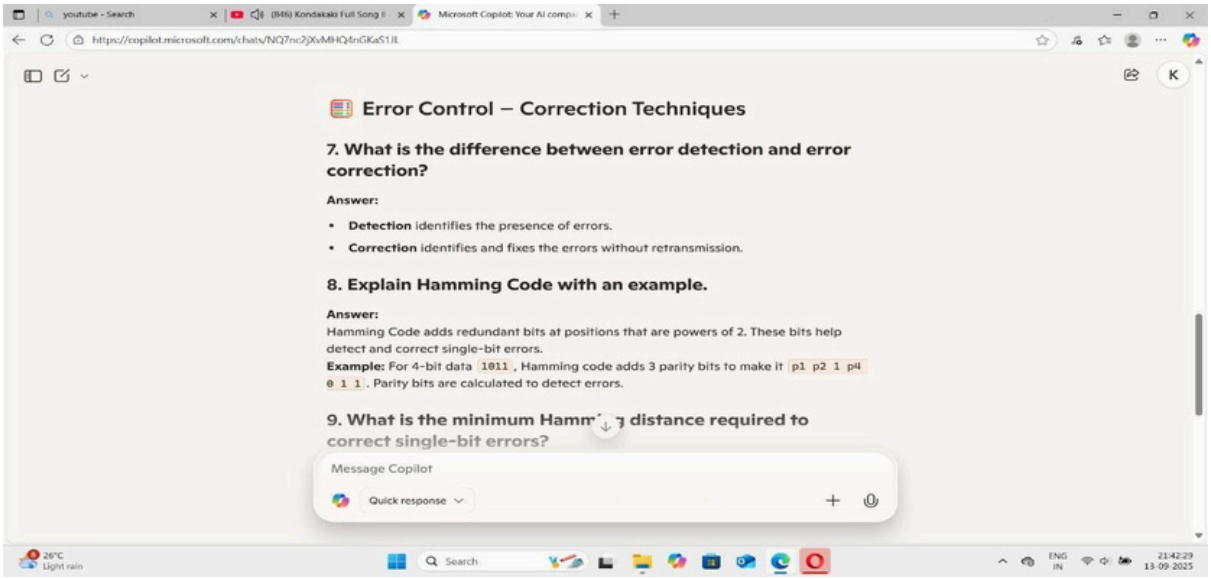
Sample Input Code: class PriorityQueue: pass.

CODE & OUTPUT:





EXPLAINATION:



TASK 8:

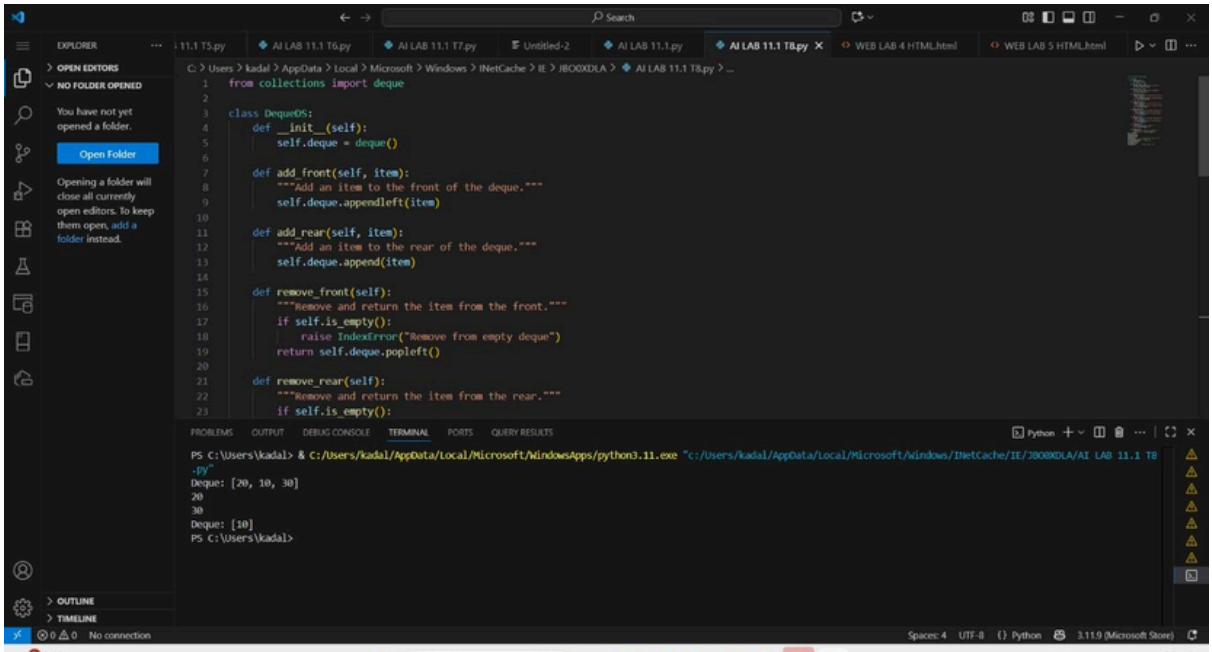
Deque

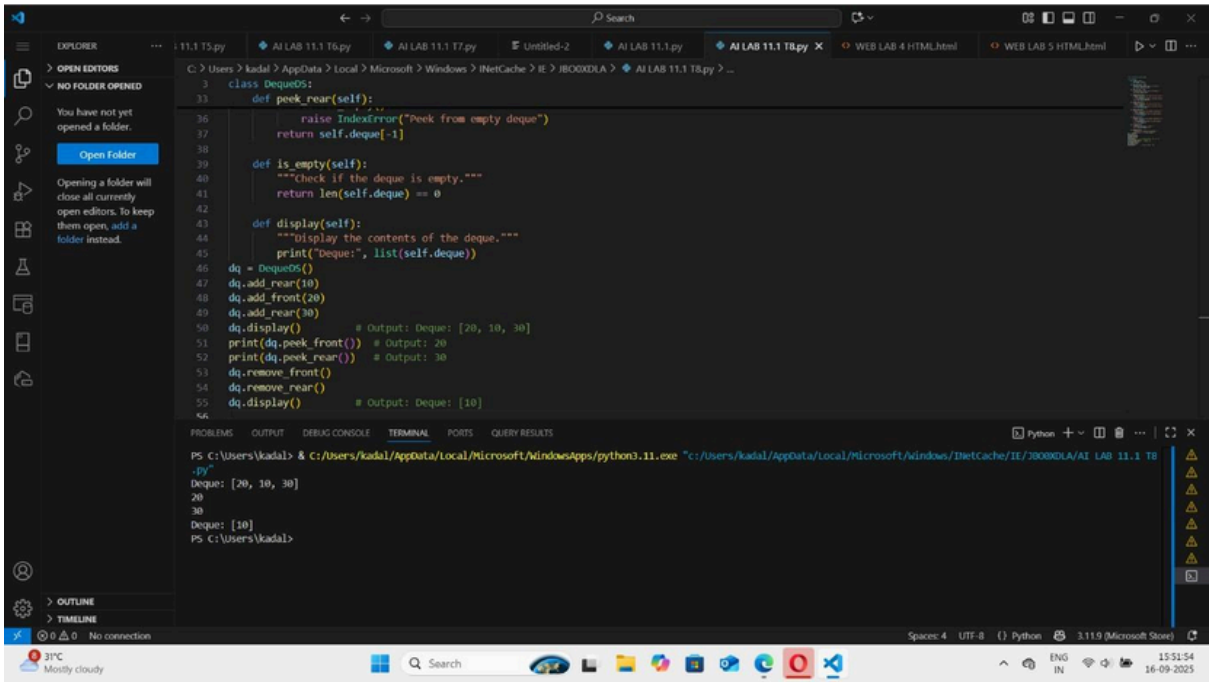
Task: Use AI to implement a double-ended queue using collections.deque.
Sample Input Code:
class DequeDS: pass.

PROMPT:

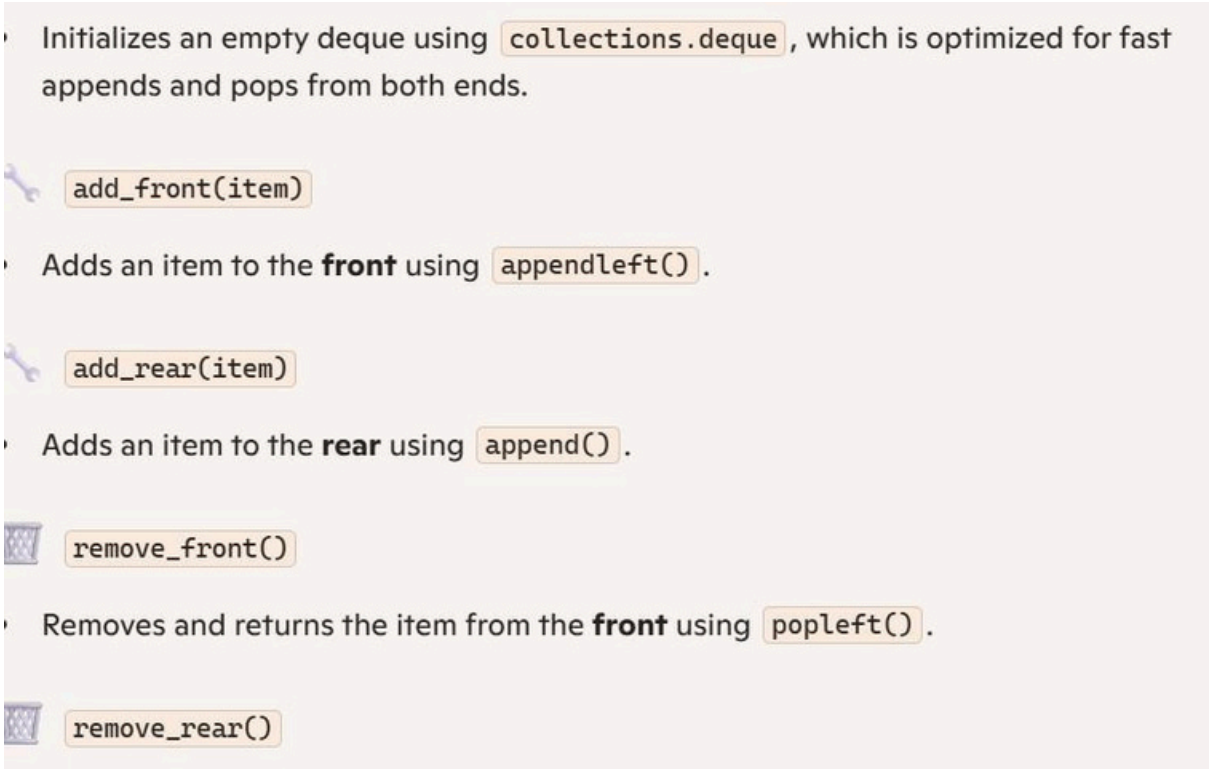
Generate python code and deque Task:
Use AI to implement a double-ended queue using collections.deque.
Sample Input Code:
class DequeDS: pass.

CODE &OUTPUT:





EXPLAINATION:



TASK 9:

AI-Generated Data Structure Comparisons Task: Use AI to generate a comparison table of different data structures (stack, queue, linked list, etc.) including time complexities.

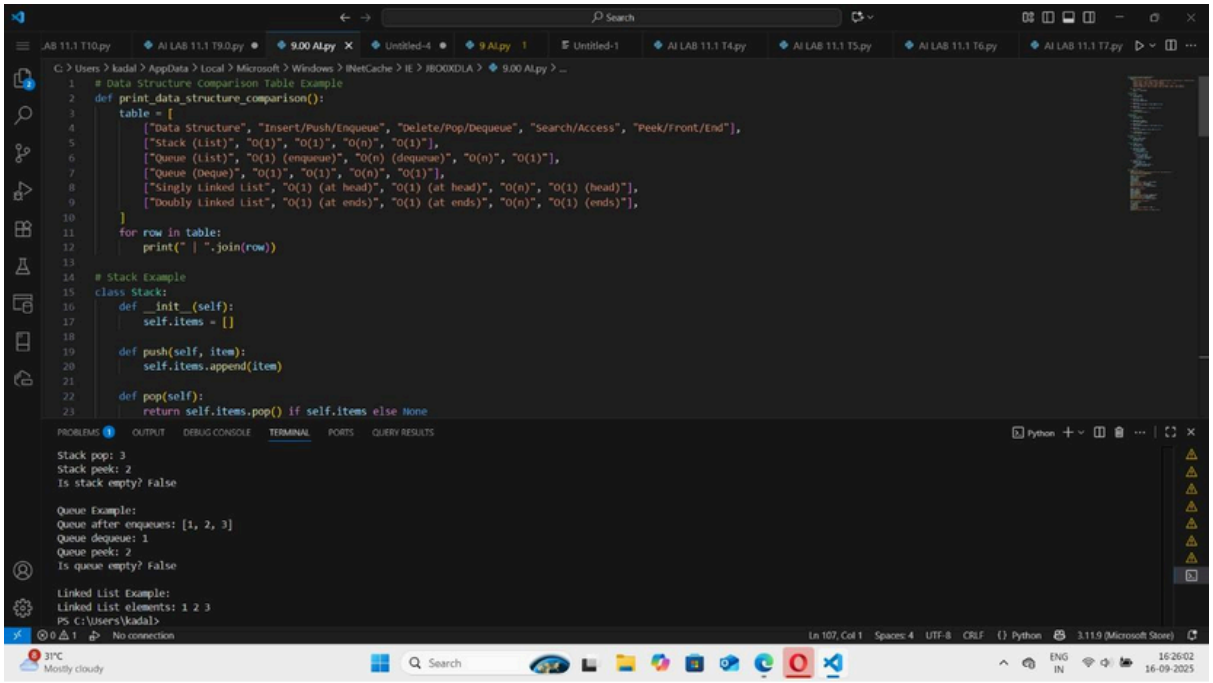
Sample Input Code:

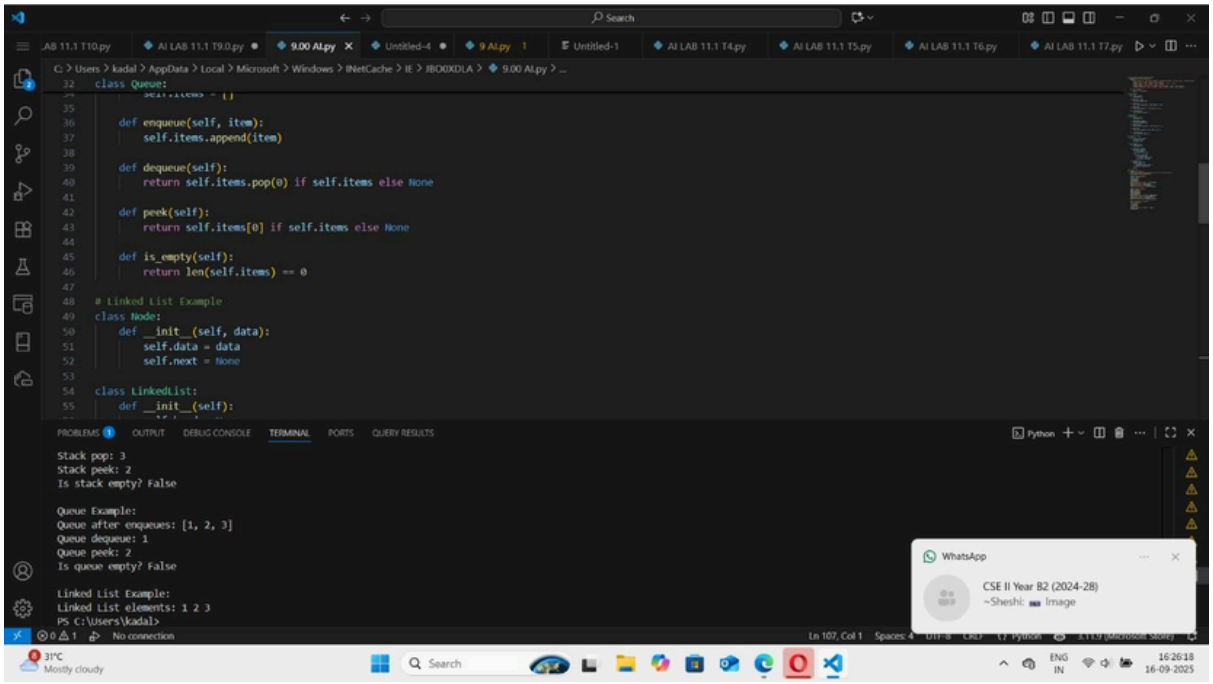
No code, prompt AI for a data structure comparison table.

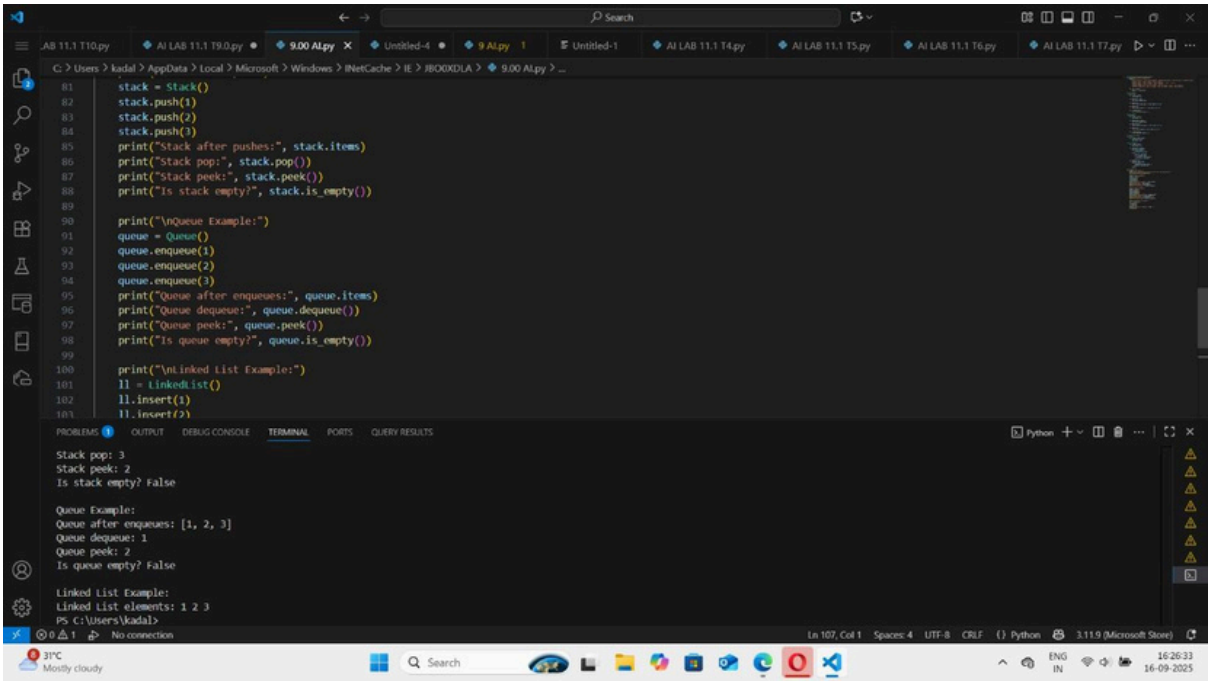
PROMPT:

Generate python code and AI-Generated Data Structure Comparisons
Task: Use AI to generate a comparison table of different data structures (stack, queue, linked list, etc.) including time complexities.
Sample Input Code:
No code, prompt AI for a data structure comparison table.

CODE & OUTPUT:


AB 11.1 T10.py
AI LAB 11.1 T9.0.py
9.00 AI.py
Untitled-4
9 AI.py
Untitled-1
AI LAB 11.1 T4.py
AI LAB 11.1 T5.py
AI LAB 11.1 T6.py
AI LAB 11.1 T7.py
C: > Users > kadal > AppData > Local > Microsoft > Windows > INetCache > IE > JBO0XDLA > 9.00 AI.py > ...
# Data Structure Comparison Table Example
def print_data_structure_comparison():
table = [
["Data Structure", "Insert/Push/Enqueue", "Delete/Pop/Dequeue", "Search/Access", "Peek/Front/End"],
["Stack (List)", "O(1)", "O(1)", "O(n)", "O(1)"],
["Queue (List)", "O(1) (enqueue)", "O(n) (dequeue)", "O(n)", "O(1)"],
["Queue (Deque)", "O(1)", "O(1)", "O(n)", "O(1)"],
["Singly Linked List", "O(1) (at head)", "O(1) (at head)", "O(n)", "O(1) (head)"],
["Doubly Linked List", "O(1) (at ends)", "O(1) (at ends)", "O(n)", "O(1) (ends)"],
]
for row in table:
print(" | ".join(row))
# Stack Example
class Stack:
def __init__(self):
self.items = []
def push(self, item):
self.items.append(item)
def pop(self):
return self.items.pop() if self.items else None
PROBLEMS 1
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
QUERY RESULTS
Python
Stack pop: 3
Stack peek: 2
Is stack empty? False
Queue Example:
Queue after enqueues: [1, 2, 3]
Queue dequeue: 1
Queue peek: 2
Is queue empty? False
Linked List Example:
Linked List elements: 1 2 3
PS C:\Users\kadal>
No connection
Ln 107, Col 1
Spaces: 4
UTF-8
CRLF
Python
3.11.9 (Microsoft Store)
31°C
Mostly cloudy
Search
ENG
IN
16:26:02
16-09-2025


AB 11.1 T10.py
AI LAB 11.1 T9.0.py
9.00 AI.py
Untitled-4
9 AI.py
Untitled-1
AI LAB 11.1 T4.py
AI LAB 11.1 T5.py
AI LAB 11.1 T6.py
AI LAB 11.1 T7.py
C: > Users > kadal > AppData > Local > Microsoft > Windows > INetCache > IE > JBO0XDLA > 9.00 AI.py > ...
class Queue:
def enqueue(self, item):
self.items.append(item)
def dequeue(self):
return self.items.pop(0) if self.items else None
def peek(self):
return self.items[0] if self.items else None
def is_empty(self):
return len(self.items) == 0
# Linked List Example
class Node:
def __init__(self, data):
self.data = data
self.next = None
class LinkedList:
def __init__(self):
PROBLEMS 1
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
QUERY RESULTS
Python
Stack pop: 3
Stack peek: 2
Is stack empty? False
Queue Example:
Queue after enqueues: [1, 2, 3]
Queue dequeue: 1
Queue peek: 2
Is queue empty? False
Linked List Example:
Linked List elements: 1 2 3
PS C:\Users\kadal>
WhatsApp
CSE II Year B2 (2024-28)
~Sheshi: Image
No connection
Ln 107, Col 1
Spaces: 4
31°C
Mostly cloudy
Search
ENG
IN
16:26:18
16-09-2025



EXPLAINATION:

`def print_data_structure_comparison():`

- Defines a function that prints a formatted comparison table.

`table = [...]`

- A list of lists, where each inner list represents a row in the table.
- The first row is the header: column titles like "Insert", "Delete", etc.
- Each subsequent row compares a specific data structure.

`" | ".join(row)`

- Joins each element in the row with `" | "` to mimic a table format.
- This makes the output readable and aligned like a markdown-style table.

TASK 10:

Task Description #10 Real-Time Application Challenge – Choose the Right
Data Structure Scenario:

Your college wants to develop a Campus Resource Management System that handles:
1. StudentAttendanceTracking–Dailylog of students entering/exiting the campus.
2. EventRegistrationSystem–Manage participants in events with quick search and removal.
3. LibraryBookBorrowing–Keeptrackof available books and their due dates.
4. BusSchedulingSystem–Maintainbus routes and stop connections.
5. CafeteriaOrderQueue–Servestudents in the order they arrive.
Student Task:
• For each feature, select the most appropriate data structure from the list below: o Stack o Queue o Priority Queue o Linked List

o Binary Search Tree (BST)
o Graph o Hash Table o
Deque
• Justifyyourchoicein2–3sentencesper feature.
• Implementoneselectedfeatureasa working Python program with AI- assisted code generation.

PROMPT:

Generate python code and task Description #10 Real-Time Application Challenge – Choose the
Right Data Structure Scenario:

Your college wants to develop a Campus Resource Management System that handles:
1. StudentAttendanceTracking–Dailylog of students entering/exiting the campus.

2. EventRegistrationSystem–Manage participants in events with quick search and removal.
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• For each feature, select the most appropriate data structure from the list below:
o Stack o Queue o Priority Queue o Linked List
o Binary Search Tree (BST)
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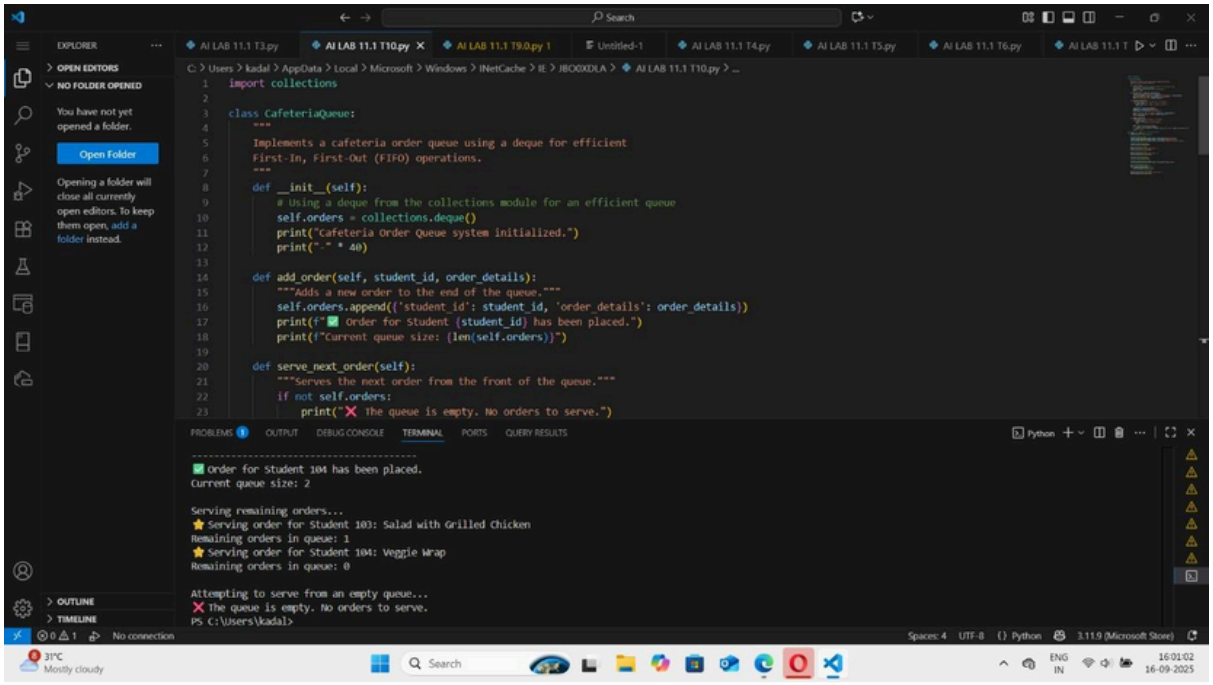
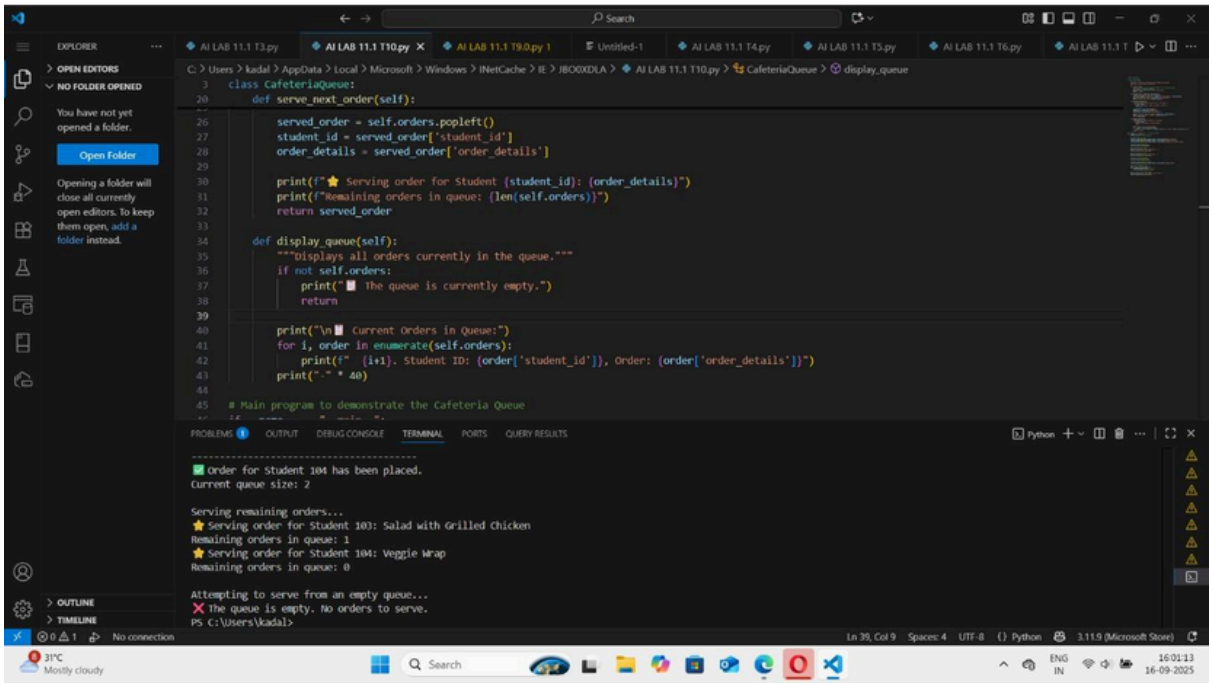
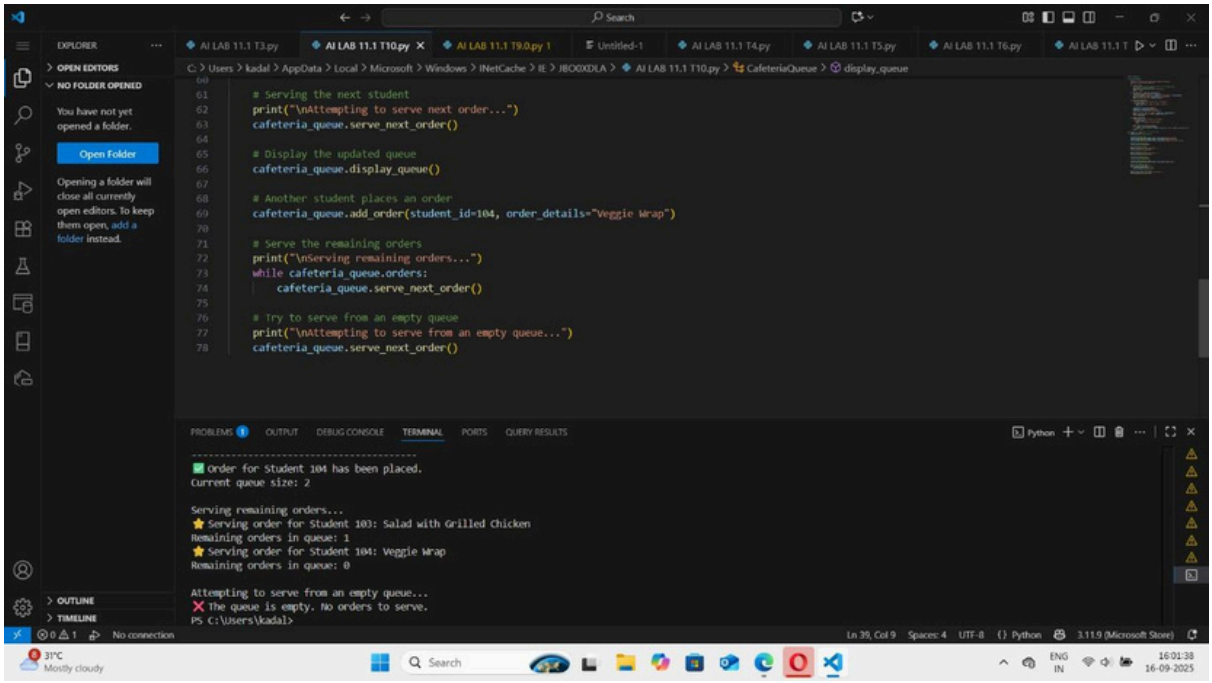
• Justifyyourchoicein2–3sentencesper feature.

- Implementoneselectedfeatureasa working Python program with AI- assisted code generation.

CODE & OUTPUT:







EXPLAINATION:

- Initializes an empty list `queue` to store student names.

🍽️ `place_order(student_name)`

- Adds a student to the end of the queue using `append()` — O(1) time.

📃 `serve_order()`

- Removes and returns the first student using `pop(0)` — O(n) time due to shifting.
- Raises an error if the queue is empty.

👀 `peek_next()`

- Returns the first student without removing them — O(1) time.

✅ `is_empty()`

- Checks if the queue is empty — O(1) time.