Assignmennt 11.3 Ai Assisted Coding

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Batch: 05

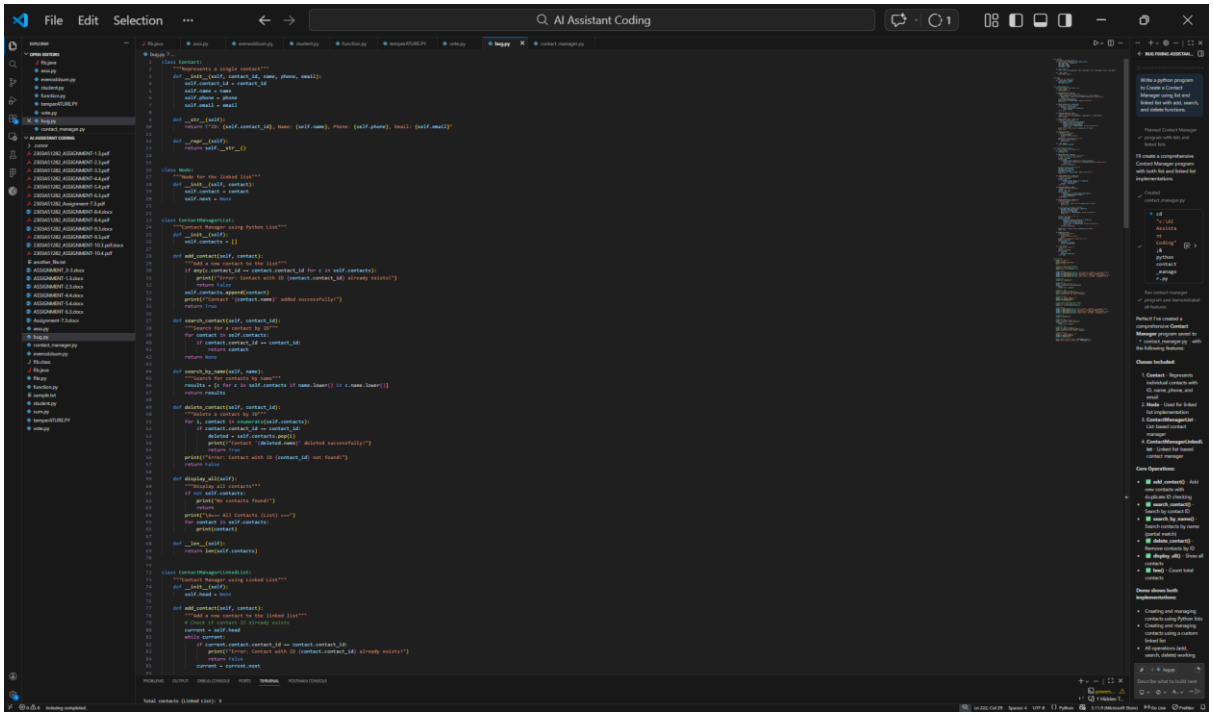
Task 1:

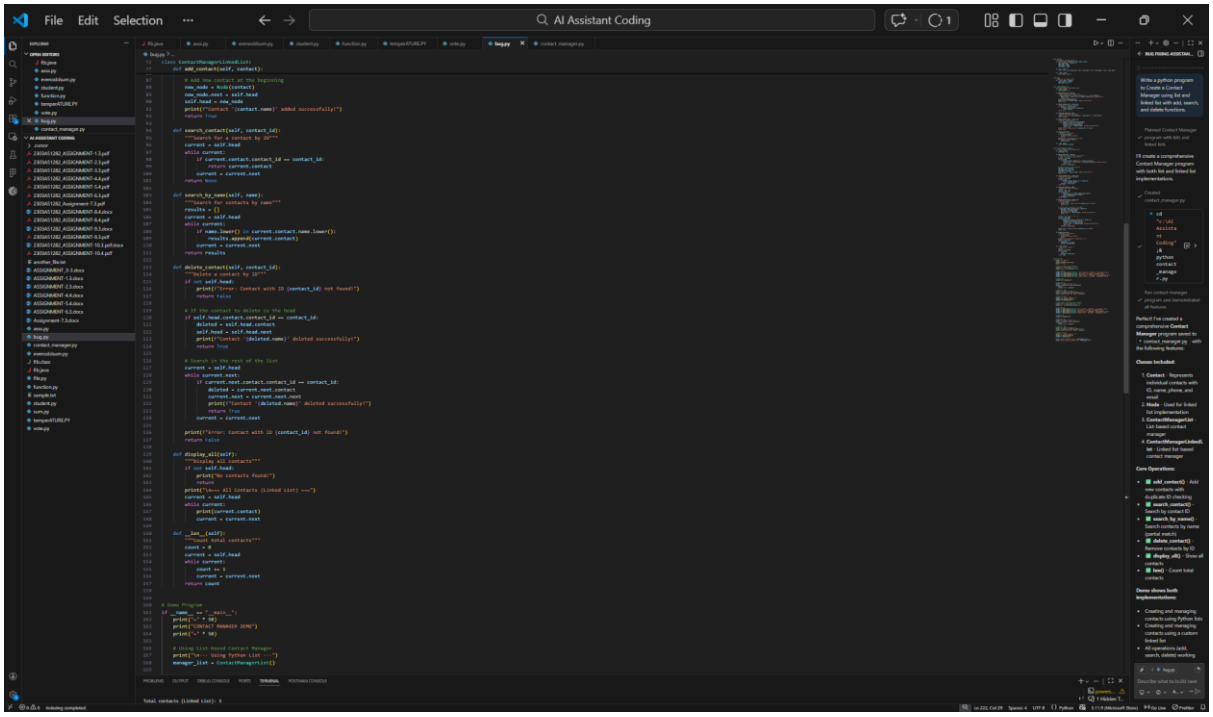
Smart Contact Manager (Arrays & Linked Lists)
Scenario
SR University's student club requires a simple Contact Manager Application to store members' names and phone numbers. The system should support efficient addition, searching, and deletion of contacts.

Prompt:

Write a python program to Create a Contact Manager using list and linked list with add, search, and delete functions.

Code:

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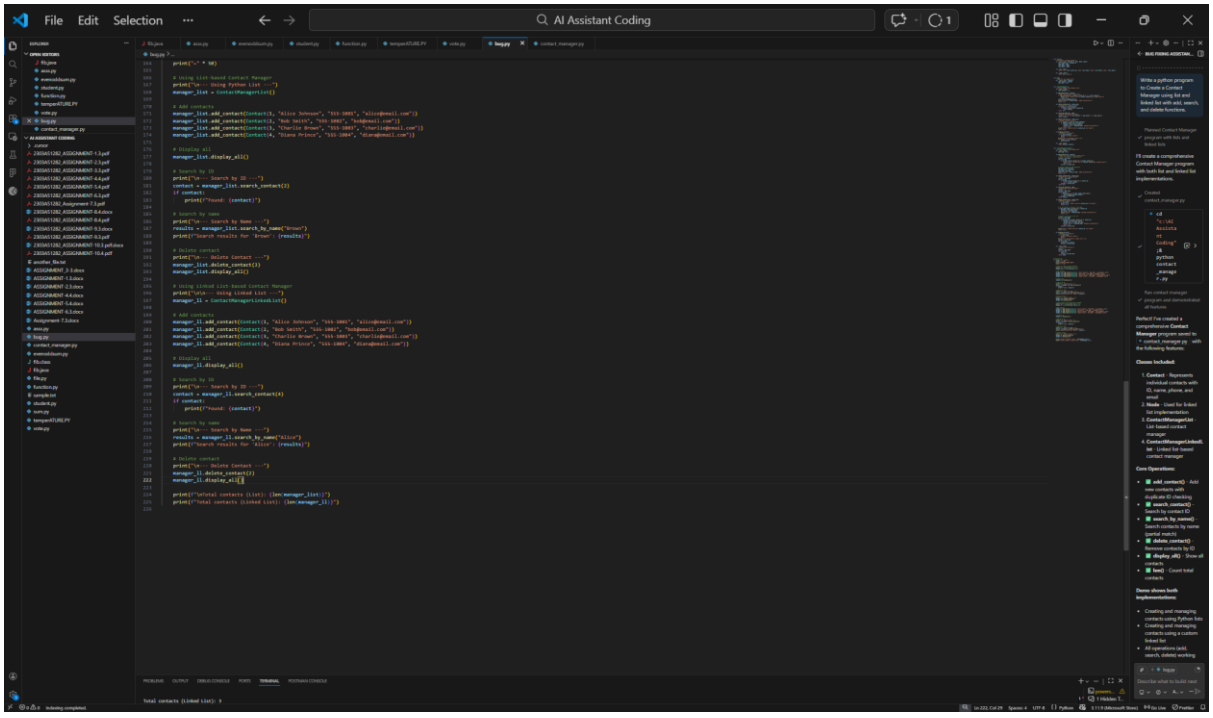
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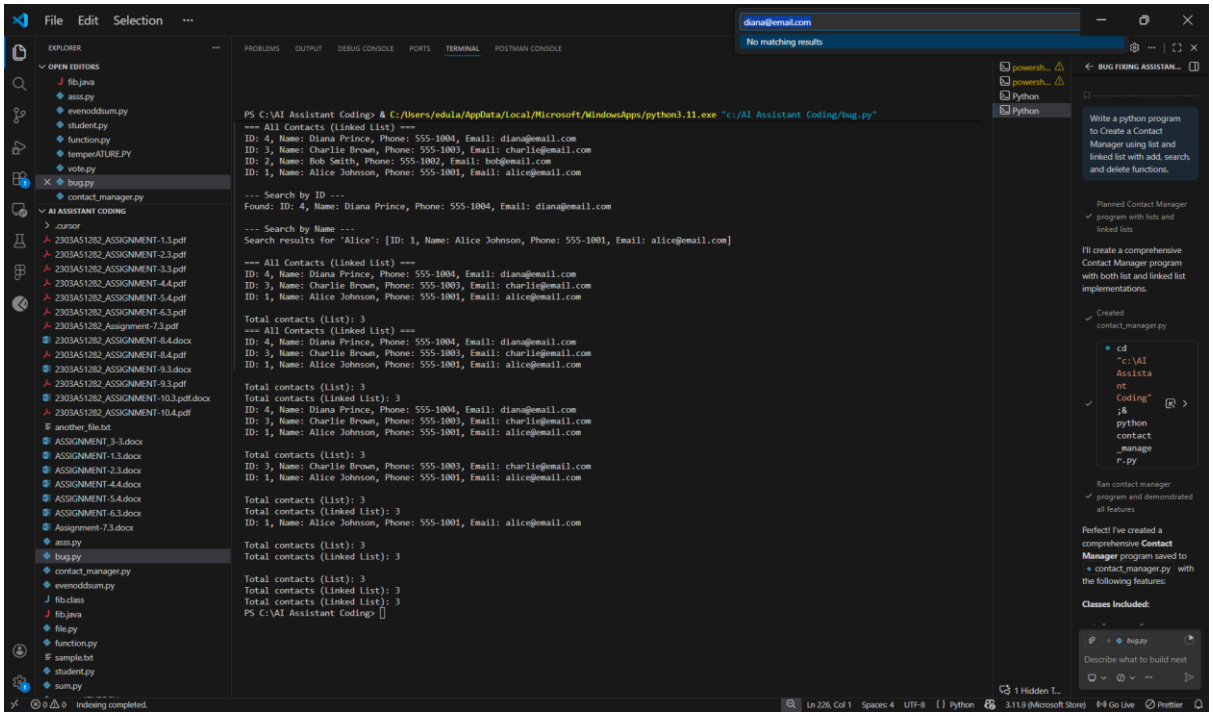
Output:



Explanation:

- In an array, adding at the end is fast, but inserting in the middle is slow because elements must shift.
- In a linked list, insertion is fast because no shifting is needed.
- Searching takes the same time in both (you must check each element).
- Deleting in an array is slower due to shifting elements.
- Linked list is better for frequent insertions and deletions.

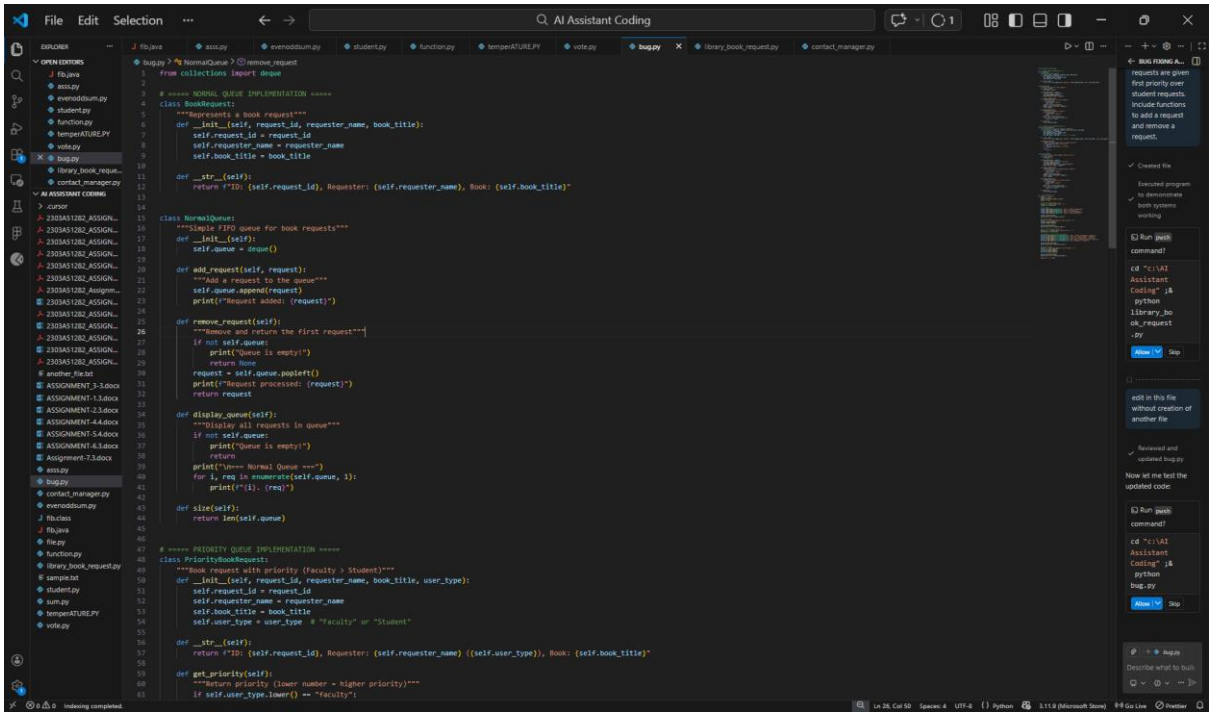
Task 2:

Library Book Search System (Queues & Priority Queues)
Scenario
The SRU Library manages book borrow requests. Students and faculty submit requests, but faculty requests must be prioritized over student requests.

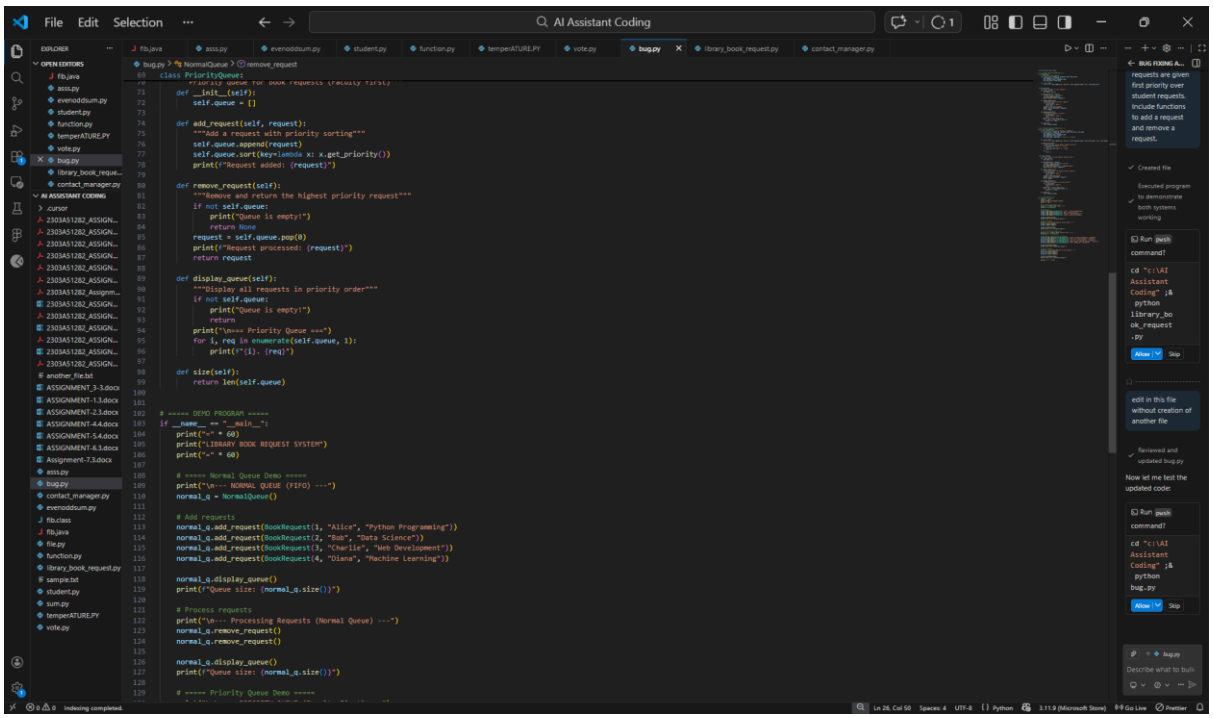
Prompt:

Write a Python program for a library book request system.First, make a normal queue where requests are handled in the order they come.Then, make another version where faculty requests are given first priority over student requests.Include functions to add a request and remove a request.

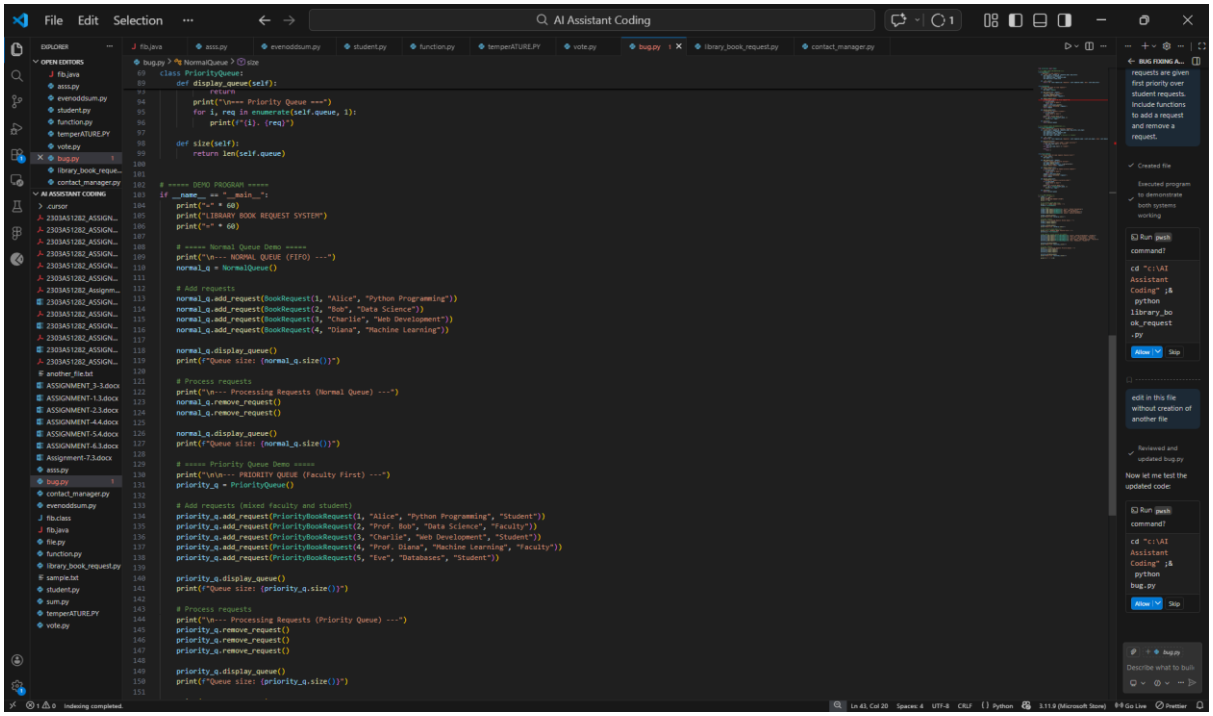
Code:



```python
from collections import deque

# ===== NORMAL QUEUE IMPLEMENTATION =====
class BookRequest:
    """Represents a book request"""
    def __init__(self, request_id, requester_name, book_title):
        self.request_id = request_id
        self.requester_name = requester_name
        self.book_title = book_title

    def __str__(self):
        return f"ID: {self.request_id}, Requester: {self.requester_name}, Book: {self.book_title}"


class NormalQueue:
    """Simple FIFO queue for book requests"""
    def __init__(self):
        self.queue = deque()

    def add_request(self, request):
        """Add a request to the queue"""
        self.queue.append(request)
        print(f"Request added: {request}")

    def remove_request(self):
        """Remove and return the first request"""
        if not self.queue:
            print("Queue is empty!")
            return None
        request = self.queue.popleft()
        print(f"Request processed: {request}")
        return request

    def display_queue(self):
        """Display all requests in queue"""
        if not self.queue:
            print("Queue is empty!")
            return
        print("\n=== Normal Queue ===")
        for i, req in enumerate(self.queue, 1):
            print(f"{i}. {req}")

    def size(self):
        return len(self.queue)


# ===== PRIORITY QUEUE IMPLEMENTATION =====
class PriorityBookRequest:
    """Book request with priority (Faculty > Student)"""
    def __init__(self, request_id, requester_name, book_title, user_type):
        self.request_id = request_id
        self.requester_name = requester_name
        self.book_title = book_title
        self.user_type = user_type  # "Faculty" or "Student"

    def __str__(self):
        return f"ID: {self.request_id}, Requester: {self.requester_name} ({self.user_type}), Book: {self.book_title}"

    def get_priority(self):
        """Return priority (lower number = higher priority)"""
        if self.user_type.lower() == "faculty":
```



```python
class PriorityQueue:
    def __init__(self):
        self.queue = []

    def add_request(self, request):
        """Add a request with priority sorting"""
        self.queue.append(request)
        self.queue.sort(key=lambda x: x.get_priority())
        print(f"Request added: {request}")

    def remove_request(self):
        """Remove and return the highest priority request"""
        if not self.queue:
            print("Queue is empty!")
            return None
        request = self.queue.pop(0)
        print(f"Request processed: {request}")
        return request

    def display_queue(self):
        """Display all requests in priority order"""
        if not self.queue:
            print("Queue is empty!")
            return
        print("\n=== Priority Queue ===")
        for i, req in enumerate(self.queue, 1):
            print(f"{i}. {req}")

    def size(self):
        return len(self.queue)


# ===== DEMO PROGRAM =====
if __name__ == "__main__":
    print("=" * 60)
    print("LIBRARY BOOK REQUEST SYSTEM")
    print("=" * 60)

    # ===== Normal Queue Demo =====
    print("\n--- NORMAL QUEUE (FIFO) ---")
    normal_q = NormalQueue()

    # Add requests
    normal_q.add_request(BookRequest(1, "Alice", "Python Programming"))
    normal_q.add_request(BookRequest(2, "Bob", "Data Science"))
    normal_q.add_request(BookRequest(3, "Charlie", "Web Development"))
    normal_q.add_request(BookRequest(4, "Diana", "Machine Learning"))

    normal_q.display_queue()
    print(f"Queue size: {normal_q.size()}")

    # Process requests
    print("\n--- Processing Requests (Normal Queue) ---")
    normal_q.remove_request()
    normal_q.remove_request()

    normal_q.display_queue()
    print(f"Queue size: {normal_q.size()}")

    # ===== Priority Queue Demo =====
```



Output:

Explanation:

- Queue (FIFO) → First request comes, first served.(If a student requests first, they get the book first.)
- Priority Queue → Faculty requests are served before students, even if they come later.
- enqueue() → Adds a request to the system.
- dequeue() → Removes and processes the next request.

Task 3: Emergency Help Desk (Stack Implementation)

Scenario

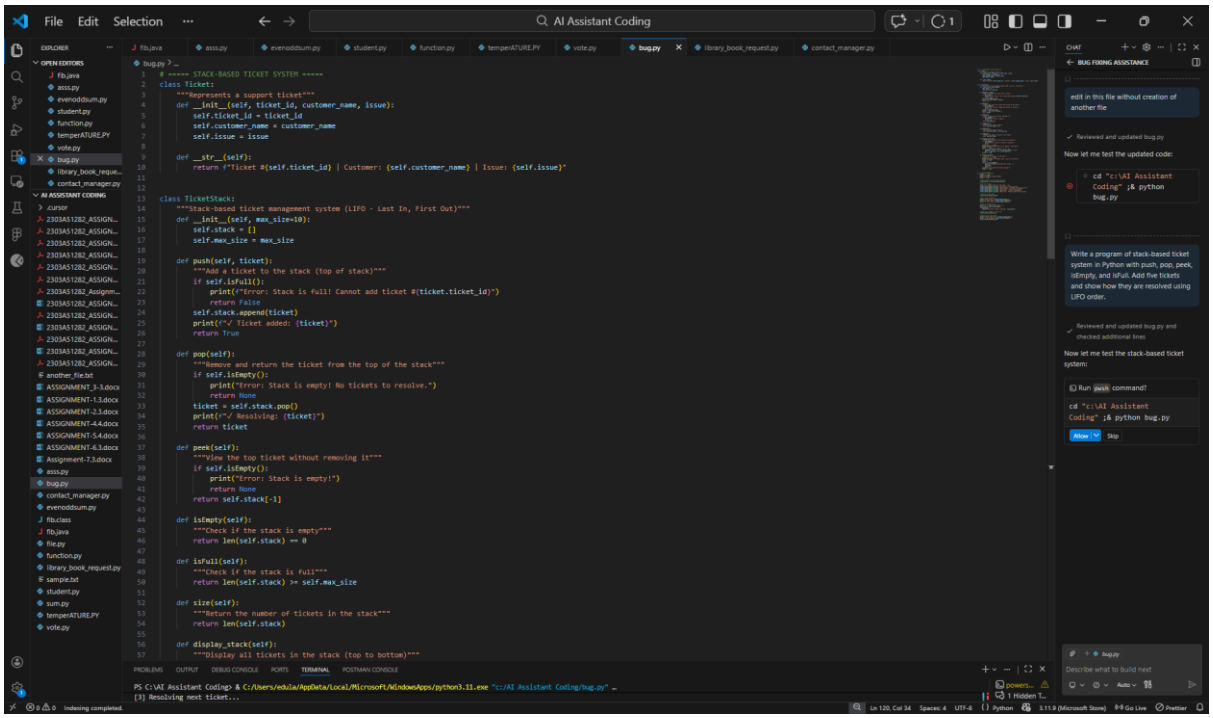
SR University's IT Help Desk receives technical support tickets from students and staff.

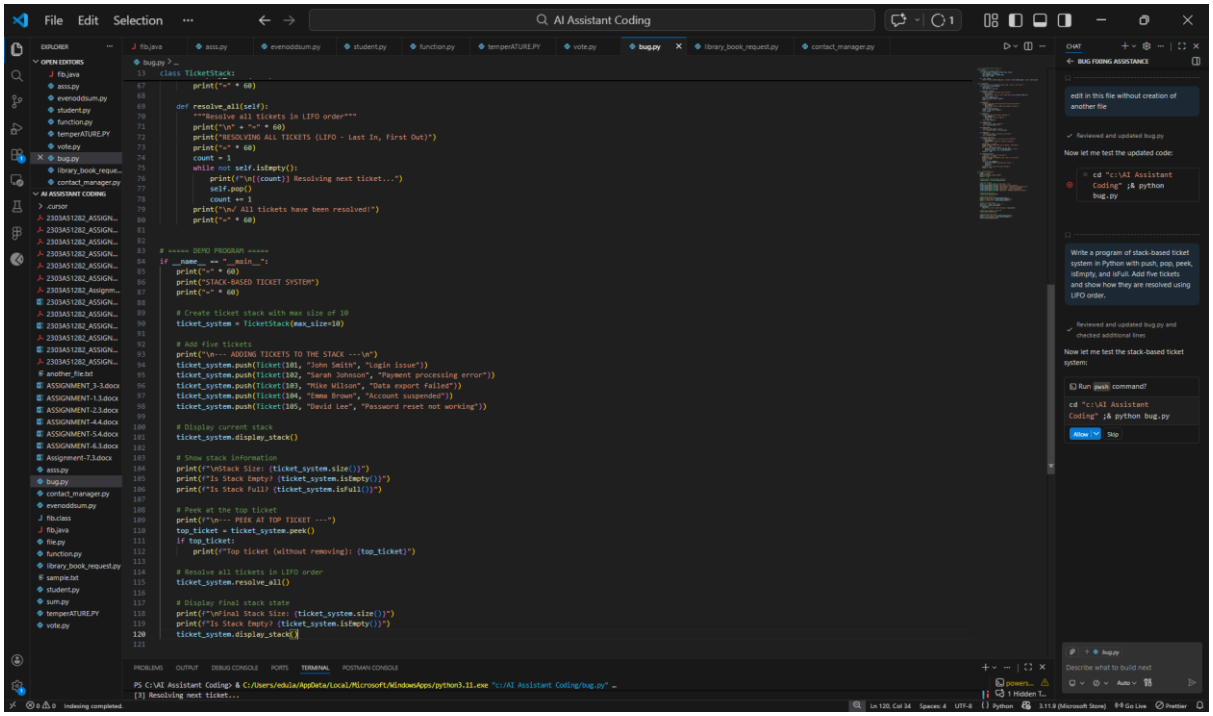
While tickets are received sequentially, issue escalation follows a Last-In, First-Out (LIFO) approach.

Prompt:

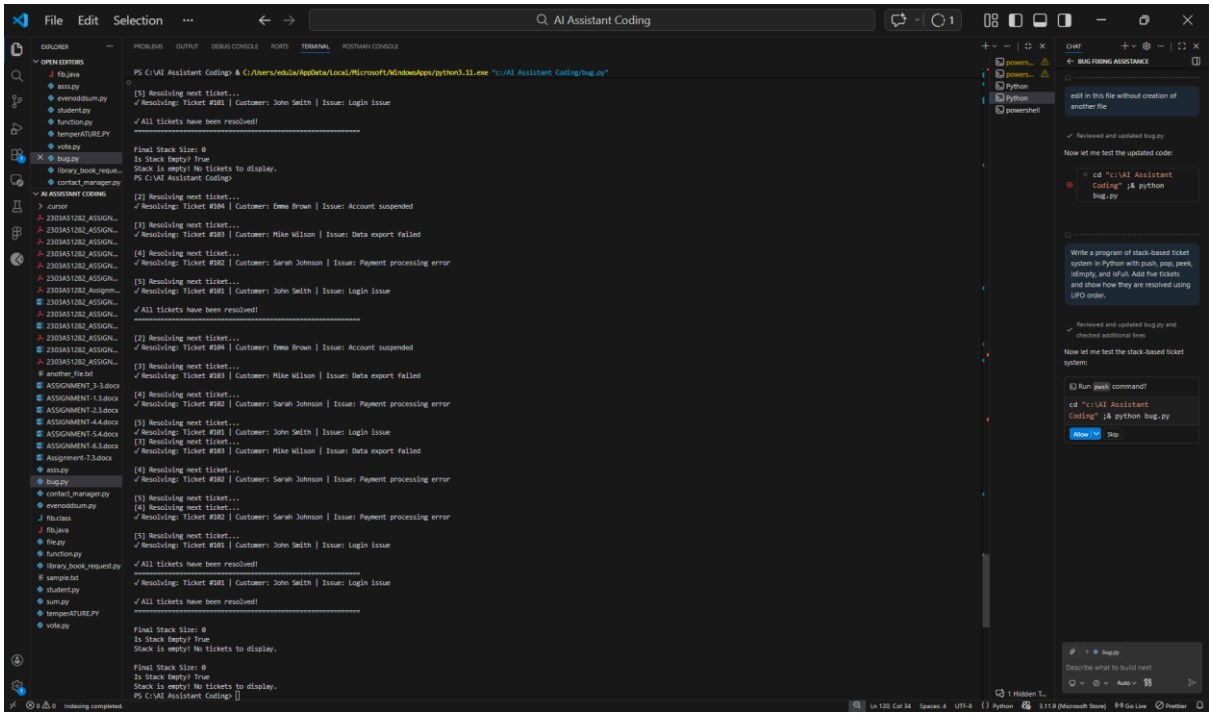
Write a program of stack-based ticket system in Python with push, pop, peek, isEmpty, and isFull. Add five tickets and show how they are resolved using LIFO order.

Code:





Output:



Explanation:

The program uses a stack to manage help desk tickets.
A stack works in last in, first solved order.
When a new ticket is raised, it is added to the top.
When solving a ticket, the most recent one is handled first.
The program can also check if there are no tickets left or if the stack is full.

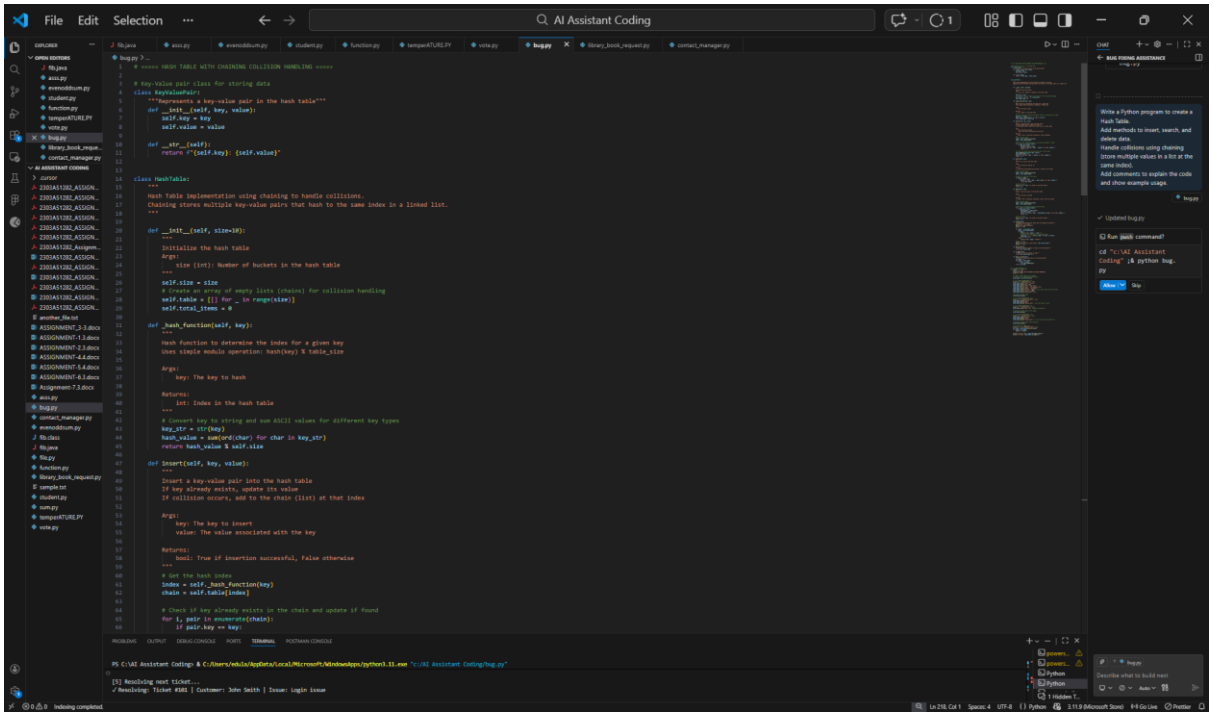
Task 4:

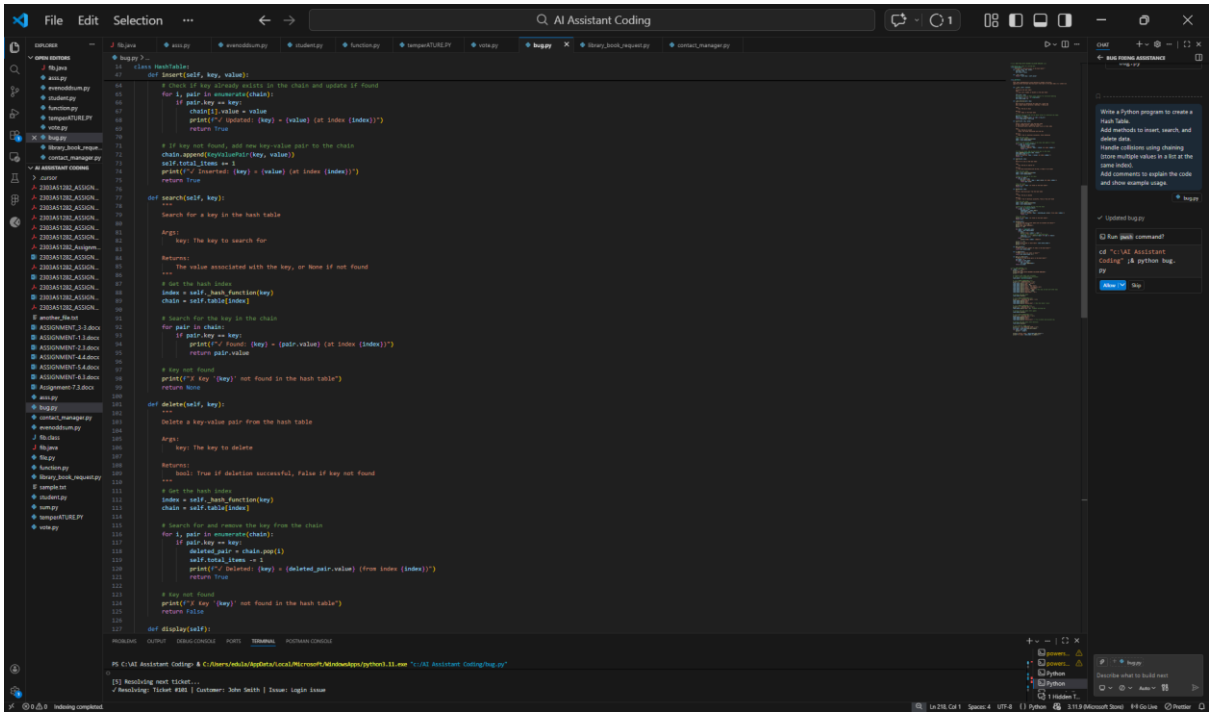
Hash Table
Objective
To implement a Hash Table and understand collision handling.

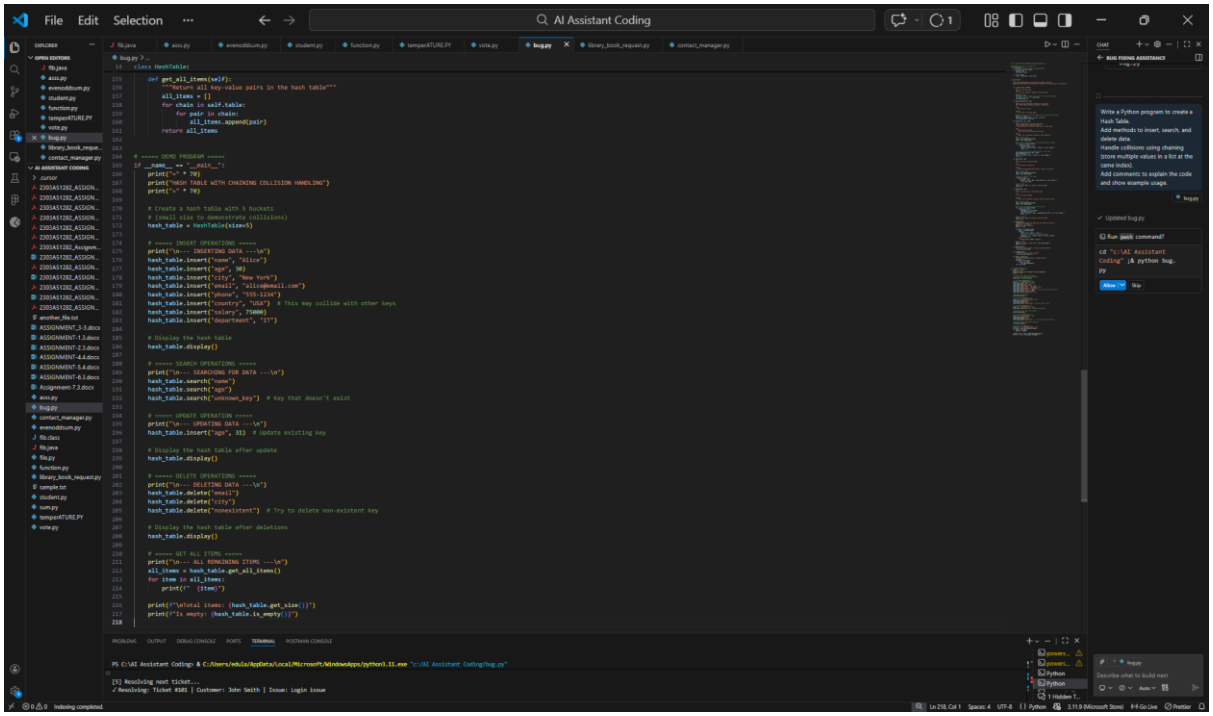
Prompt:

Write a Python program to create a Hash Table.
Add methods to insert, search, and delete data.
Handle collisions using chaining (store multiple values in a list at the same index).
Add comments to explain the code and show example usage.

Code:







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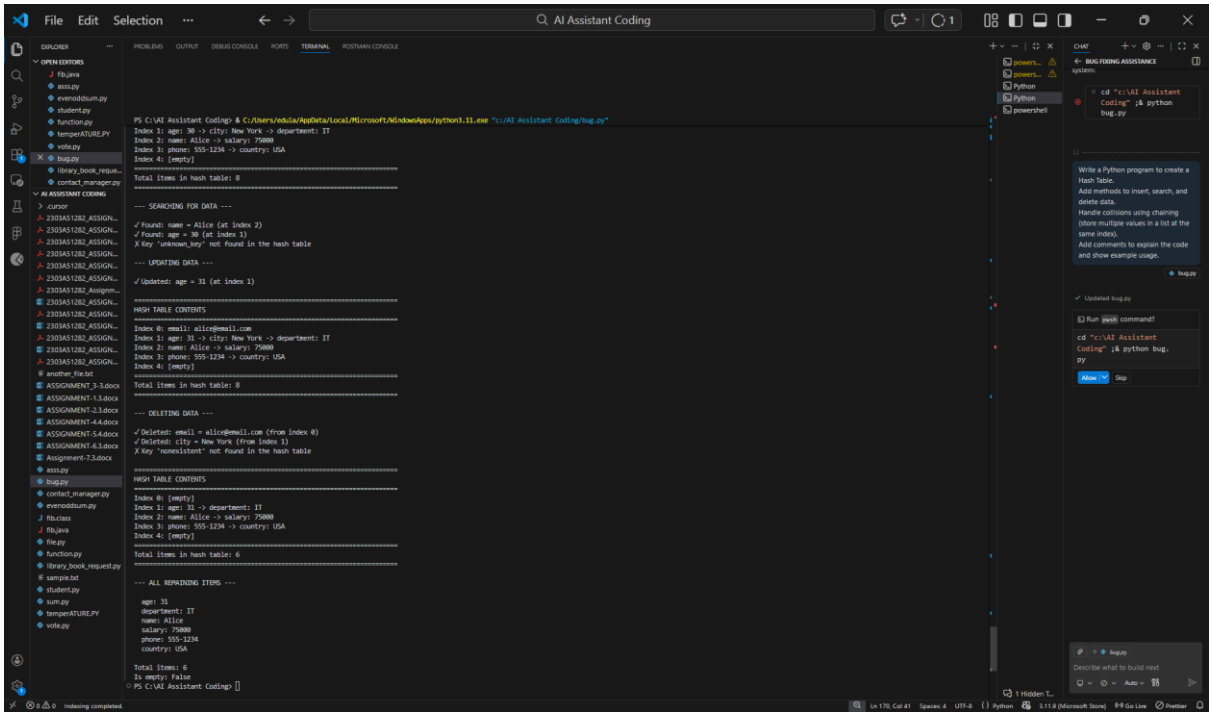


Explanation:

- A Hash Table stores data using a key and value.
- A hash function decides where to store the data.
- Sometimes two keys go to the same place. This is called a collision.
- To solve collisions, we use chaining, meaning we store multiple items in a list at the same index.
- The program should allow adding, finding, and removing data correctly.

Task 5:

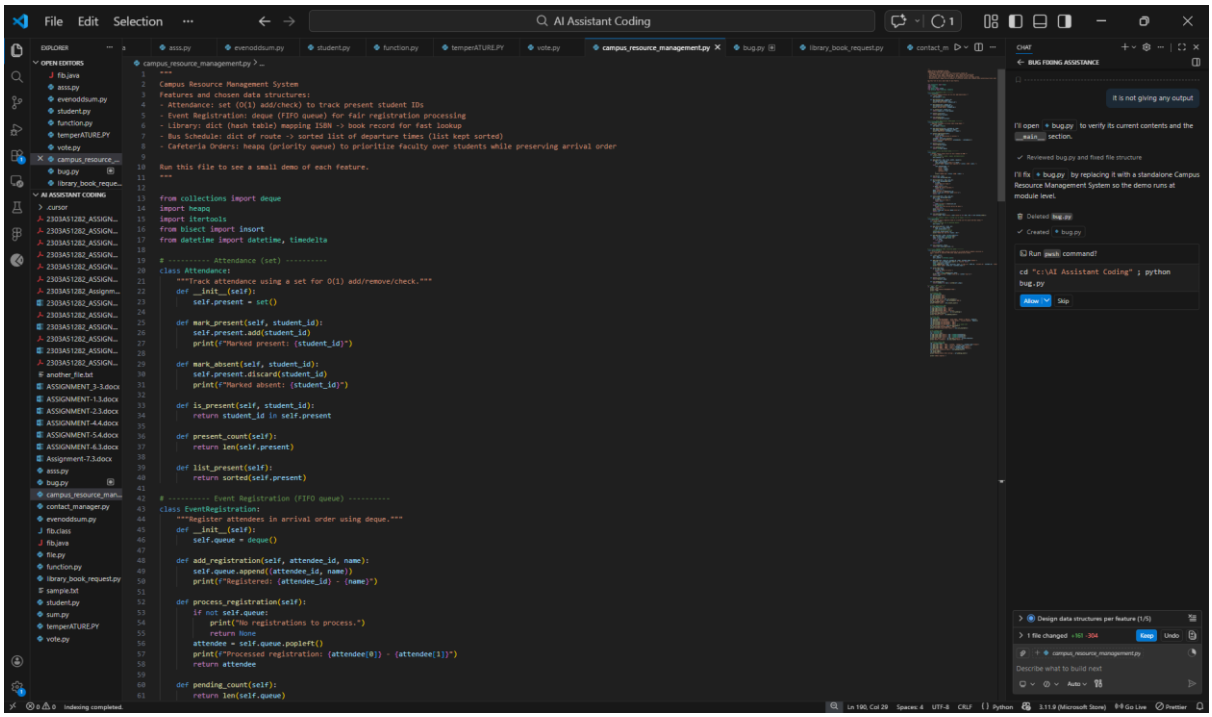
Real-Time Application Challenge
Scenario
Design a Campus Resource Management System with the following features:

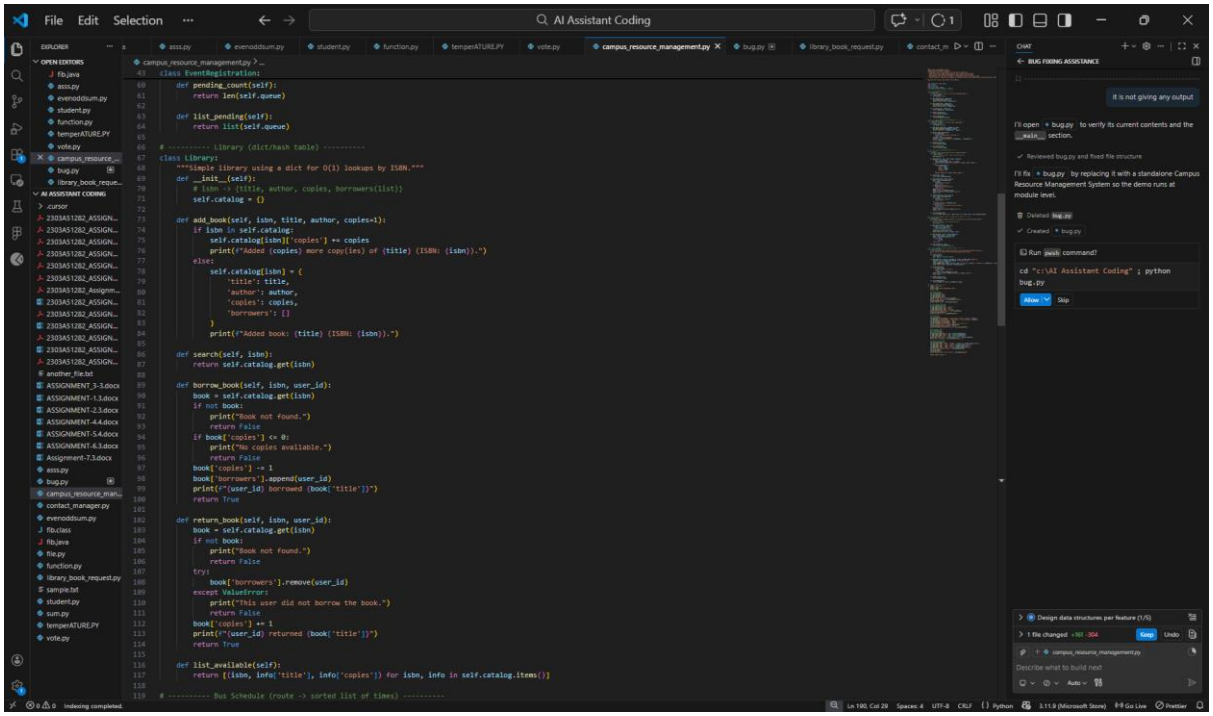
- Student Attendance Tracking
- Event Registration System
- Library Book Borrowing
- Bus Scheduling System
- Cafeteria Order Queue

Prompt:

Create a Campus Resource Management System in Python.For each feature (Attendance, Event Registration, Library, Bus Schedule, Cafeteria Orders), choose the best data structure

Code:

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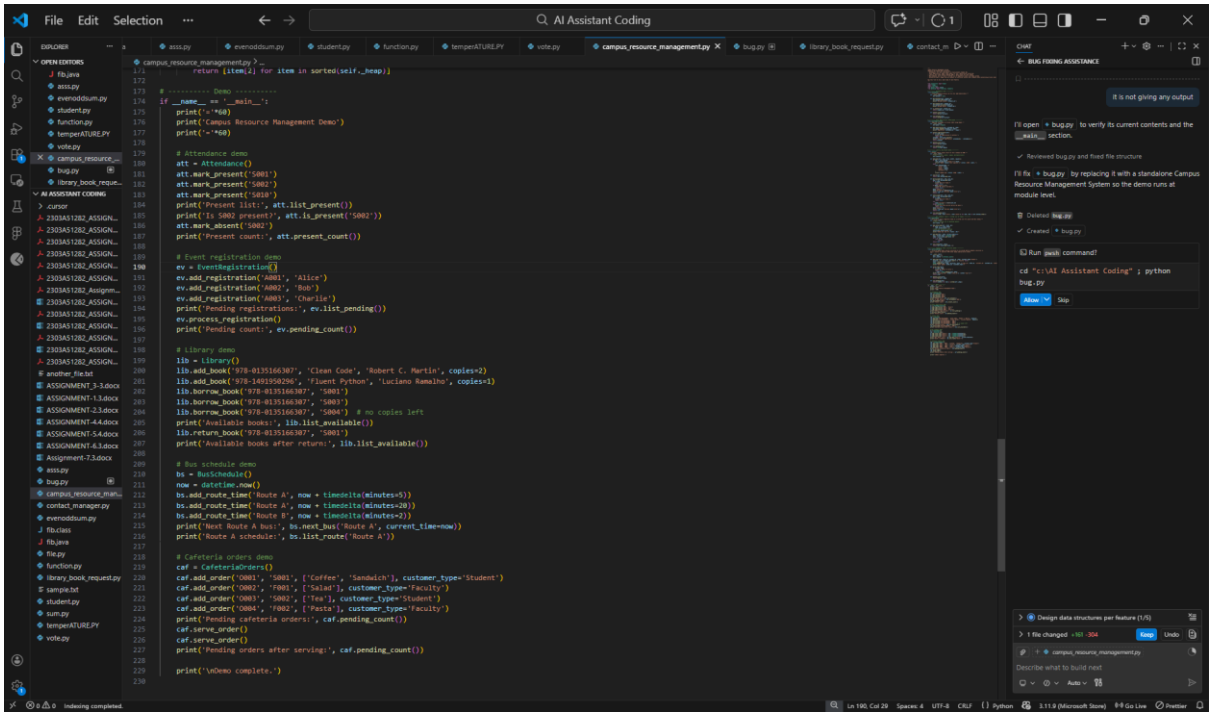
campus_resource_management.py
BUG FIXING ASSISTANCE
it is not giving any output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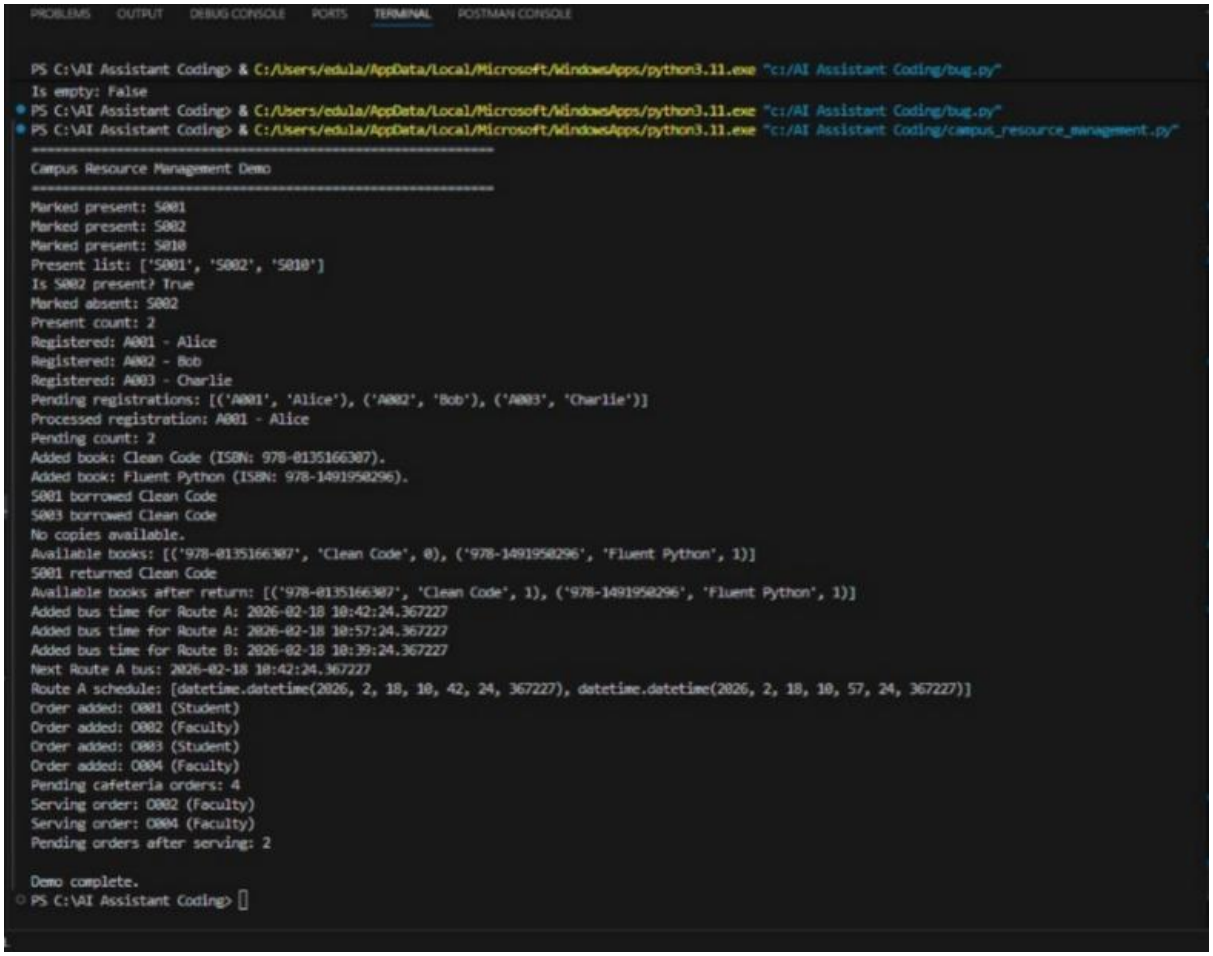
campus_resource_management.py
BUG FIXING ASSISTANCE
it is not giving any output

Output:



Explanation:

Library Book Borrowing using a queue:

- The queue stores student names who request a book.
- When a student requests a book, we use enqueue() to add them to the queue.
- When a book becomes available, we use dequeue() to give it to the first student in line.
- This ensures fairness because the first requester gets the book first.