

ASSIGNMENT-11.1

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BATCH-14

Task Description #1 – Stack Implementation

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

Sample Input Code:

```
class Stack:
```

pass

Expected Output:

- A functional stack implementation with all required methods and docstrings.

```

1  class Stack:
2      """
3      Stack Data Structure (LIFO - Last In First Out)
4      """
5
6      def __init__(self):
7          """Initialize an empty stack."""
8          self.items = []
9
10     def push(self, item):
11         """Add an item to the top of the stack."""
12         self.items.append(item)
13
14     def pop(self):
15         """
16         Remove and return the top item of the stack.
17         Raises IndexError if stack is empty.
18         """
19         if self.is_empty():
20             raise IndexError("Pop from empty stack")
21         return self.items.pop()
22
23     def peek(self):
24         """Return the top item without removing it."""
25         if self.is_empty():
26             raise IndexError("Peek from empty stack")

```

PROBLEMS

OUTPUT

DEBUG CONSOLE

TERMINAL

PORTS

```

PS C:\Users\srini\OneDrive\Desktop\Blockchain> & 'c:\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-python.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '59582' '--' 'C:\Users\srini\OneDrive\Desktop\Blockchain\.github\11.1.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain>

```

Task Description #2 – Queue Implementation

Task: Use AI to implement a Queue using Python lists.

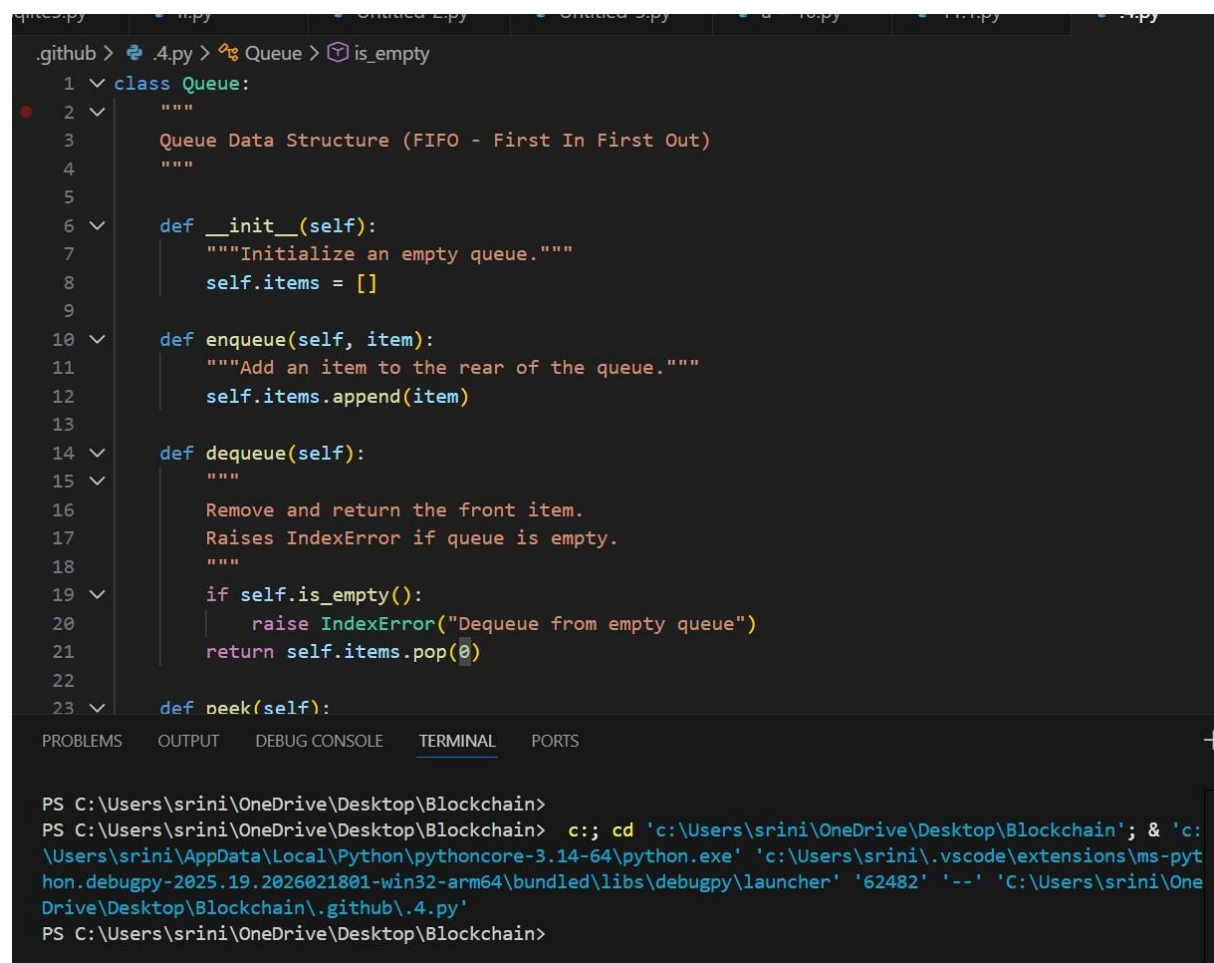
Sample Input Code:

```
class Queue:
```

```
pass
```

Expected Output:

- FIFO-based queue class with enqueue, dequeue, peek, and size methods.



The screenshot shows a VS Code editor with a Python file named `Queue.py`. The code implements a FIFO-based queue class. The terminal window at the bottom shows the command to run the script, which successfully executes the `is_empty` method.

```
.github > .py > Queue > is_empty
1 class Queue:
2     """
3     Queue Data Structure (FIFO - First In First Out)
4     """
5
6     def __init__(self):
7         """Initialize an empty queue."""
8         self.items = []
9
10    def enqueue(self, item):
11        """Add an item to the rear of the queue."""
12        self.items.append(item)
13
14    def dequeue(self):
15        """
16        Remove and return the front item.
17        Raises IndexError if queue is empty.
18        """
19        if self.is_empty():
20            raise IndexError("Dequeue from empty queue")
21        return self.items.pop(0)
22
23    def peek(self):
```

```
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c::; cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:
\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '62482' '--' 'C:\Users\sринi\One
Drive\Desktop\Blockchain\.github\.4.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
```

Task Description #3 – Linked List

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

Sample Input Code:

```
class Node:
```

```
pass
```

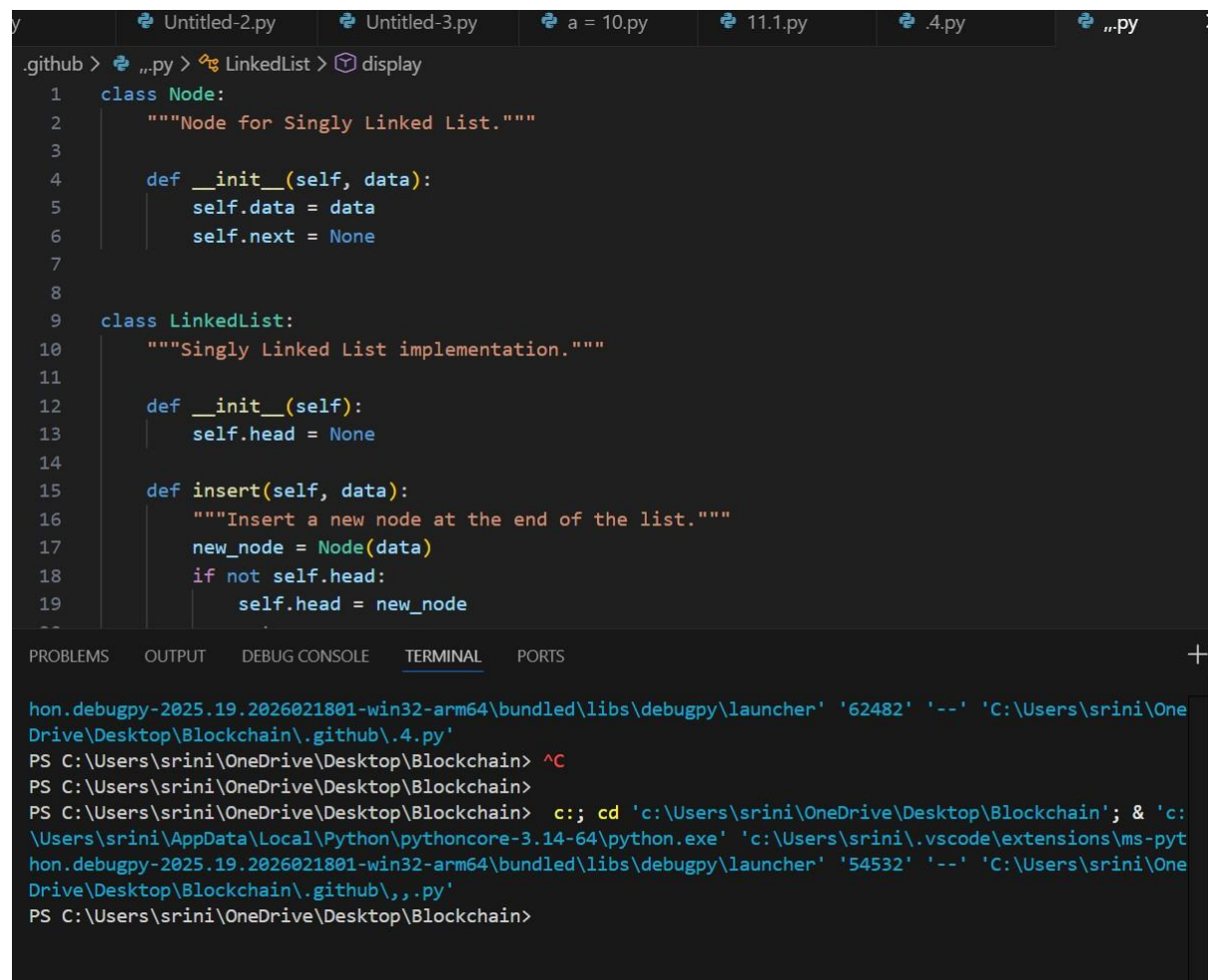
```
class LinkedList:
```

```
pass
```

Expected Output:

- A working linked list implementation with clear method

documentation.



```
.github > .py > LinkedList > display
1  class Node:
2      """Node for Singly Linked List."""
3
4      def __init__(self, data):
5          self.data = data
6          self.next = None
7
8
9  class LinkedList:
10     """Singly Linked List implementation."""
11
12     def __init__(self):
13         self.head = None
14
15     def insert(self, data):
16         """Insert a new node at the end of the list."""
17         new_node = Node(data)
18         if not self.head:
19             self.head = new_node
20
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '62482' '--' 'C:\Users\sринi\OneDrive\Desktop\Blockchain\.github\.4.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c:; cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '54532' '--' 'C:\Users\sринi\OneDrive\Desktop\Blockchain\.github\,.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
```

Task Description #4 – Binary Search Tree (BST)

Task: Use AI to create a BST with insert and in-order traversal methods.

Sample Input Code:

```
class BST:
```

```
pass
```

Expected Output:

- BST implementation with recursive insert and traversal methods

```
.github > A11.py > BST > _inorder_recursive
1 class BST:
20     def _insert_recursive(self, node, value):
21         if node.right:
29             self._insert_recursive(node.right, value)
30         else:
31             node.right = self.Node(value)
32
33     def inorder_traversal(self):
34         """Perform in-order traversal."""
35         self._inorder_recursive(self.root)
36
37     def _inorder_recursive(self, node):
38         if node:
39             self._inorder_recursive(node.left)
40             print(node.value, end=" ")
41             self._inorder_recursive(node.right)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

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PS C:\Users\sринi\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c:: cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:
\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '54532' '--' 'C:\Users\sринi\One
Drive\Desktop\Blockchain\.github\,,.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c:: cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:
\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '57602' '--' 'C:\Users\sринi\One
Drive\Desktop\Blockchain\.github\A11.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
```

Task Description #5 – Hash Table

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

Sample Input Code:

```
class HashTable:
```

```
pass
```

Expected Output:

- Collision handling using chaining, with well-commented methods.

```
github > .\A11.py > HashTable > delete
1 class HashTable:
2     """
3     Hash Table implementation using chaining for collision handling.
4     """
5
6     def __init__(self, size=10):
7         self.size = size
8         self.table = [[] for _ in range(size)]
9
10    def _hash(self, key):
11        """Generate hash index for a key."""
12        return hash(key) % self.size
13
14    def insert(self, key, value):
15        """Insert key-value pair."""
16        index = self._hash(key)
17        for pair in self.table[index]:
18            if pair[0] == key:
19                pair[1] = value
20
21    def delete(self, key):
22        """Delete key-value pair."""
23        index = self._hash(key)
24        for pair in self.table[index]:
25            if pair[0] == key:
26                self.table[index].remove(pair)
27
28    def display(self):
29        """Display the hash table contents."""
30        for i in range(self.size):
31            print(f"Bucket {i}: ", end="")
32            for pair in self.table[i]:
33                print(pair, " ")
34            print()
35
36    def __str__(self):
37        return str(self.table)
38
39    def __repr__(self):
40        return repr(self.table)
41
42    def __len__(self):
43        return self.size
44
45    def __getitem__(self, key):
46        index = self._hash(key)
47        for pair in self.table[index]:
48            if pair[0] == key:
49                return pair[1]
50        return None
51
52    def __setitem__(self, key, value):
53        self.insert(key, value)
54
55    def __delitem__(self, key):
56        self.delete(key)
57
58    def __contains__(self, key):
59        return self.__getitem__(key) is not None
60
61    def __iter__(self):
62        for i in range(self.size):
63            for pair in self.table[i]:
64                yield pair
65
66    def __reversed__(self):
67        for i in range(self.size - 1, -1, -1):
68            for pair in reversed(self.table[i]):
69                yield pair
70
71    def __add__(self, other):
72        if isinstance(other, HashTable):
73            return self + other
74        return NotImplemented
75
76    def __sub__(self, other):
77        if isinstance(other, HashTable):
78            return self - other
79        return NotImplemented
80
81    def __mul__(self, other):
82        if isinstance(other, HashTable):
83            return self * other
84        return NotImplemented
85
86    def __div__(self, other):
87        if isinstance(other, HashTable):
88            return self / other
89        return NotImplemented
90
91    def __mod__(self, other):
92        if isinstance(other, HashTable):
93            return self % other
94        return NotImplemented
95
96    def __pow__(self, other):
97        if isinstance(other, HashTable):
98            return self ** other
99        return NotImplemented
100
101    def __radd__(self, other):
102        if isinstance(other, HashTable):
103            return other + self
104        return NotImplemented
105
106    def __rsub__(self, other):
107        if isinstance(other, HashTable):
108            return other - self
109        return NotImplemented
110
111    def __rmul__(self, other):
112        if isinstance(other, HashTable):
113            return other * self
114        return NotImplemented
115
116    def __rdiv__(self, other):
117        if isinstance(other, HashTable):
118            return other / self
119        return NotImplemented
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```
.github > PP.py > Graph > display
Click to add a breakpoint
graph implementation using adjacency list."""
3
4     def __init__(self):
5         self.adj_list = {}
6
7     def add_vertex(self, vertex):
8         """Add a new vertex."""
9         if vertex not in self.adj_list:
10             self.adj_list[vertex] = []
11
12     def add_edge(self, v1, v2):
13         """Add edge between v1 and v2."""
14         if v1 not in self.adj_list:
15             self.add_vertex(v1)
16         if v2 not in self.adj_list:
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c;; cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-python.debugpy-2025.19.2026021801-win32-arm64\bundle\libs\debugpy\launcher' '53619' '--' 'C:\Users\sринi\OneDrive\Desktop\Blockchain\.github\.,.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
PS C:\Users\sринi\OneDrive\Desktop\Blockchain> c;; cd 'c:\Users\sринi\OneDrive\Desktop\Blockchain'; & 'c:\Users\sринi\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\sринi\.vscode\extensions\ms-python.debugpy-2025.19.2026021801-win32-arm64\bundle\libs\debugpy\launcher' '64758' '--' 'C:\Users\sринi\OneDrive\Desktop\Blockchain\.github\PP.py'
PS C:\Users\sринi\OneDrive\Desktop\Blockchain>
```

Task Description #7 – Priority Queue

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

Sample Input Code:

```
class PriorityQueue:
    pass
```

Expected Output:

- Implementation with `enqueue (priority)`, `dequeue (highest priority)`, and `display` methods.

```
.github > ASS11.1.py > PriorityQueue > display
1  import heapq
2
3  class PriorityQueue:
4      """
5      Priority Queue using heapq (min-heap).
6      Lower value = higher priority.
7      """
8
9      def __init__(self):
10         self.heap = []
11
12     def enqueue(self, item, priority):
13         """Add item with priority."""
14         heapq.heappush(self.heap, (priority, item))
15
16     def dequeue(self):
17         """Remove and return highest priority item."""
18         if not self.heap:
19             raise IndexError("Dequeue from empty priority queue")
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c::; cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-python.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '54927' '--' 'C:\Users\srini\OneDrive\Desktop\Blockchain\.github\ASS11.1.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c::; cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-python.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '57884' '--' 'C:\Users\srini\OneDrive\Desktop\Blockchain\.github\ASS11.1.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
```

Task Description #8 – Deque

Task: Use AI to implement a double-ended queue using `collections.deque`.

Sample Input Code:

```
class DequeDS:
```

```
    pass
```

Expected Output:

- Insert and remove from both ends with docstrings.

```
github > .py > DequeDS > remove_rear
1  from collections import deque
2
3  class DequeDS:
4      """Double-ended Queue implementation."""
5
6      def __init__(self):
7          self.items = deque()
8
9      def add_front(self, item):
10         """Insert item at front."""
11         self.items.appendleft(item)
12
13     def add_rear(self, item):
14         """Insert item at rear."""
15         self.items.append(item)
16
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
Drive\Desktop\Blockchain\.github\ASS11.1.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c:: cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:
\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '57884' '--' 'C:\Users\srini\One
Drive\Desktop\Blockchain\.github\ASS11.1.py'
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PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c:: cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:
\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '58788' '--' 'C:\Users\srini\One
Drive\Desktop\Blockchain\.github\=.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
```

Task Description #9 Real-Time Application Challenge – Choose the Right Data Structure

Scenario:

Your college wants to develop a Campus Resource Management System
that handles:

1. Student Attendance Tracking – Daily log of students
entering/exiting the campus.
2. Event Registration System – Manage participants in events with
quick search and removal.
3. Library Book Borrowing – Keep track of available books and their
due dates.

4. Bus Scheduling System – Maintain bus routes and stop connections.

5. Cafeteria Order Queue – Serve students 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

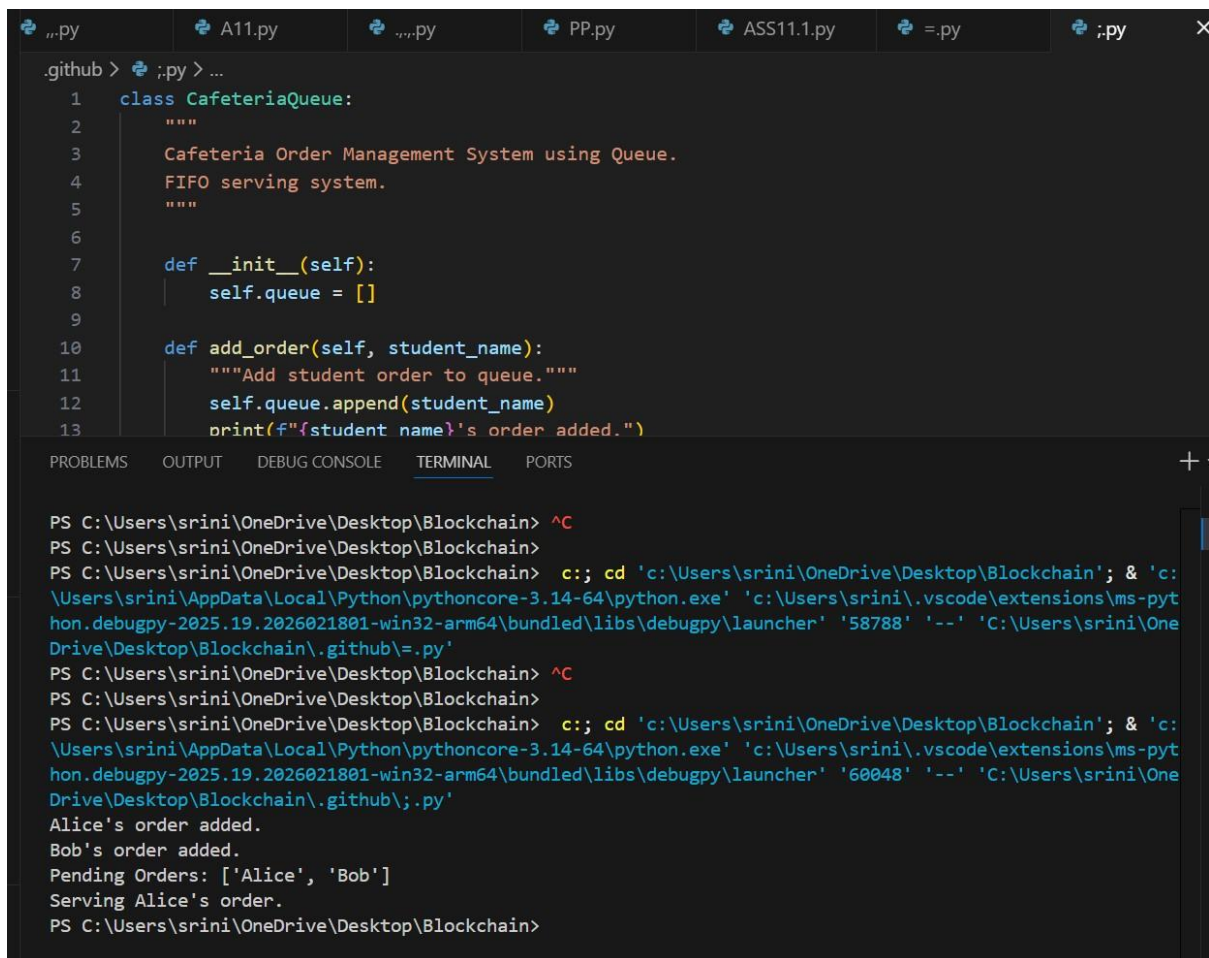
- Justify your choice in 2–3 sentences per feature.

- Implement one selected feature as a working Python program with AI-assisted code generation.

Expected Output:

- A table mapping feature → chosen data structure → justification.

- A functional Python program implementing the chosen feature with comments and docstrings.



```
.github > .py > ...
1 class CafeteriaQueue:
2     """
3     Cafeteria Order Management System using Queue.
4     FIFO serving system.
5     """
6
7     def __init__(self):
8         self.queue = []
9
10    def add_order(self, student_name):
11        """Add student order to queue."""
12        self.queue.append(student_name)
13        print(f"{student_name}'s order added.")

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\srini\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c;; cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:
\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundle\libs\debugpy\launcher' '58788' '--' 'C:\Users\srini\One
Drive\Desktop\Blockchain\.github\=.py'
PS C:\Users\srini\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c;; cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:
\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundle\libs\debugpy\launcher' '60048' '--' 'C:\Users\srini\One
Drive\Desktop\Blockchain\.github\=.py'
Alice's order added.
Bob's order added.
Pending Orders: ['Alice', 'Bob']
Serving Alice's order.
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
```

Task Description #10: Smart E-Commerce Platform – Data Structure

Challenge

An e-commerce company wants to build a Smart Online Shopping System with:

1. Shopping Cart Management – Add and remove products dynamically.
2. Order Processing System – Orders processed in the order they are placed.
3. Top-Selling Products Tracker – Products ranked by sales count.
4. Product Search Engine – Fast lookup of products using product ID.
5. Delivery Route Planning – Connect warehouses and delivery

locations.

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

- Justify your choice in 2–3 sentences per feature.
- Implement one selected feature as a working Python program with AI-assisted code generation.

Expected Output:

- A table mapping feature → chosen data structure → justification.
- A functional Python program implementing the chosen feature with comments and docstrings.

.github >  ==.py > ...

```
1 class OrderProcessingSystem:
2     """
3     Order processing using Queue (FIFO).
4     """
5
6     def __init__(self):
7         self.orders = []
8
9     def place_order(self, order_id):
10        """Add order to processing queue."""
11        self.orders.append(order_id)
12        print(f"Order {order_id} placed.")
13
14    def process_order(self):
15        """Process next order."""
16        if not self.orders:
17            print("No orders to process.")
18            return
19        order = self.orders.pop(0)
20        print(f"Processing Order {order}")
21
22    def display_orders(self):
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\srini\OneDrive\Desktop\Blockchain> ^C
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
PS C:\Users\srini\OneDrive\Desktop\Blockchain> c:; cd 'c:\Users\srini\OneDrive\Desktop\Blockchain'; & 'c:
\Users\srini\AppData\Local\Python\pythoncore-3.14-64\python.exe' 'c:\Users\srini\.vscode\extensions\ms-pyt
hon.debugpy-2025.19.2026021801-win32-arm64\bundled\libs\debugpy\launcher' '55459' '--' 'C:\Users\srini\One
Drive\Desktop\Blockchain\.github\==.py'
Order 101 placed.
Order 102 placed.
Processing Order 101
PS C:\Users\srini\OneDrive\Desktop\Blockchain>
```