

AI ASSISTED CODING

LAB-11.1

Katta Lasya

2303A51733

Batch-11

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

PROMPT:

#Write a code to generate a stack class with push,pop,peek and isEmpty methods

CODE:

```

lab6.py > ...
1  #Write a code to generate a stack class with push,pop,peek and isEmpty methods
2  class Stack:
3      def __init__(self):
4          self.stack = []
5      def push(self, item):
6          self.stack.append(item)
7      def pop(self):
8          if not self.isEmpty():
9              return self.stack.pop()
10         else:
11             raise IndexError("Stack is empty")
12     def peek(self):
13         if not self.isEmpty():
14             return self.stack[-1]
15         else:
16             raise IndexError("Stack is empty")
17     def isEmpty(self):
18         return len(self.stack) == 0
19 # Example usage
20 if __name__ == "__main__":
21     stack = Stack()
22     stack.push(1)
23     stack.push(2)
24     stack.push(3)
25     print(stack.peek()) # Output: 3
26     print(stack.pop()) # Output: 3
27     print(stack.isEmpty()) # Output: False
28     print(stack.pop()) # Output: 2
29     print(stack.pop()) # Output: 1
30     print(stack.isEmpty()) # Output: True
31

```

OUTPUT:

```

False ...
PS C:\Users\thota\OneDrive\Desktop\AIAC> & C:/Users/thota/AppData/Local/Programs/Python/Python39-64/Python.exe C:/Users/thota/OneDrive/Desktop/AIAC/lab6.py
3
3
False
2
1
True
PS C:\Users\thota\OneDrive\Desktop\AIAC>

```

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.

PROMPT:

#Write a code to generate a queue class with enqueue,dequeue,peek and size methods

CODE:

```
palindrome.py > ...
1  #Write a code to generate a queue class with enqueue,dequeue,peek and size methods
2  class Queue:
3      def __init__(self):
4          self.queue = []
5      def enqueue(self, item):
6          self.queue.append(item)
7      def dequeue(self):
8          if not self.isEmpty():
9              return self.queue.pop(0)
10         else:
11             raise IndexError("Queue is empty")
12     def peek(self):
13         if not self.isEmpty():
14             return self.queue[0]
15         else:
16             raise IndexError("Queue is empty")
17     def size(self):
18         return len(self.queue)
19     def isEmpty(self):
20         return len(self.queue) == 0
21     # Example usage
22     if __name__ == "__main__":
23         queue = Queue()
24         queue.enqueue(1)
25         queue.enqueue(2)
26         queue.enqueue(3)
27         print(queue.peek()) # Output: 1
28         print(queue.dequeue()) # Output: 1
29         print(queue.size()) # Output: 2
30         print(queue.dequeue()) # Output: 2
31         print(queue.dequeue()) # Output: 3
32         print(queue.isEmpty()) # Output: True
```

OUTPUT:


```
palindrome.py > SinglyLinkedList > display
2 class Node:
3     def __init__(self, data):
4         self.data = data
5         self.next = None
6 class SinglyLinkedList:
7     def __init__(self):
8         self.head = None
9     def insert(self, data):
10        new_node = Node(data)
11        if not self.head:
12            self.head = new_node
13            return
14        last_node = self.head
15        while last_node.next:
16            last_node = last_node.next
17        last_node.next = new_node
18    def display(self):
19        current_node = self.head
20        while current_node:
21            print(current_node.data, end=' ')
22            current_node = current_node.next
23        print()
24    # Example usage
25    if __name__ == "__main__":
26        linked_list = SinglyLinkedList()
27        linked_list.insert(10)
28        linked_list.insert(20)
29        linked_list.insert(30)
30        print("Singly Linked List:")
31        linked_list.display()
32    # This program defines a Node class for the elements of the linked
```

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Singly Linked List:
10 20 30
PS C:\Users\thota\OneDrive\Desktop\AIAC>

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.**

PROMPT:

#Write a code to create a binary search tree and inorder traversal methods using recursive insert and traversal methods

CODE AND OUTPUT:

```
palindrome.py X lab6.py lab1exam.py lab4.py lab2.py 1 lab5.py
palindrome.py > BinarySearchTree > _insert_recursive
1 #Write a code to create a binary search tree and inorder traversal methods using recursive
2 class TreeNode:
3     def __init__(self, value):
4         self.value = value
5         self.left = None
6         self.right = None
7 class BinarySearchTree:
8     def __init__(self):
9         self.root = None
10    def insert(self, value):
11        if self.root is None:
12            self.root = TreeNode(value)
13        else:
14            self._insert_recursive(self.root, value)
15    def _insert_recursive(self, node, value):
16        if value < node.value:
17            if node.left is None:
18                node.left = TreeNode(value)
19            else:
20                self._insert_recursive(node.left, value)
21        else:
22            if node.right is None:
23                node.right = TreeNode(value)
24            else:
25                self._insert_recursive(node.right, value)
26    def inorder_traversal(self):
27        return self._inorder_recursive(self.root)
28    def _inorder_recursive(self, node):
29        result = []
30        if node:
31            result.extend(self._inorder_recursive(node.left))
32            result.append(node.value)
33            result.extend(self._inorder_recursive(node.right))
34        return result
35 # Example usage
36 if __name__ == "__main__":
37     bst = BinarySearchTree()
```



```
palindrome.py > BinarySearchTree > _insert_recursive
7 class BinarySearchTree:
28     def _inorder_recursive(self, node):
30         if node:
31             result.extend(self._inorder_recursive(node.left))
32             result.append(node.value)
33             result.extend(self._inorder_recursive(node.right))
34         return result
35 # Example usage
36 if __name__ == "__main__":
37     bst = BinarySearchTree()
38     bst.insert(5)
39     bst.insert(3)
40     bst.insert(7)
41     bst.insert(2)
42     bst.insert(4)
43     bst.insert(6)
44     bst.insert(8)
45     print("Inorder Traversal:", bst.inorder_traversal()) # Output: [2, 3, 4, 5, 6, 7, 8]
46 # This code defines a binary search tree with methods for inserting values and performing an inorder tra
47
```

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True ...

```
PS C:\Users\thota\OneDrive\Desktop\AIAC> & C:/Users/thota/AppData/Local/Programs/Python/Python313/python.exe c:/Users/
/ AIAC/palindrome.py
/ AIAC/palindrome.py
Inorder Traversal: [2, 3, 4, 5, 6, 7, 8]
PS C:\Users\thota\OneDrive\Desktop\AIAC>
```

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 wellcommented methods.

PROMPT:

#Write a code to implement a hash table with basic operations like insert, delete and search methods using chaining for collision handling with well commented methods

CODE AND OUTPUT:

```

palindrome.py > HashTable > hash_function
1 #Write a code to implement a hash table with basic operations like insert, delete and search methods using cha
2 class HashTable:
3     def __init__(self, size=10):
4         """Initialize the hash table with a specified size."""
5         self.size = size
6         self.table = [[] for _ in range(size)] # Create a list of empty lists for chaining
7     def hash_function(self, key):
8         """Generate a hash for the given key."""
9         return hash(key) % self.size
10    def insert(self, key, value):
11        """Insert a key-value pair into the hash table."""
12        index = self.hash_function(key)
13        # Check if the key already exists and update it
14        for i, (k, v) in enumerate(self.table[index]):
15            if k == key:
16                self.table[index][i] = (key, value) # Update existing key
17                return
18        # If the key does not exist, add a new key-value pair
19        self.table[index].append((key, value))
20    def delete(self, key):
21        """Delete a key-value pair from the hash table."""
22        index = self.hash_function(key)
23        for i, (k, v) in enumerate(self.table[index]):
24            if k == key:
25                del self.table[index][i] # Remove the key-value pair
26                return True
27        return False # Key not found
28    def search(self, key):
29        """Search for a value by its key in the hash table."""
30        index = self.hash_function(key)
31        for k, v in self.table[index]:
32            if k == key:
33                return v # Return the value associated with the key

```

```

palindrome.py > HashTable > hash_function
2 class HashTable:
20    def delete(self, key):
24        if k == key:
25            del self.table[index][i] # Remove the key-value pair
26            return True
27        return False # Key not found
28    def search(self, key):
29        """Search for a value by its key in the hash table."""
30        index = self.hash_function(key)
31        for k, v in self.table[index]:
32            if k == key:
33                return v # Return the value associated with the key
34        return None # Key not found
35 # Example usage
36 if __name__ == "__main__":
37     hash_table = HashTable()
38     hash_table.insert("name", "Alice")
39     hash_table.insert("age", 30)
40     print(hash_table.search("name")) # Output: Alice
41     print(hash_table.search("age")) # Output: 30
42     hash_table.delete("name")
43     print(hash_table.search("name")) # Output: None
44 # This program implements a hash table using chaining for collision handling. It includes methods for

```

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PS C:\Users\thota\OneDrive\Desktop\AIAC> ^C

● PS C:\Users\thota\OneDrive\Desktop\AIAC> & C:/Users/thota/AppData/Local/Programs/Python/Python313/python.exe c:/User
/AIAC/palindrome.py

Alice

30

None

○ PS C:\Users\thota\OneDrive\Desktop\AIAC> █

Task Description #6 – Graph Representation

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

Sample Input Code: class Graph:

pass

Expected Output:

- Graph with methods to add vertices, add edges, and display connections.

PROMPT:

#Write a code to implement a graph using an adjacency list and perform methods like add_vertices, add_edges and display connections CODE AND OUTPUT:

```
palindrome.py > ...
1  Write a code to implement a graph using an adjacency list and perform methods like add_vertices
2  class Graph:
3      def __init__(self):
4          self.adjacency_list = {}
5      def add_vertex(self, vertex):
6          if vertex not in self.adjacency_list:
7              self.adjacency_list[vertex] = []
8      def add_edge(self, vertex1, vertex2):
9          if vertex1 in self.adjacency_list and vertex2 in self.adjacency_list:
10             self.adjacency_list[vertex1].append(vertex2)
11             self.adjacency_list[vertex2].append(vertex1) # For undirected graph
12      def display_connections(self):
13          for vertex, edges in self.adjacency_list.items():
14              print(f"{vertex}: {' '.join(edges)}")
15  Example usage
16  __name__ == "__main__":
17      graph = Graph()
18      graph.add_vertex("A")
19      graph.add_vertex("B")
20      graph.add_vertex("C")
21      graph.add_edge("A", "B")
22      graph.add_edge("A", "C")
23      graph.add_edge("B", "C")
24      graph.display_connections()
25

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/ATAC/palindrome.py
PS C:\Users\thota\OneDrive\Desktop\AIAC> & C:/Users/thota/AppData/Local/Programs/Python/Python313/python.
/ATAC/palindrome.py
A: B, C
B: A, C
C: A, B
PS C:\Users\thota\OneDrive\Desktop\AIAC>
```

Task Description #7 – Priority Queue

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

Sample Input Code: class PriorityQueue:

```
palindrome.py X lab6.py lab1exam.py lab4.py lab2.py 1 lab5.py
palindrome.py > PriorityQueue > is_empty
1 #Write a code to implement a priority queue using python's heapq module and implement
2 import heapq
3 class PriorityQueue:
4     def __init__(self):
5         self.elements = []
6     def enqueue(self, item, priority):
7         heapq.heappush(self.elements, (priority, item))
8     def dequeue(self):
9         if not self.is_empty():
10            return heapq.heappop(self.elements)[1]
11        else:
12            raise IndexError("Priority Queue is empty")
13    def display(self):
14        print("Priority Queue:")
15        for priority, item in sorted(self.elements):
16            print(f"Item: {item}, Priority: {priority}")
17    def is_empty(self):
18        return len(self.elements) == 0
19 # Example usage
20 if __name__ == "__main__":
21     pq = PriorityQueue()
22     pq.enqueue("Task 1", priority=3)
23     pq.enqueue("Task 2", priority=1)
24     pq.enqueue("Task 3", priority=2)
25     pq.display()
```

```
palindrome.py X lab6.py lab1exam.py lab4.py lab2.py 1 lab5.py
palindrome.py > PriorityQueue > is_empty
1 #Write a code to implement a priority queue using python's heapq module and implement
2 import heapq
3 class PriorityQueue:
4     def __init__(self):
5         self.elements = []
6     def enqueue(self, item, priority):
7         heapq.heappush(self.elements, (priority, item))
8     def dequeue(self):
9         if not self.is_empty():
10            return heapq.heappop(self.elements)[1]
11        else:
12            raise IndexError("Priority Queue is empty")
13    def display(self):
14        print("Priority Queue:")
15        for priority, item in sorted(self.elements):
16            print(f"Item: {item}, Priority: {priority}")
17    def is_empty(self):
18        return len(self.elements) == 0
19 # Example usage
20 if __name__ == "__main__":
21     pq = PriorityQueue()
22     pq.enqueue("Task 1", priority=3)
23     pq.enqueue("Task 2", priority=1)
24     pq.enqueue("Task 3", priority=2)
25     pq.display()
```

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.

PROMPT:

#Write a code to implement a double ended queue using `collections.dequeue` using insert and remove from both ends with docstring

CODE AND OUTPUT:

```
palindrome.py > DoubleEndedQueue > is_empty
1 #Write a code to implement a double ended queue using collections.dequeue using insert and remove from both ends with docstr
2 from collections import deque
3 class DoubleEndedQueue:
4     def __init__(self):
5         """Initialize an empty double-ended queue."""
6         self.deque = deque()
7     def insert_front(self, item):
8         """Insert an item at the front of the deque."""
9         self.deque.appendleft(item)
10    def insert_rear(self, item):
11        """Insert an item at the rear of the deque."""
12        self.deque.append(item)
13    def remove_front(self):
14        """Remove and return an item from the front of the deque. Raises IndexError if the deque is empty."""
15        if not self.is_empty():
16            return self.deque.popleft()
17        else:
18            raise IndexError("Deque is empty")
19    def remove_rear(self):
20        """Remove and return an item from the rear of the deque. Raises IndexError if the deque is empty."""
21        if not self.is_empty():
22            return self.deque.pop()
23        else:
24            raise IndexError("Deque is empty")
25    def is_empty(self):
26        """Check if the deque is empty."""
27        return len(self.deque) == 0
28 # Example usage
29 if name == " main ":
```

```

3  class DoubleEndedQueue:
19     def remove_rear(self):
22         return self.deque.pop()
23     else:
24         raise IndexError("Deque is empty")
25     def is_empty(self):
26         """Check if the deque is empty."""
27         return len(self.deque) == 0
28 # Example usage
29 if __name__ == "__main__":
30     deq = DoubleEndedQueue()
31     deq.insert_rear(1)
32     deq.insert_rear(2)
33     deq.insert_front(0)
34     print(deq.deque) # Output: deque([0, 1, 2])
35     print(deq.remove_front()) # Output: 0
36     print(deq.remove_rear()) # Output: 2
37     print(deq.is_empty()) # Output: False
38     print(deq.remove_front()) # Output: 1
39     print(deq.is_empty()) # Output: True
40 # This code implements a double-ended queue (deque) using the collections.d
41

```

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/AIAC/palindrome.py

1

True

PS C:\Users\thota\OneDrive\Desktop\AIAC> ^C

PS C:\Users\thota\OneDrive\Desktop\AIAC> & C:/Users/thota/AppData/Local/Programs/Python

/AIAC/palindrome.py

deque([0, 1, 2])

0

2

False

1

True

PS C:\Users\thota\OneDrive\Desktop\AIAC> █