

# 2303A51739

## Batch:25

Task 1: Smart Contact Manager (Arrays & Linked Lists)

Scenario

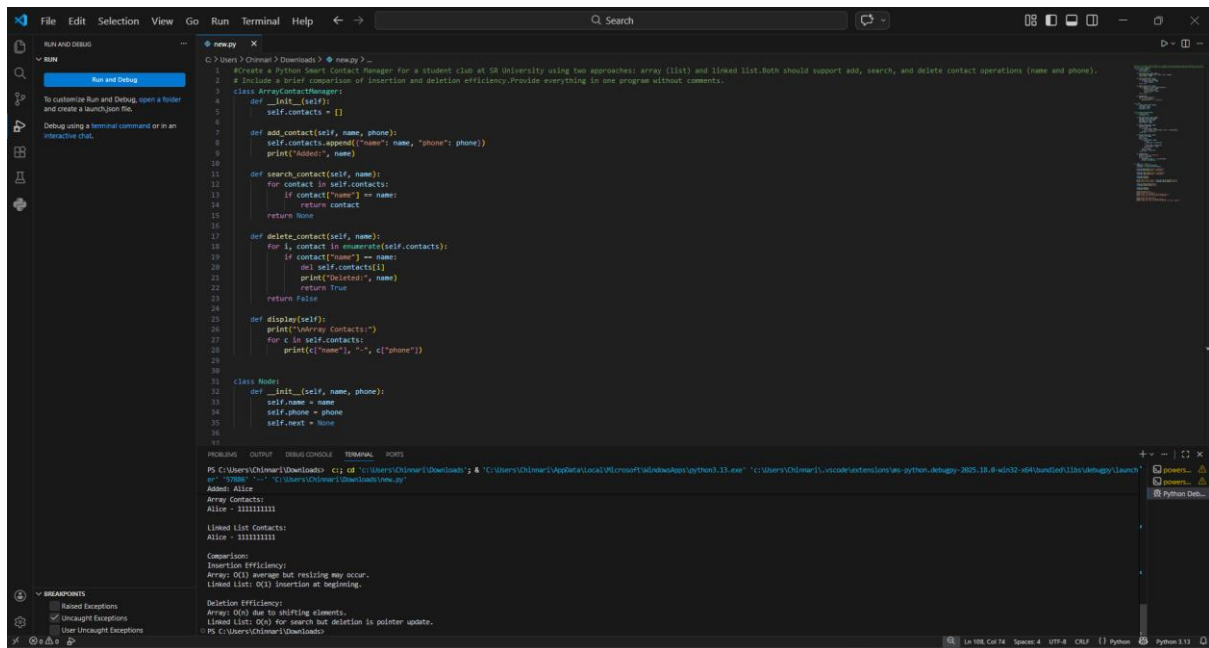
SR University's student club requires a simple Contact Manager Application to store members' names and phone numbers. The system should support efficient addition, searching, and deletion of contacts.

Tasks

1. Implement the contact manager using arrays (lists).
2. Implement the same functionality using a linked list for dynamic memory allocation.
3. Implement the following operations in both approaches:
  - o Add a contact
  - o Search for a contact
  - o Delete a contact
4. Use GitHub Copilot to assist in generating search and delete methods.
5. Compare array vs. linked list approaches with respect to:
  - o Insertion efficiency
  - o Deletion efficiency

Expected Outcome

- Two working implementations (array-based and linked-list-based).
- A brief comparison explaining performance differences.



## 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.

## Tasks

1. Implement a Queue (FIFO) to manage book requests.
2. Extend the system to a Priority Queue, prioritizing faculty requests.
3. Use GitHub Copilot to assist in generating:
  - o enqueue() method
  - o dequeue() method
4. Test the system with a mix of student and faculty requests.

## Expected Outcome

- Working queue and priority queue implementations.
- Correct prioritization of faculty requests

```
1 # Create a Python program for SR University Library Book Request System using a Queue (FIFO) and a Priority Queue where faculty requests have higher priority than student requests.
2 # Include enqueue and dequeue methods and test with mixed requests. Provide one program without comments.
3 from collections import deque
4 import time
5
6 class QueueSystem:
7     def __init__(self):
8         self.queue = deque()
9
10    def enqueue(self, name, role, book):
11        self.queue.append((name, role, book))
12        print(f"Added: {name, role, book}")
13
14    def dequeue(self):
15        if self.queue:
16            req = self.queue.popleft()
17            print(f"Processing: {req}")
18            return req
19        print("No requests")
20        return None
21
22    def display(self):
23        print("\nQueue Requests:")
24        for r in self.queue:
25            print(r)
26
27
28 class PriorityQueueSystem:
29     def __init__(self):
30         self.pq = []
31         self.count = 0
32
33     def enqueue(self, name, role, book):
34         priority = 0 if role.lower() == "faculty" else 1
35         heapq.heappush(self.pq, (priority, self.count, name, role, book))
36         self.count += 1
37         print(f"Added: {name, role, book}")
38
39     def dequeue(self):
40         if self.pq:
41             req = heapq.heappop(self.pq)
42             print(f"Processing: {req}")
43             return req
44         print("No requests")
45         return None
46
47     def display(self):
48         print("\nPriority Queue Requests:")
49         for r in self.pq:
50             print(r)
51
52
53 if __name__ == "__main__":
54     q = QueueSystem()
55     pq = PriorityQueueSystem()
56
57     q.enqueue("Alice", "Student", "Data Structures")
58     q.enqueue("Dr. Rao", "Faculty", "Machine Learning")
59     q.enqueue("Bob", "Student", "OS")
60
61     pq.enqueue("Alice", "Student", "Data Structures")
62     pq.enqueue("Dr. Rao", "Faculty", "Machine Learning")
63     pq.enqueue("Bob", "Student", "OS")
64
65     q.display()
66     pq.display()
67
68     print("\nQueue Processing:")
69     q.dequeue()
70     q.dequeue()
71
72     print("\nPriority Queue Processing:")
73     pq.dequeue()
74     pq.dequeue()
```

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35         heapq.heappush(self.pq, (priority, self.count, name, role, book))
36         self.count += 1
37         print(f"Added: {name, role, book}")
38
39     def dequeue(self):
40         if self.pq:
41             req = heapq.heappop(self.pq)
42             print(f"Processing: {req}")
43             return req
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45         return None
46
47     def display(self):
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49         for r in self.pq:
50             print(r)
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53 if __name__ == "__main__":
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63     pq.enqueue("Bob", "Student", "OS")
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65     q.display()
66     pq.display()
67
68     print("\nQueue Processing:")
69     q.dequeue()
70     q.dequeue()
71
72     print("\nPriority Queue Processing:")
73     pq.dequeue()
74     pq.dequeue()
```

## 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.

### Tasks

1. Implement a Stack to manage support tickets.
2. Provide the following operations:
  - o push(ticket)

o pop()

o peek()

3. Simulate at least five tickets being raised and resolved.

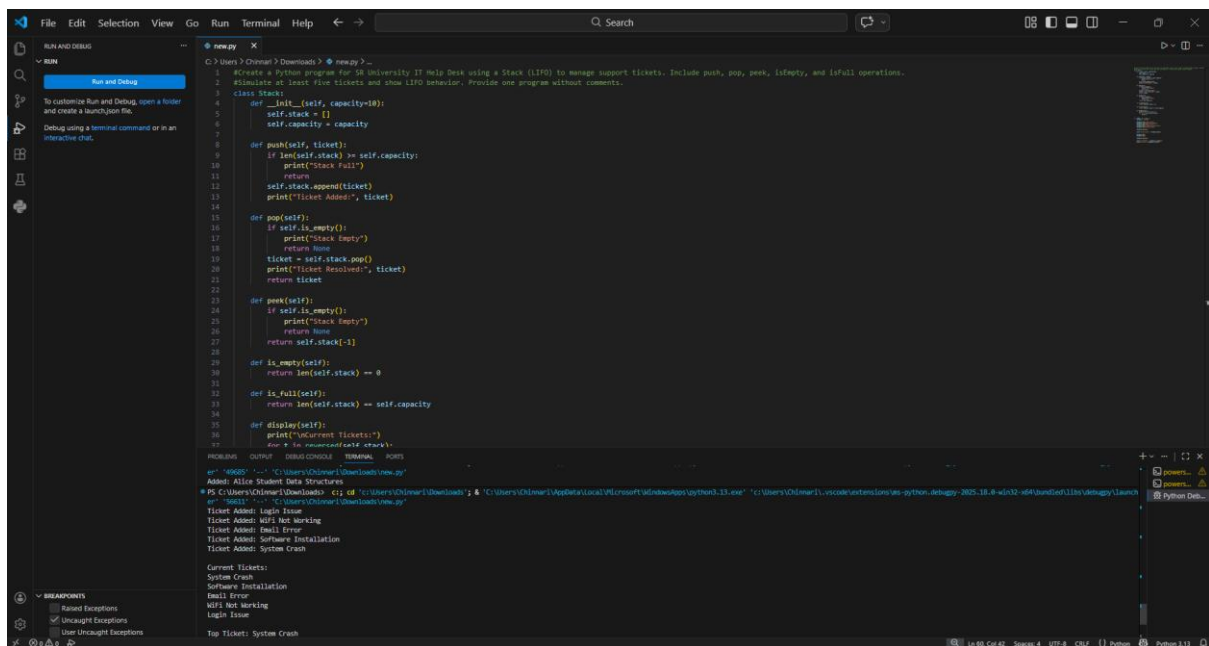
4. Use GitHub Copilot to suggest additional stack operations such as:

o Checking whether the stack is empty

o Checking whether the stack is full (if applicable)

Expected Outcome

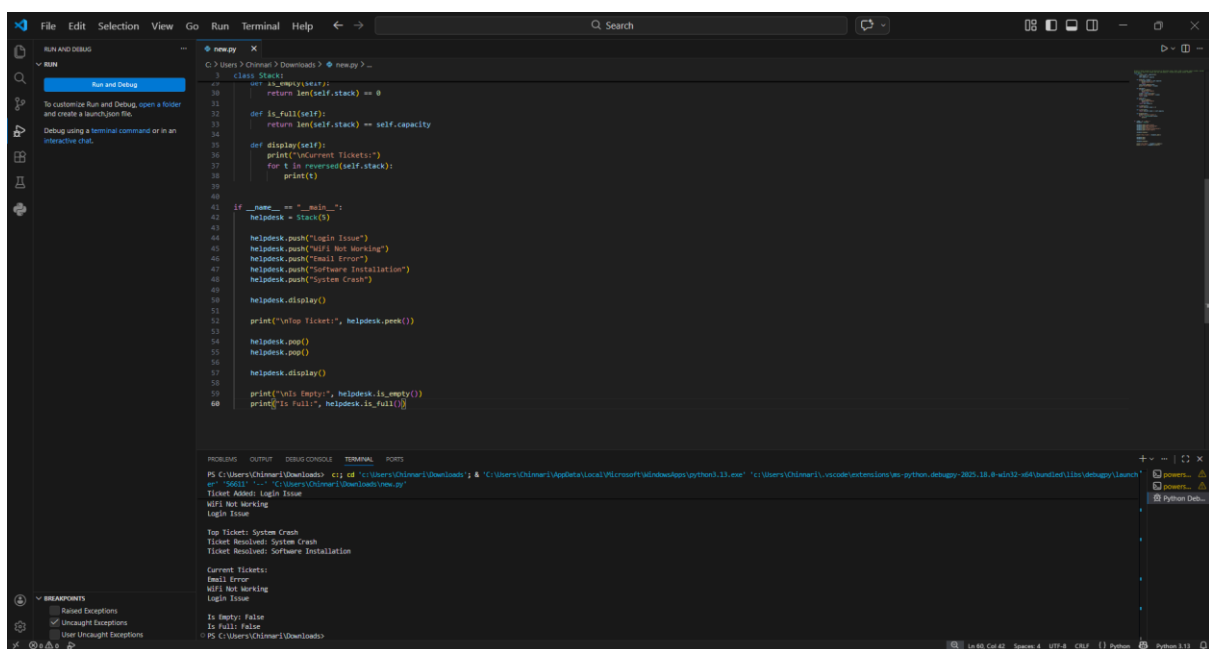
- Functional stack-based ticket management system.
- Clear demonstration of LIFO behavior.



```
1 # Create a Python program for SH University IT Help Desk using a Stack (LIFO) to manage support tickets. Include push, pop, peek, is_empty, and is_full operations.
2 # Simulate at least five tickets and show LIFO behavior. Provide one program without comments.
3 class Stack:
4     def __init__(self, capacity=10):
5         self.stack = []
6         self.capacity = capacity
7
8     def push(self, ticket):
9         if len(self.stack) >= self.capacity:
10             print("Stack Full")
11             return
12         self.stack.append(ticket)
13         print("Ticket Added:", ticket)
14
15     def pop(self):
16         if self.is_empty():
17             print("Stack Empty")
18             return None
19         ticket = self.stack.pop()
20         print("Ticket Resolved:", ticket)
21         return ticket
22
23     def peek(self):
24         if self.is_empty():
25             print("Stack Empty")
26             return None
27         return self.stack[-1]
28
29     def is_empty(self):
30         return len(self.stack) == 0
31
32     def is_full(self):
33         return len(self.stack) == self.capacity
34
35     def display(self):
36         print("Current Tickets:")
37         for t in reversed(self.stack):
38             print(t)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
er "46022" '-' "C:\Users\Chinmay\Downloads\new.py"
Ticket Added: Login Issue
Ticket Added: WiFi Not Working
Ticket Added: Email Error
Ticket Added: Software Installation
Ticket Added: System Crash
Current Tickets:
System Crash
Software Installation
Email Error
WiFi Not Working
Login Issue
Top Tickets: System Crash
```



```
39         print(t)
40
41 if __name__ == "__main__":
42     helpdesk = Stack(5)
43
44     helpdesk.push("Login Issue")
45     helpdesk.push("WiFi Not Working")
46     helpdesk.push("Email Error")
47     helpdesk.push("Software Installation")
48     helpdesk.push("System Crash")
49
50     helpdesk.display()
51
52     print("Unpop Ticket:", helpdesk.peek())
53
54     helpdesk.pop()
55     helpdesk.pop()
56
57     helpdesk.display()
58
59     print("Is Empty:", helpdesk.is_empty())
60     print("Is Full:", helpdesk.is_full())
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\Chinmay\Downloads> cd cd "C:\Users\Chinmay\Downloads" & "C:\Users\Chinmay\AppData\Local\Microsoft\WindowsApps\python3.11.exe" "C:\Users\Chinmay\vscode\extensions\ms-python.debugpy-2025.18.0-win32-x64\bin\debugpy-launcher"
er "46011" '-' "C:\Users\Chinmay\Downloads\new.py"
Ticket Added: Login Issue
Ticket Added: WiFi Not Working
Ticket Added: Email Error
Ticket Added: Software Installation
Ticket Added: System Crash
Current Tickets:
System Crash
Software Installation
Email Error
WiFi Not Working
Login Issue
Is Empty: False
Is Full: False
PS C:\Users\Chinmay\Downloads>
```

## Task 4: Hash Table

## Objective

To implement a Hash Table and understand collision handling.

### Task Description

Use AI to generate a hash table with:

- Insert
- Search
- Delete

### Starter Code

```
class HashTable:
```

pass

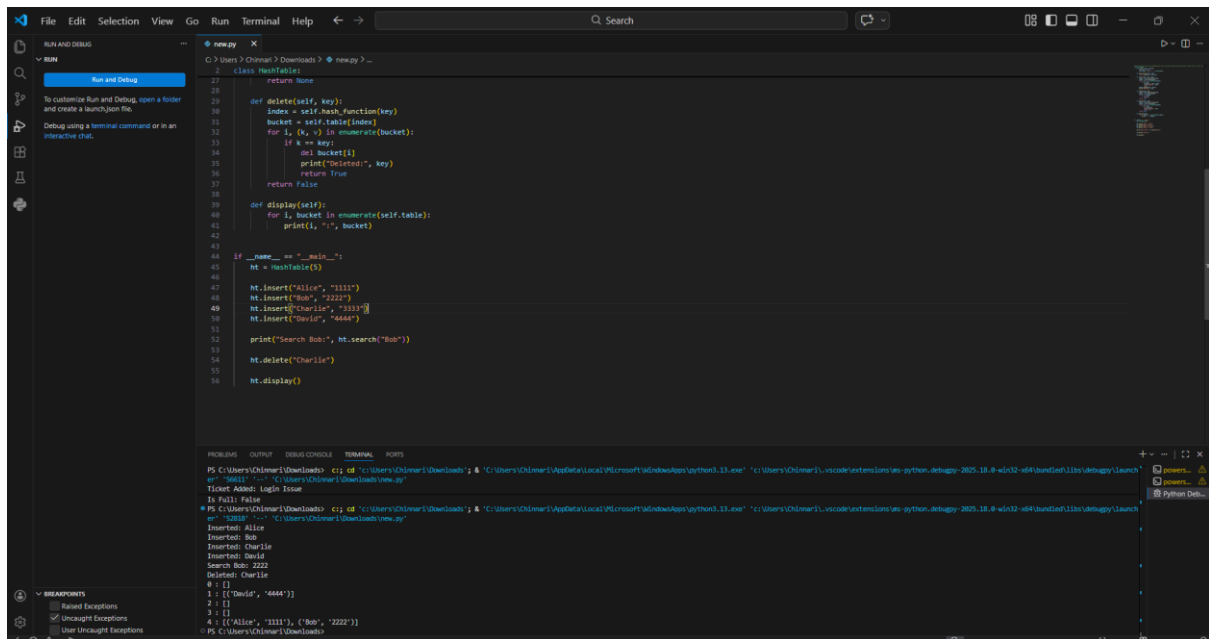
## Expected Outcome

- Collision handling using chaining
- Well-commented methods

The screenshot shows a Windows IDE with a Python script for a hash table implementation. The script is named `newpy.py` and is located in the `C:\Users\Chinmay\Downloads` directory. The script implements a hash table with collision handling using chaining. It includes functions for `insert`, `search`, and `delete`.

```

1 #Create a Python Hash Table Implementation with collision handling using chaining. Include insert, search, and delete methods in one program without comments
2 class HashTable:
3     def __init__(self, size=10):
4         self.size = size
5         self.table = [[] for _ in range(size)]
6
7     def hash_function(self, key):
8         return hash(key) % self.size
9
10    def insert(self, key, value):
11        index = self.hash_function(key)
12        bucket = self.table[index]
13        for i, (k, v) in enumerate(bucket):
14            if k == key:
15                bucket[i] = (key, value)
16                print("Updated:", key)
17        return
18        bucket.append((key, value))
19        print("Inserted:", key)
20
21    def search(self, key):
22        index = self.hash_function(key)
23        bucket = self.table[index]
24        for k, v in bucket:
25            if k == key:
26                return v
27        return None
28
29    def delete(self, key):
30        index = self.hash_function(key)
31        bucket = self.table[index]
32        for i, (k, v) in enumerate(bucket):
33            if k == key:
34                del bucket[i]
35                print("Deleted:", key)
36        return True
37
38 if __name__ == '__main__':
39     ht = HashTable()
40     ht.insert('Alice', 1234)
41     ht.insert('Bob', 5678)
42     ht.insert('Charlie', 9101)
43     ht.insert('David', 2345)
44     ht.delete('Charlie')
45     print(ht.search('Alice'))
46     print(ht.search('Bob'))
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```



### 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

## Student Tasks

1. Choose the most appropriate data structure for each feature.
2. Justify your choice in 2–3 sentences.
3. Implement one selected feature using AI-assisted code generation.

## Expected Outcome

- Mapping table: Feature  $\rightarrow$  Data Structure  $\rightarrow$  Justification
- One fully working Python implementation

```
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RUN AND DEBUG
new.py x
C:\Users\Chinmay> Downloads > new.py > ...
1 #Pnslp - a Campus Resource Management System for SR University by mapping features to suitable data structures with Justification, and implement one feature in Python without comments.
2 from collections import deque
3
4 class CafeteriaQueue:
5     def __init__(self):
6         self.queue = deque()
7
8     def place_order(self, name, item):
9         self.queue.append((name, item))
10        print("Order Placed:", name, item)
11
12    def process_order(self):
13        if self.queue:
14            order = self.queue.popleft()
15            print("Order Served:", order)
16            return order
17        print("No Orders")
18        return None
19
20    def display_orders(self):
21        print("Pending Orders:")
22        for o in self.queue:
23            print(o)
24
25    if __name__ == "__main__":
26        cafe = CafeteriaQueue()
27
28        cafe.place_order("Alice", "Sandwich")
29        cafe.place_order("Bob", "Coffee")
30        cafe.place_order("Charlie", "Burger")
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32        cafe.display_orders()
33        cafe.process_order()
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