ASSIGNMENT-11.3

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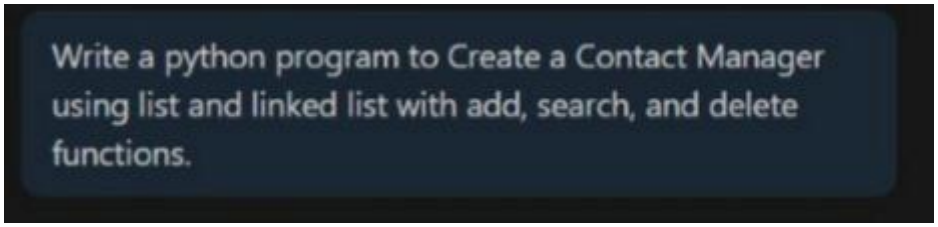
Batch: 05

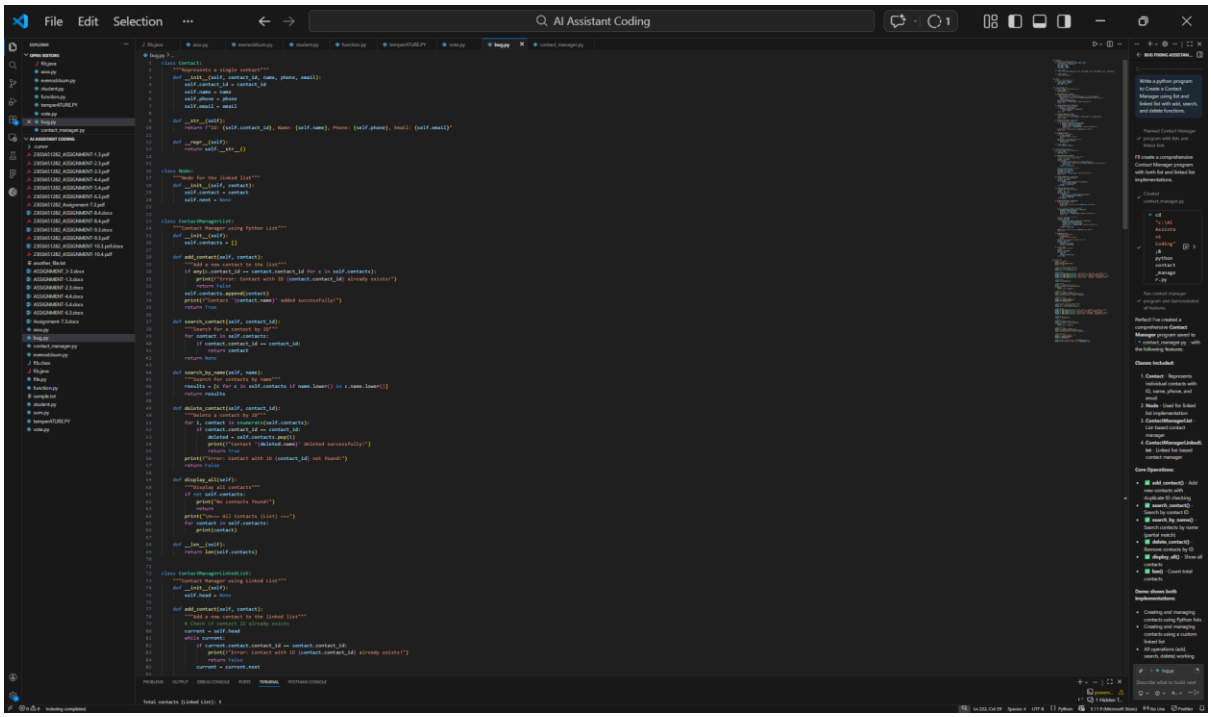
Task 1: Smart Contact Manager (Arrays & Linked Lists)
Scenario
SR University's student club requires a simple Contact Manager Application to store members' names and phone numbers. The system should support efficient addition, searching, and deletion of contacts.

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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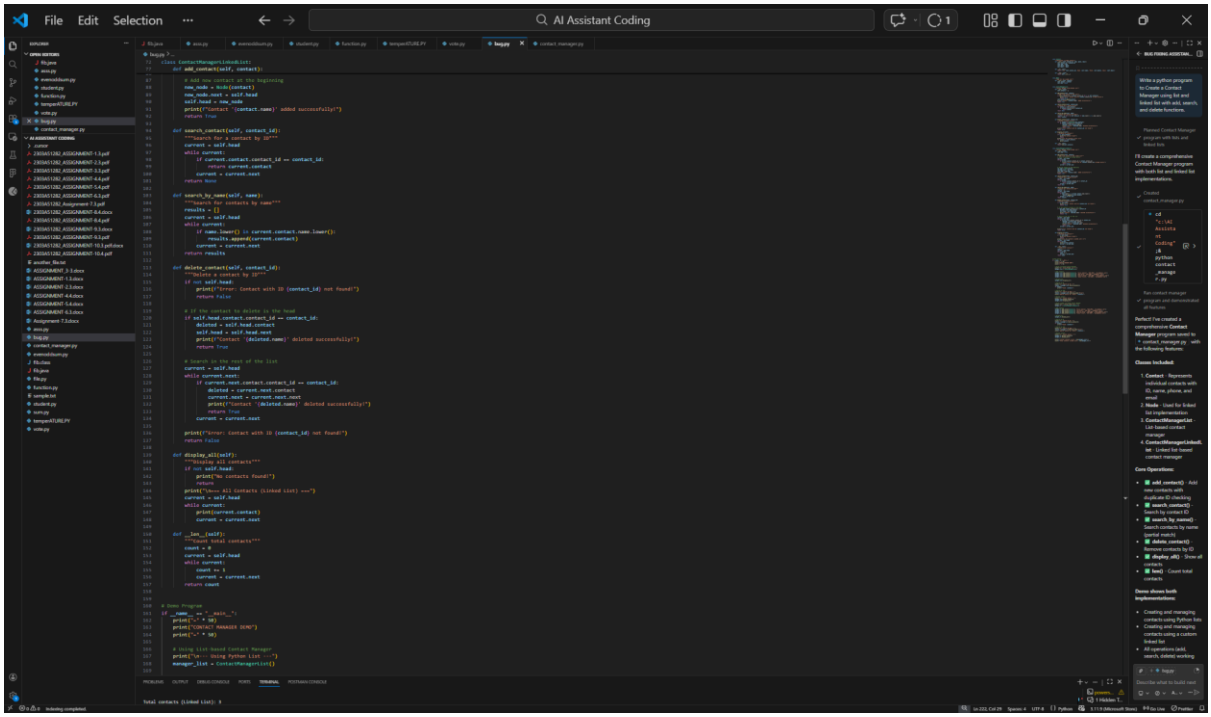
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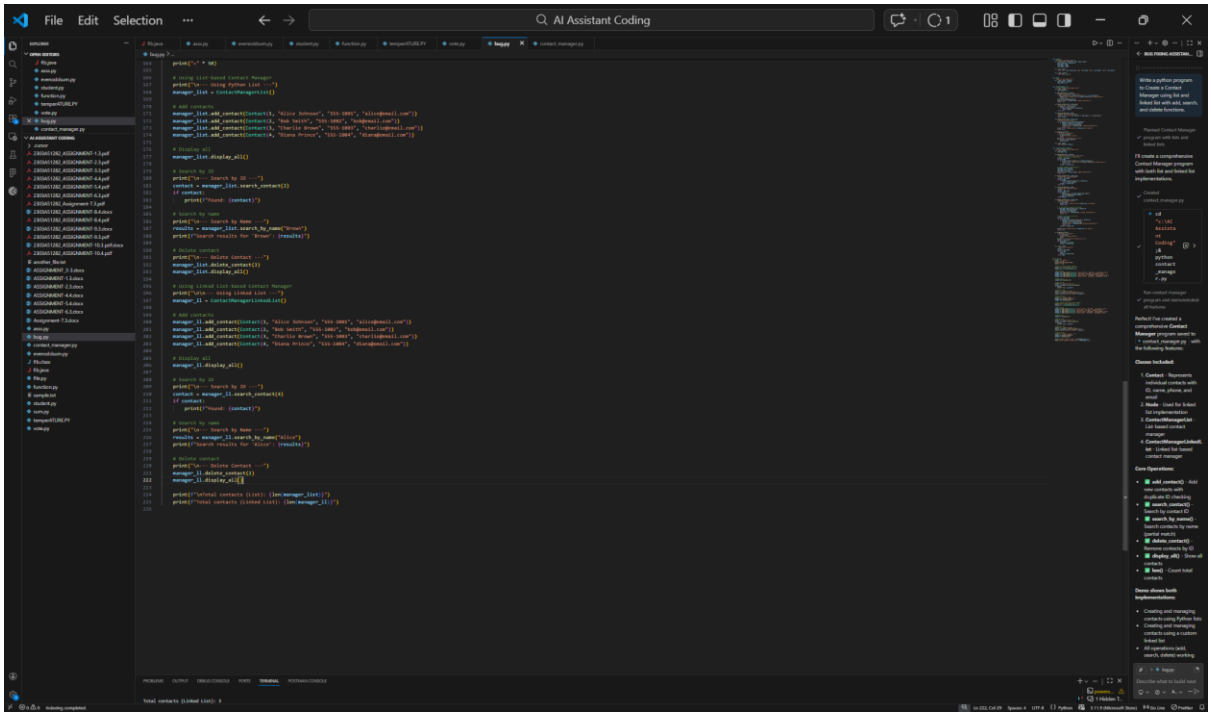

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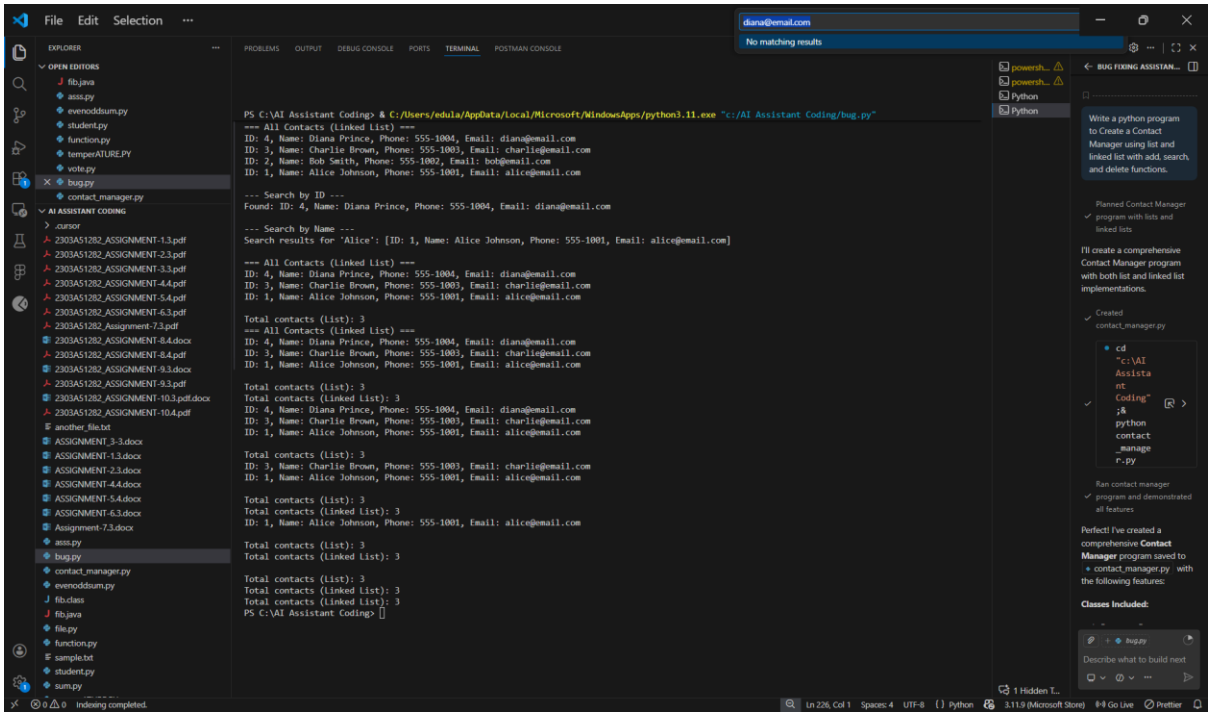


Explanation:

- 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.

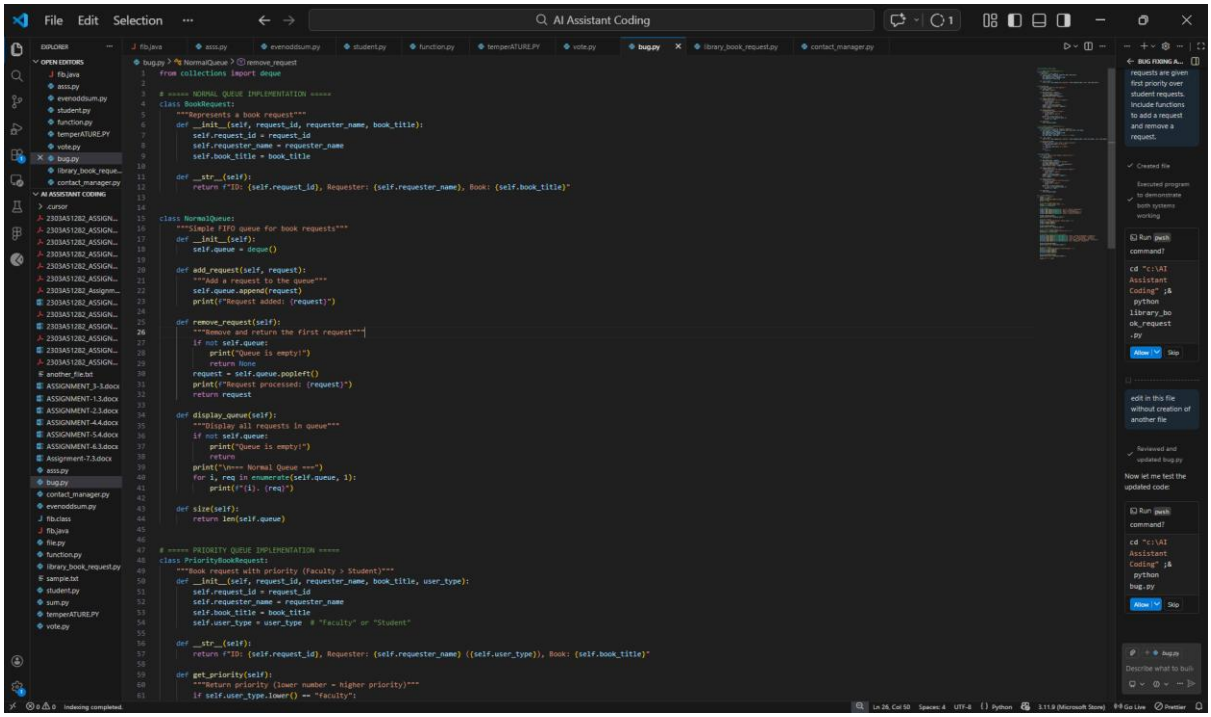
Task 2: Library Book Search System (Queues & Priority Queues)
Scenario
The SRU Library manages book borrow requests. Students and faculty submit requests, but faculty requests must be prioritized over student requests.

Prompt:

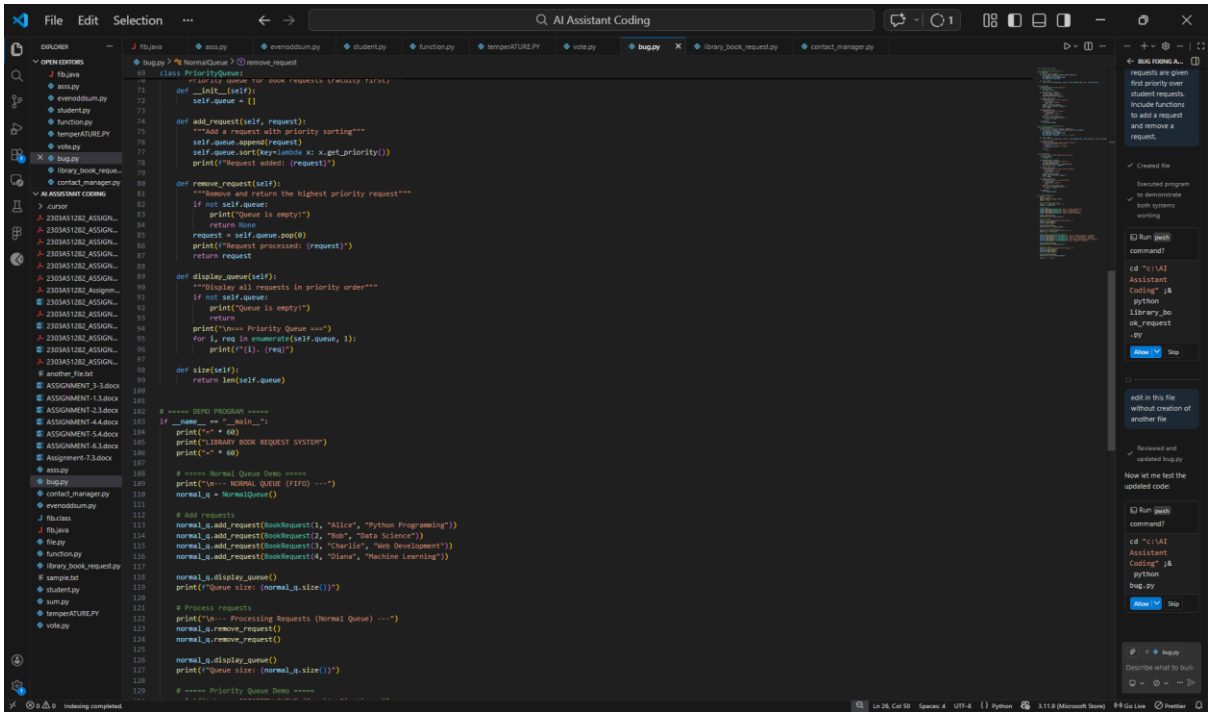
Write a Python program for a library book request system.First, make a normal queue where requests are handled in the order they come.Then, make another version where faculty requests are given first priority over student requests.Include functions to add a request and remove a request.

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.

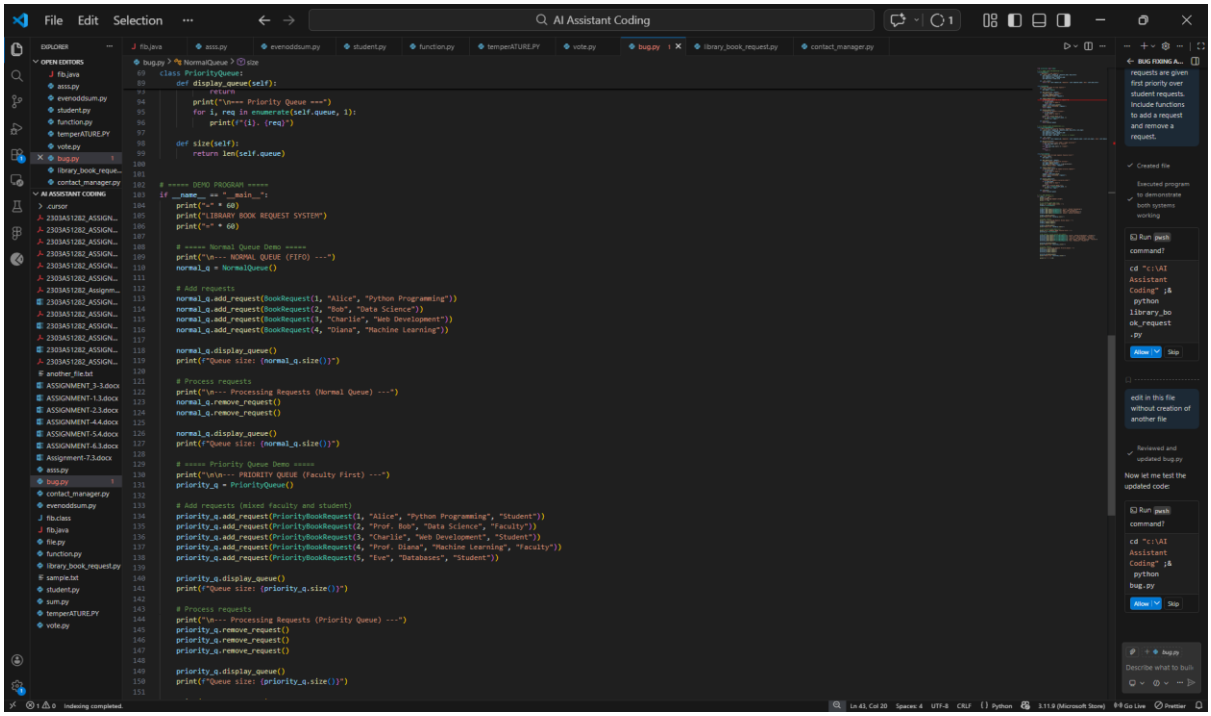
Code:



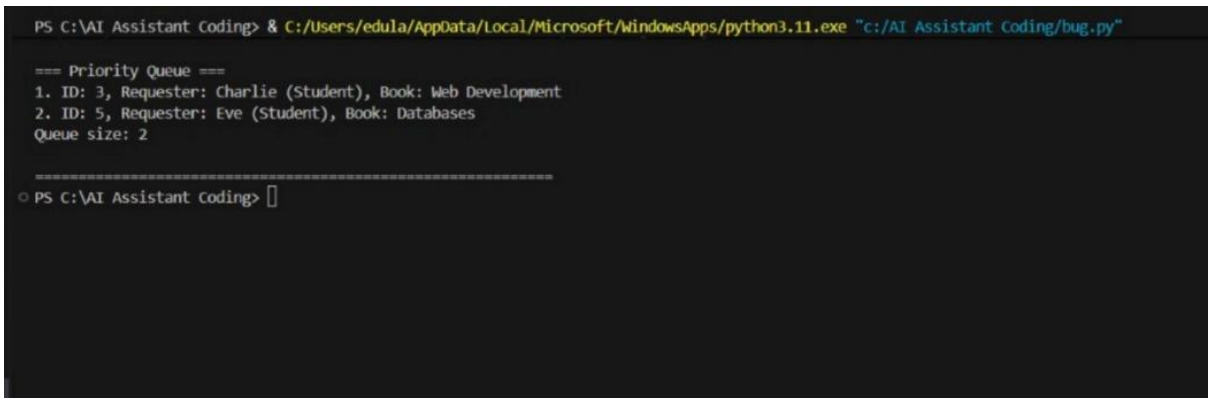
```python
from collections import deque

# ===== 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:
    """Priority queue for book requests (faculty first)"""
    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:

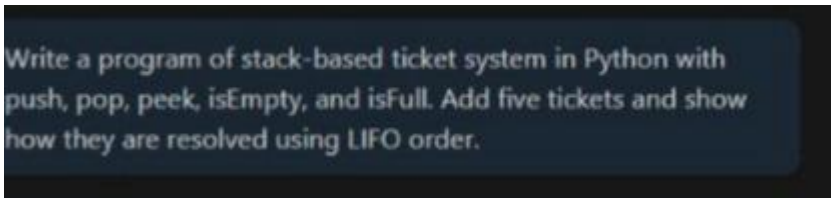
- Queue (FIFO) → First request comes, first served.(If a student requests first, they get the book first.)
- Priority Queue → Faculty requests are served before students, even if they come later.
- enqueue() → Adds a request to the system.

- dequeue() → Removes and processes the next request.

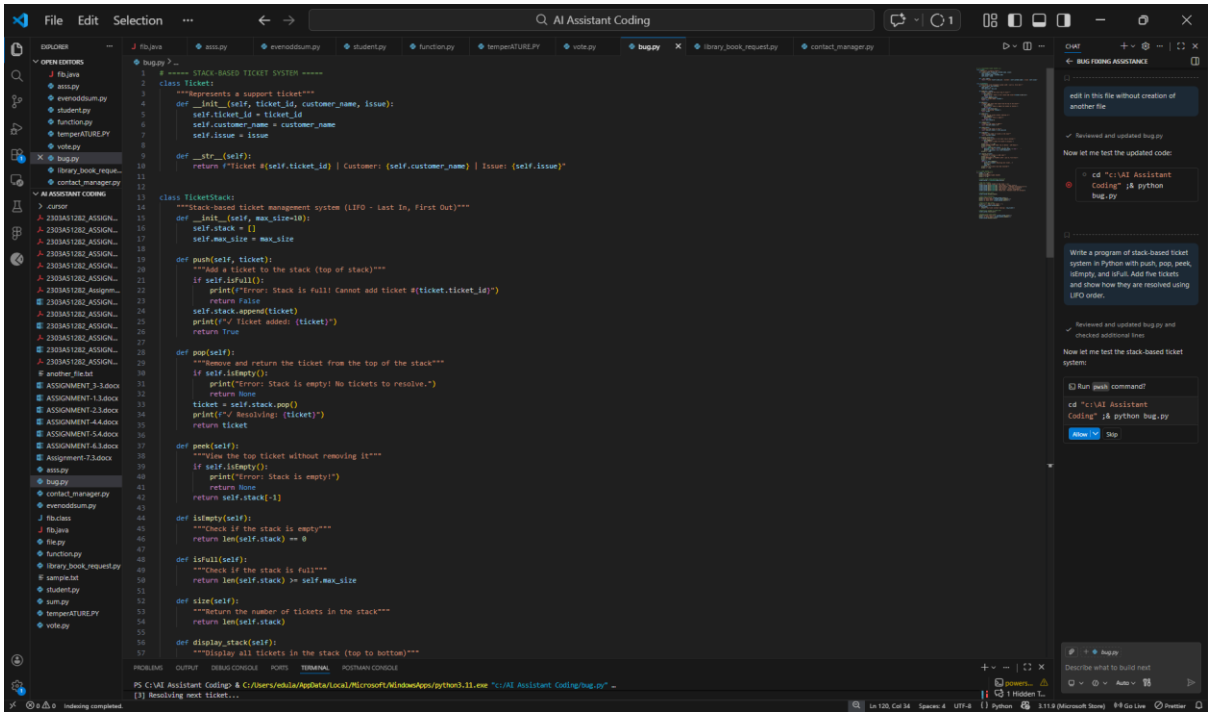
Task 3: Emergency Help Desk (Stack Implementation)
Scenario
SR University's IT Help Desk receives technical support tickets from students and staff. While tickets are received sequentially, issue escalation follows a Last-In, First-Out (LIFO) approach.

Prompt:

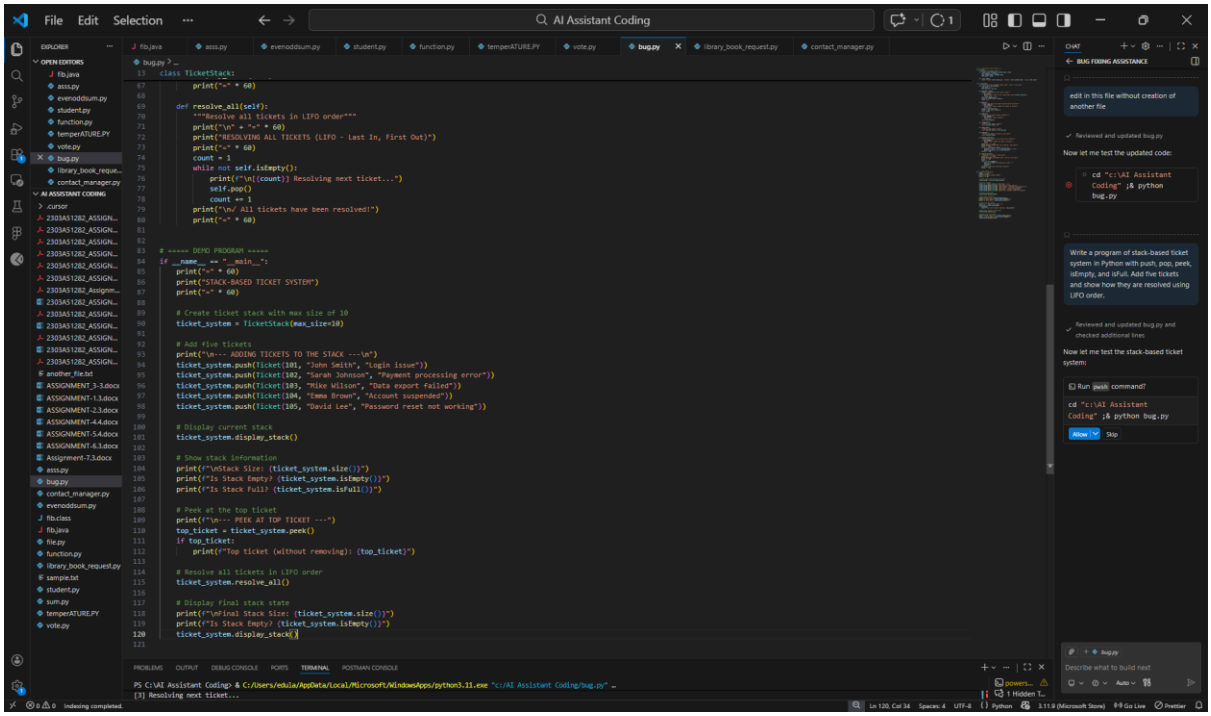
Write a program of stack-based ticket system in Python with push, pop, peek, isEmpty, and isFull. Add five tickets and show how they are resolved using LIFO order.



Code:

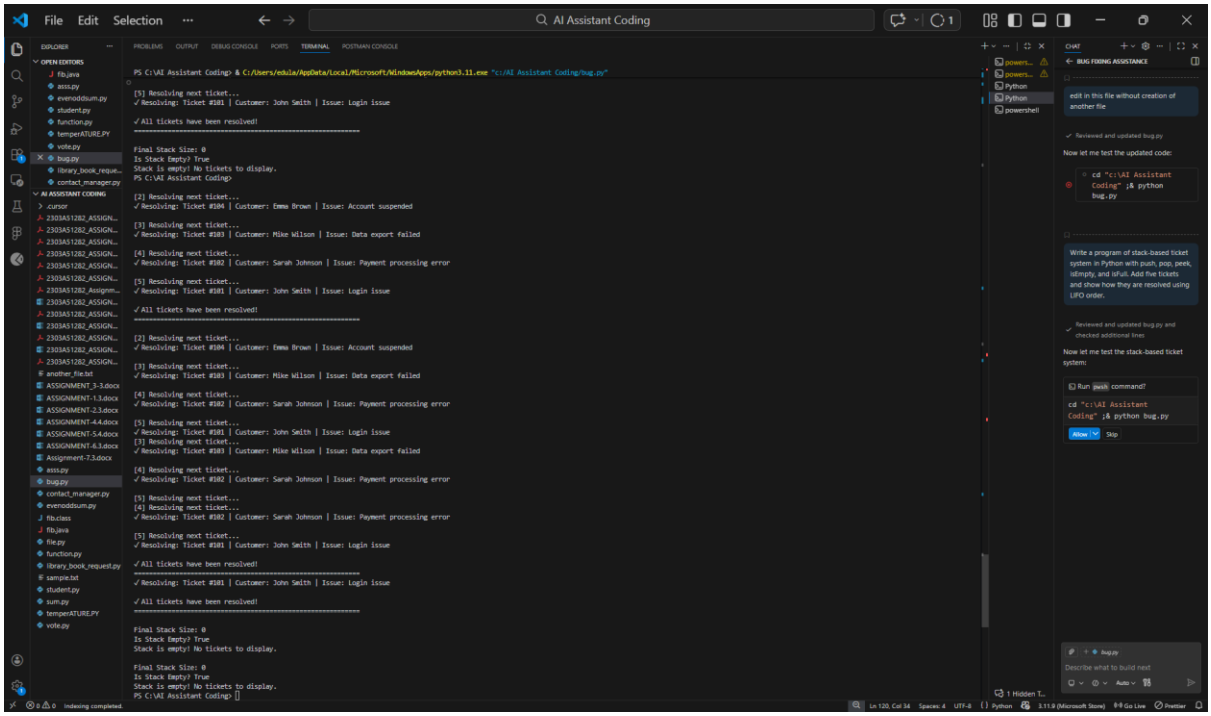


```python
# ===== STACK-BASED TICKET SYSTEM =====
class Ticket:
    """Represents a support ticket"""
    def __init__(self, ticket_id, customer_name, issue):
        self.ticket_id = ticket_id
        self.customer_name = customer_name
        self.issue = issue

    def __str__(self):
        return f"Ticket #{self.ticket_id} | Customer: {self.customer_name} | Issue: {self.issue}"


class TicketStack:
    """Stack-based ticket management system (LIFO - Last In, First Out)"""
    def __init__(self, max_size=10):
        self.stack = []
        self.max_size = max_size

    def push(self, ticket):
        """Add a ticket to the stack (top of stack)"""
        if self.isFull():
            print(f"Error: Stack is Full! Cannot add ticket #{ticket.ticket_id}")
            return False
        self.stack.append(ticket)
        print(f"✓ Ticket added: {ticket}")
        return True

    def pop(self):
        """Remove and return the ticket from the top of the stack"""
        if self.isEmpty():
            print("Error: Stack is empty! No tickets to resolve.")
            return None
        ticket = self.stack.pop()
        print(f"✓ Resolving: {ticket}")
        return ticket

    def peek(self):
        """View the top ticket without removing it"""
        if self.isEmpty():
            print("Error: Stack is empty!")
            return None
        return self.stack[-1]

    def isEmpty(self):
        """Check if the stack is empty"""
        return len(self.stack) == 0

    def isFull(self):
        """Check if the stack is full"""
        return len(self.stack) >= self.max_size

    def size(self):
        """Return the number of tickets in the stack"""
        return len(self.stack)

    def display_stack(self):
        """Display all tickets in the stack (top to bottom)"""
```



```python
        print("=" * 60)

    def resolve_all(self):
        """Resolve all tickets in LIFO order"""
        print("\n" + "=" * 60)
        print("RESOLVING ALL TICKETS (LIFO - Last In, First Out)")
        print("=" * 60)
        count = 1
        while not self.isEmpty():
            print(f"\n[{count}] Resolving next ticket...")
            self.pop()
            count += 1
        print("\n✓ All tickets have been resolved!")
        print("=" * 60)


# ===== DEMO PROGRAM =====
if __name__ == "__main__":
    print("=" * 60)
    print("STACK-BASED TICKET SYSTEM")
    print("=" * 60)

    # Create ticket stack with max size of 10
    ticket_system = TicketStack(max_size=10)

    # Add five tickets
    print("\n--- ADDING TICKETS TO THE STACK ---\n")
    ticket_system.push(Ticket(101, "John Smith", "Login issue"))
    ticket_system.push(Ticket(102, "Sarah Johnson", "Payment processing error"))
    ticket_system.push(Ticket(103, "Mike Wilson", "Data export failed"))
    ticket_system.push(Ticket(104, "Emma Brown", "Account suspended"))
    ticket_system.push(Ticket(105, "David Lee", "Password reset not working"))

    # Display current stack
    ticket_system.display_stack()

    # Show stack information
    print(f"\nStack Size: {ticket_system.size()}")
    print(f"Is Stack Empty? {ticket_system.isEmpty()}")
    print(f"Is Stack Full? {ticket_system.isFull()}")

    # Peek at the top ticket
    print("\n--- PEEK AT TOP TICKET ---")
    top_ticket = ticket_system.peek()
    if top_ticket:
        print(f"Top ticket (without removing): {top_ticket}")

    # Resolve all tickets in LIFO order
    ticket_system.resolve_all()

    # Display final stack state
    print(f"\nFinal Stack Size: {ticket_system.size()}")
    print(f"Is Stack Empty? {ticket_system.isEmpty()}")
    ticket_system.display_stack()
```

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.

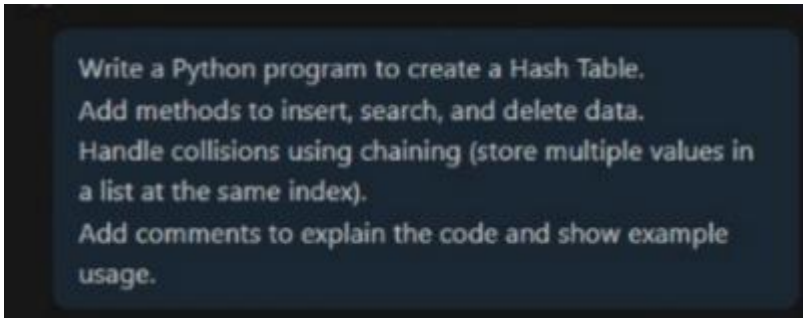
Task 4: Hash Table

Objective

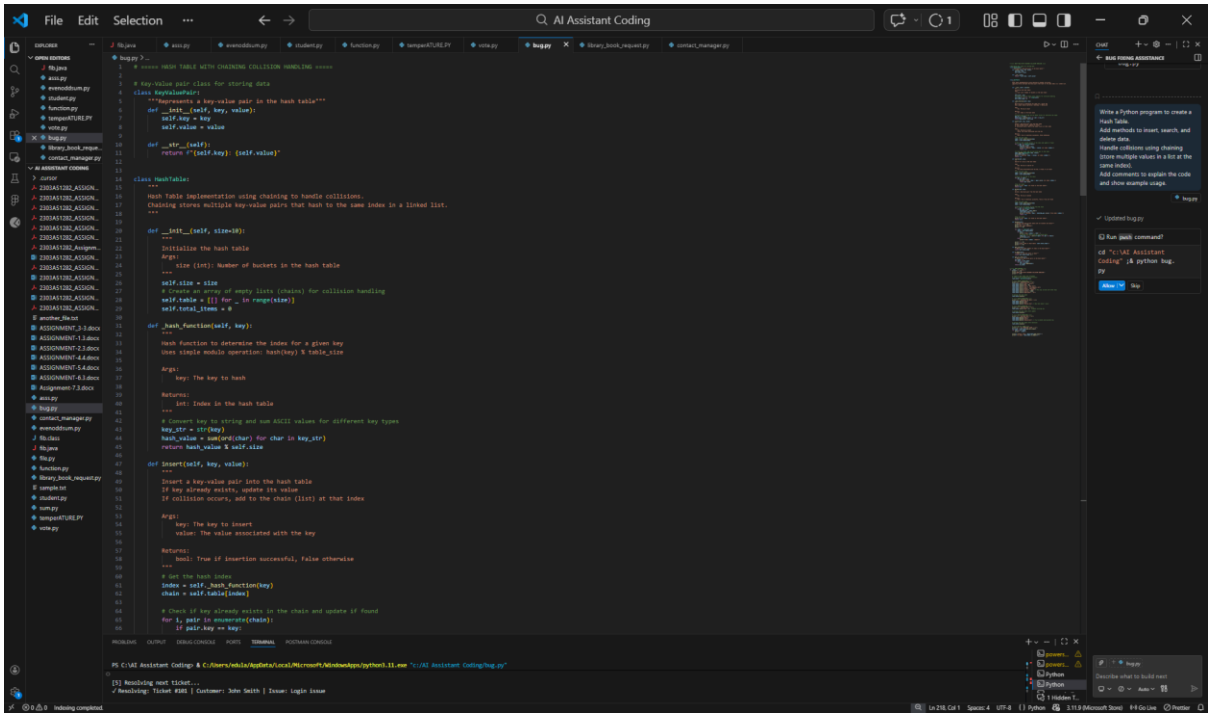
To implement a Hash Table and understand collision handling.

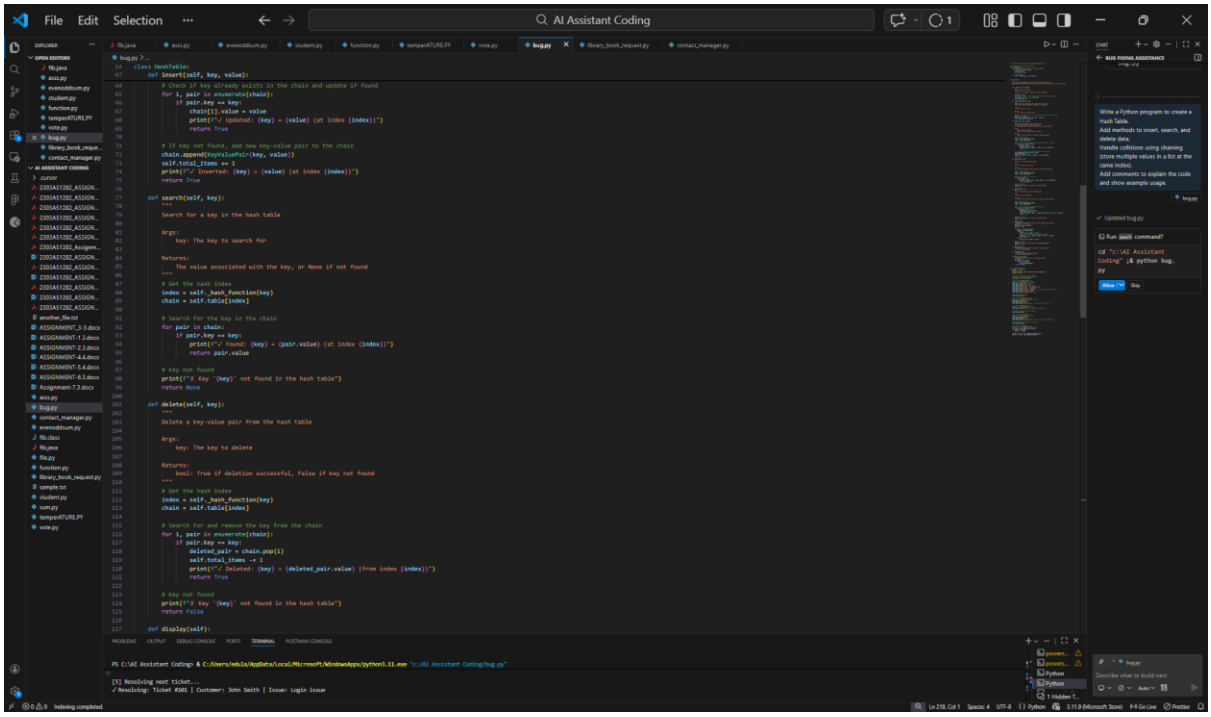
Prompt:

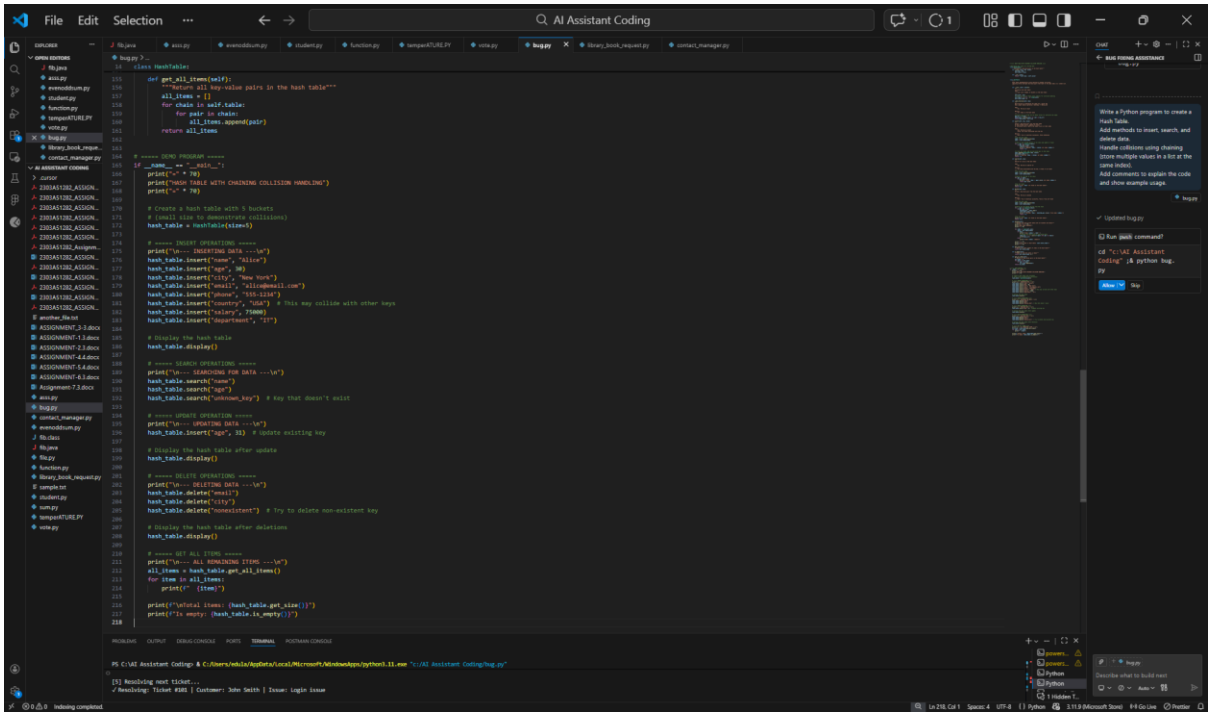
Write a Python program to create a Hash Table.
Add methods to insert, search, and delete data.
Handle collisions using chaining (store multiple values in a list at the same index).
Add comments to explain the code and show example usage.



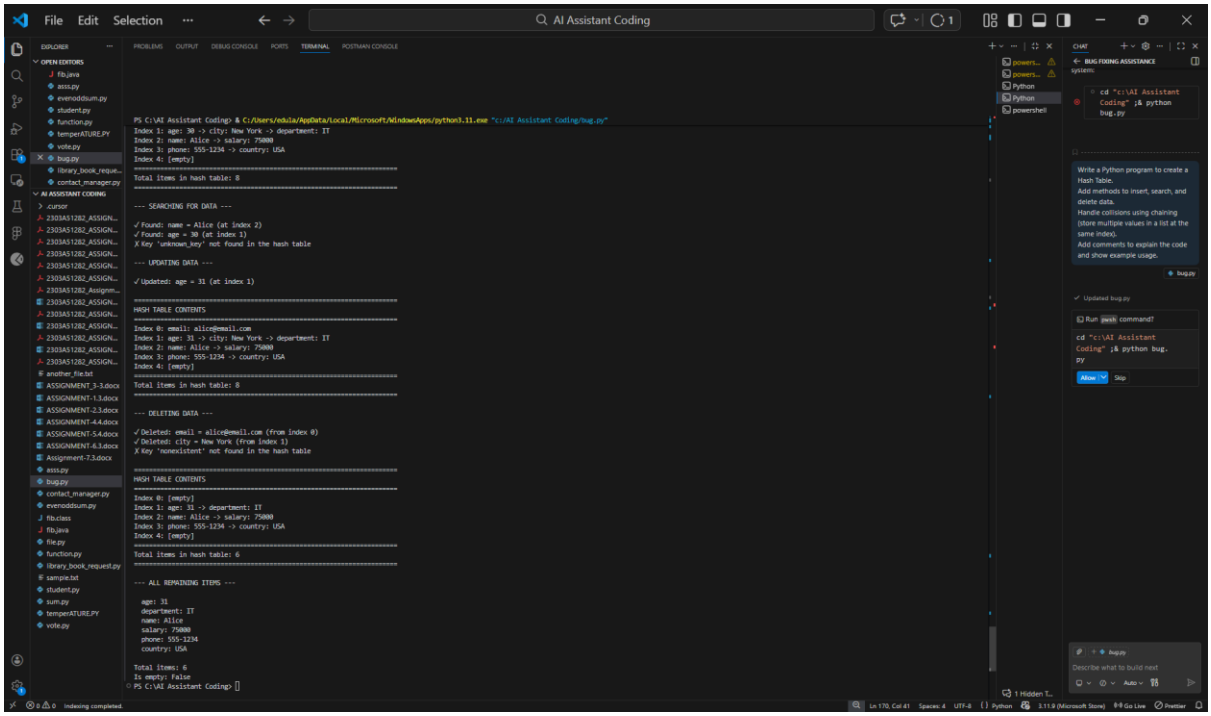
Code:







Output:



Explanation:

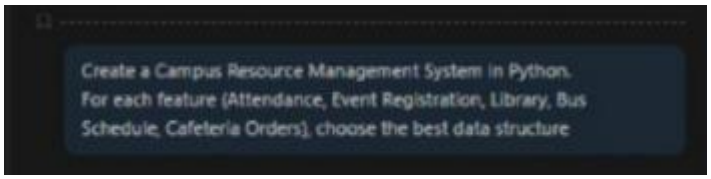
- A Hash Table stores data using a key and value.
- A hash function decides where to store the data.
- Sometimes two keys go to the same place. This is called a collision.
- To solve collisions, we use chaining, meaning we store multiple items in a list at the same index.
- The program should allow adding,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



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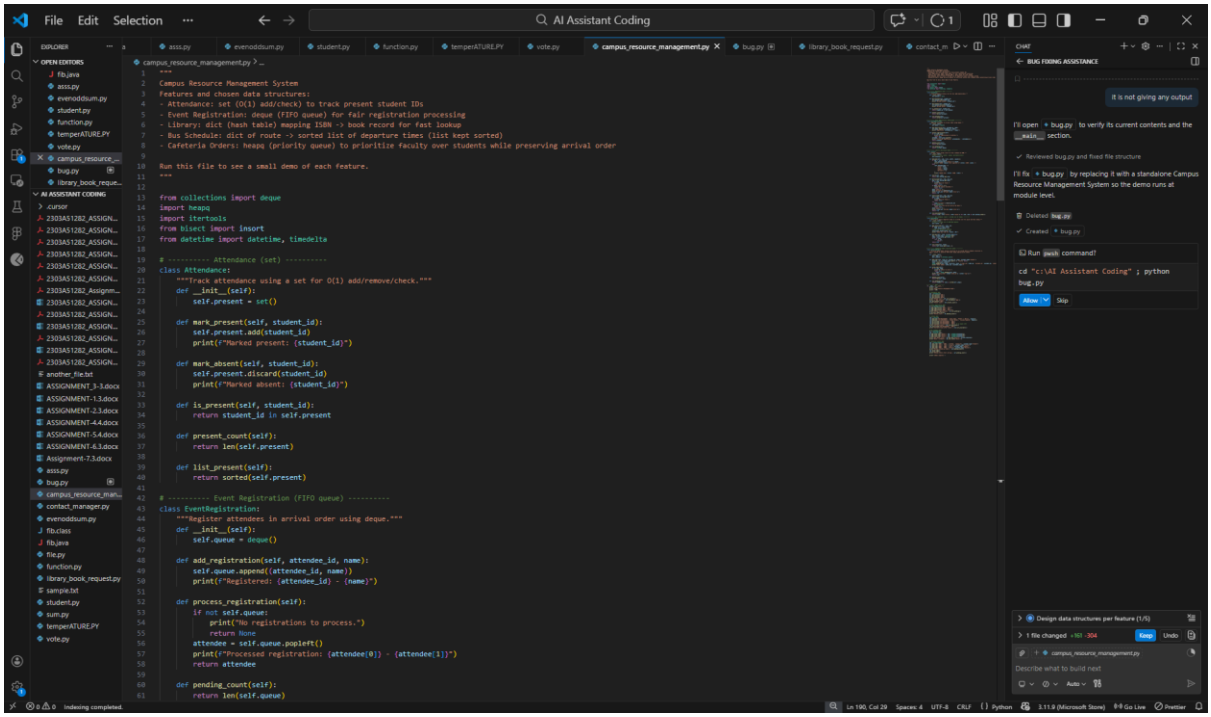
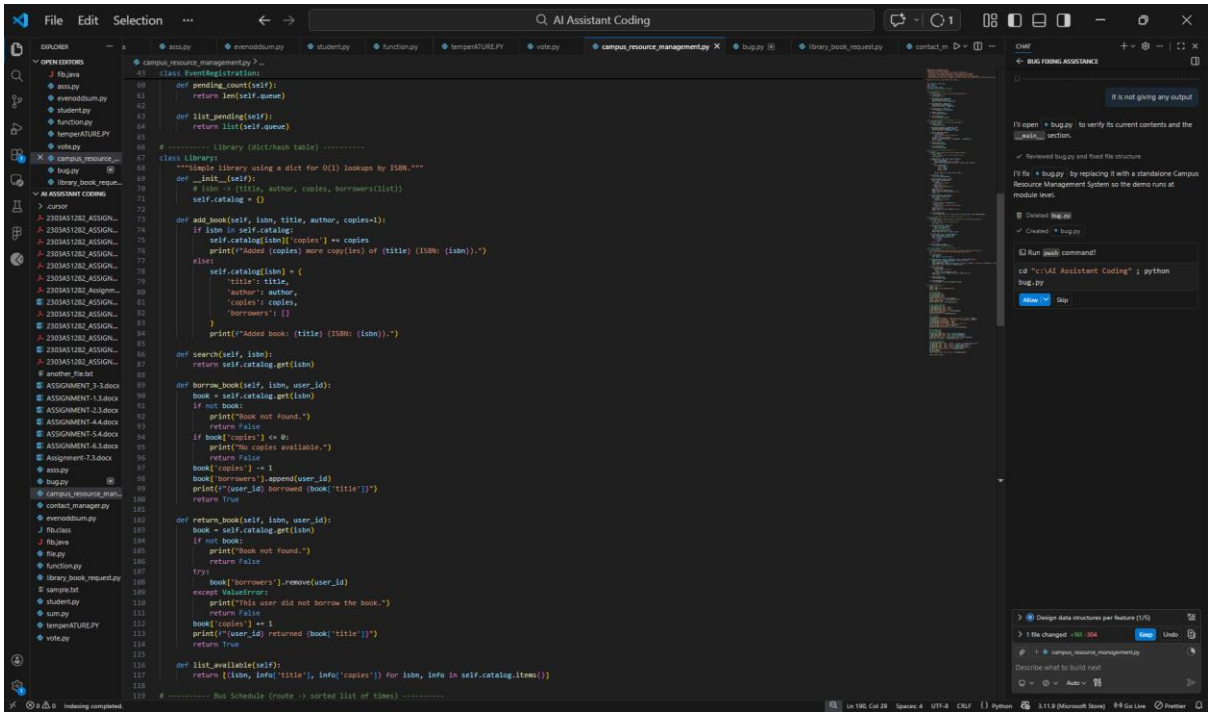
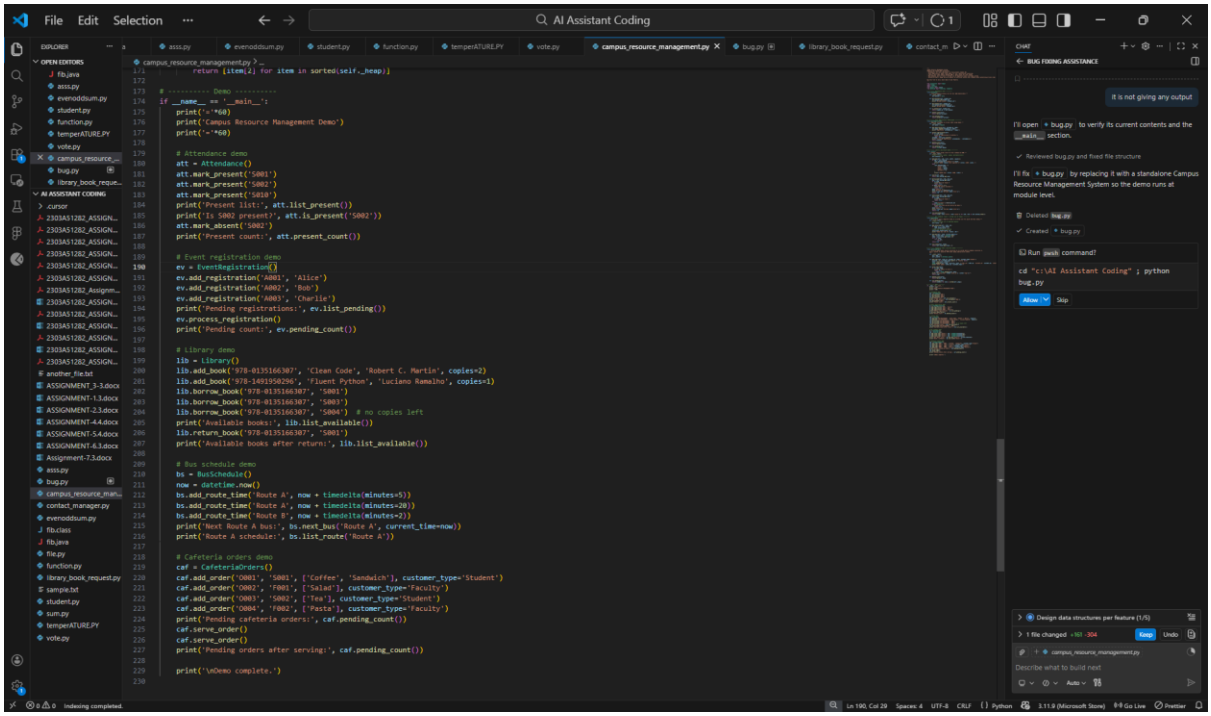



File Edit Selection
AI Assistant Coding
campus_resource_management.py
BUG FIXING ASSISTANCE
it is not giving any output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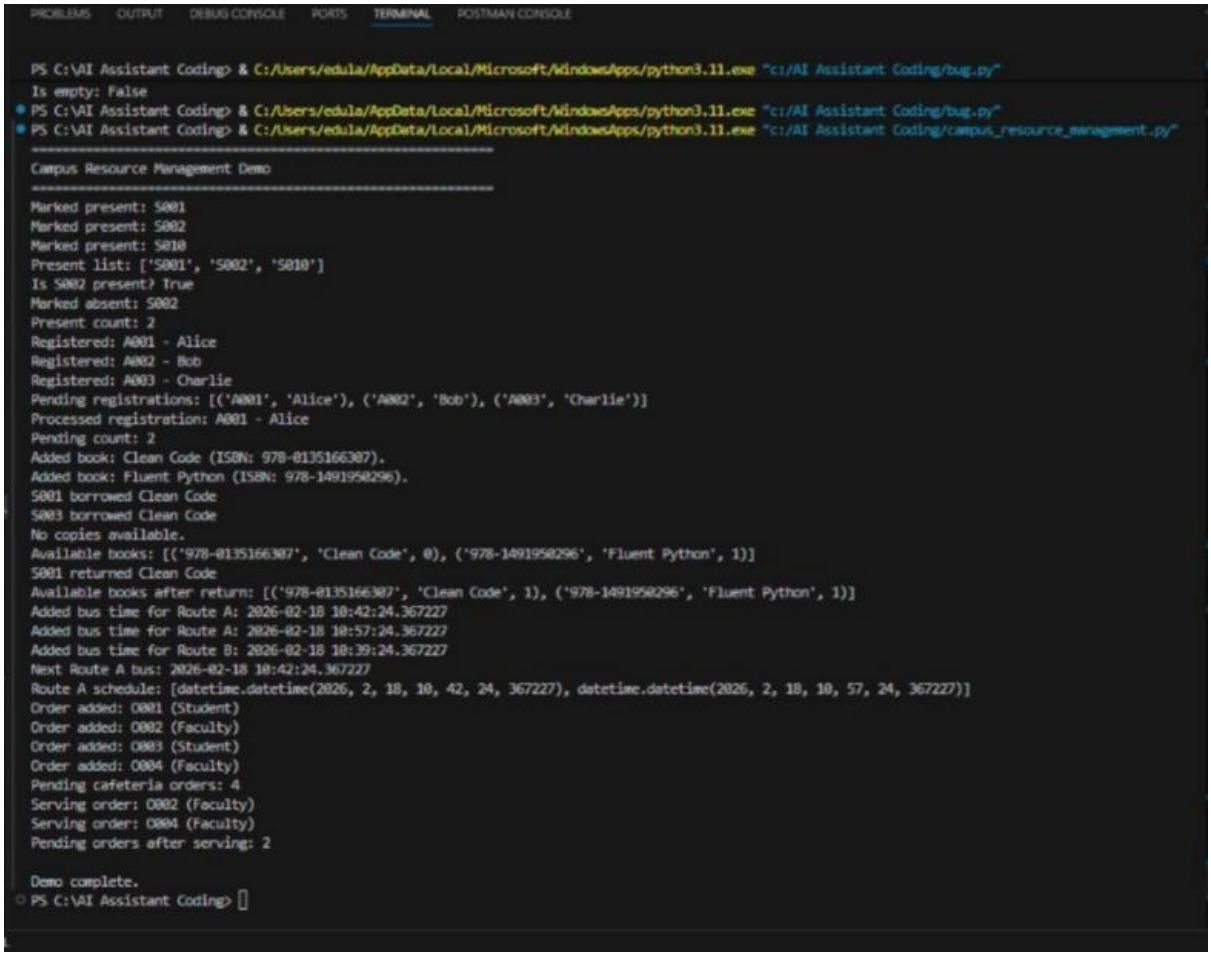

Explanation:

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.