Assignment-3

Student Name: Unnati Srivastava **UID: 22BCS13475**

Branch: BE-CSE **Section/Group: IOT-610/B**

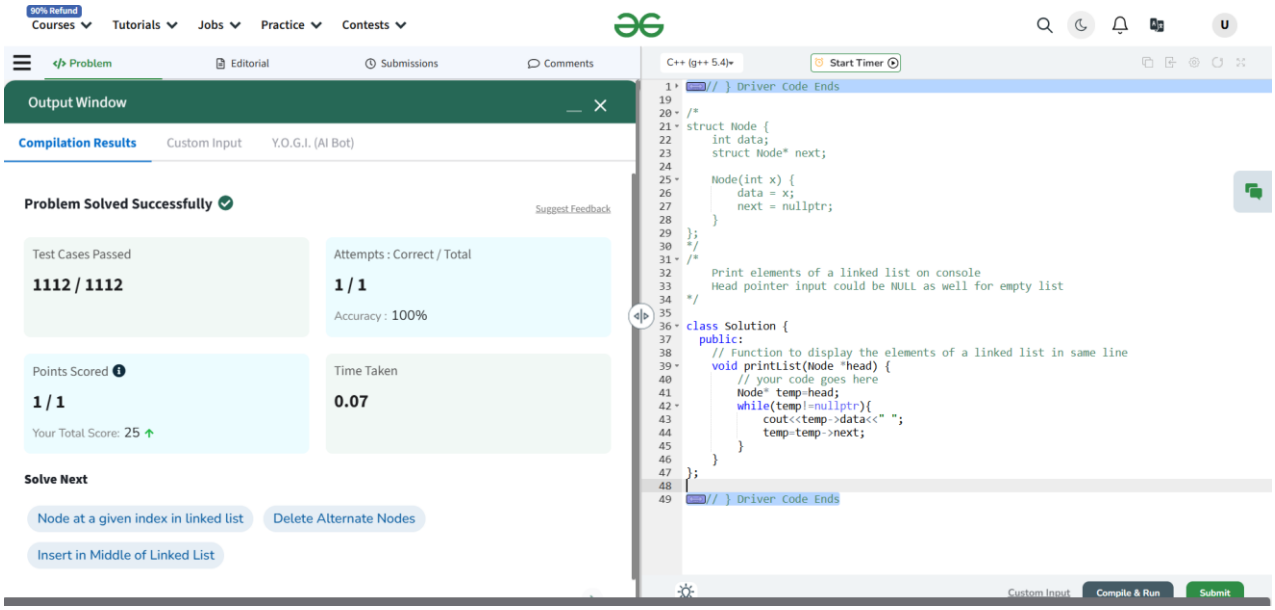
Semester: 6th **Date Of Performance: 5/3/25**

Subject Name: Advanced Programming II **Subject Code: 22CSP-351**

QUES 1: Print Linked List

Solution:

```
class Solution {
  public:
    // Function to display the elements of a linked list in same line
    void printList(Node *head) {
        // your code goes here
        Node* temp=head;
        while(temp!=nullptr){
            cout<<temp->data<<" ";
            temp=temp->next;
        }
    }
};
```

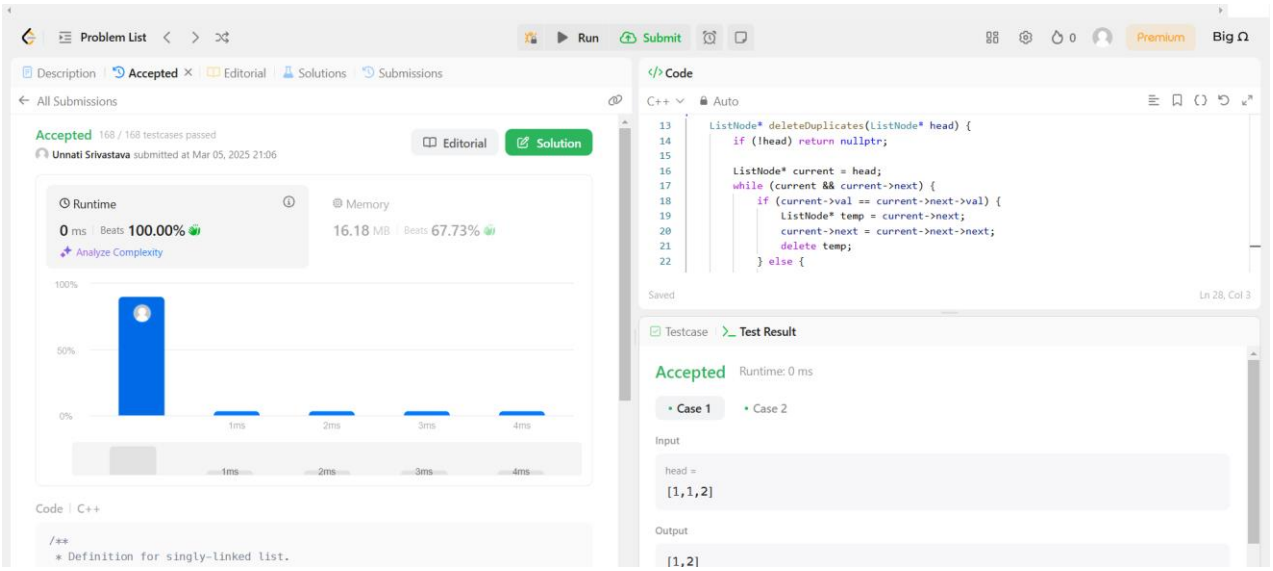


QUES 2: Remove duplicates from a sorted list

Solution:

```
class Solution {
public:
    ListNode* deleteDuplicates(ListNode* head) {
```

```
        if (!head) return nullptr;

        ListNode* current = head;
        while (current && current->next) {
            if (current->val == current->next->val) {
                ListNode* temp = current->next;
                current->next = current->next->next;
                delete temp;
            } else {
                current = current->next;
            }
        }
        return head;
    }
};
```

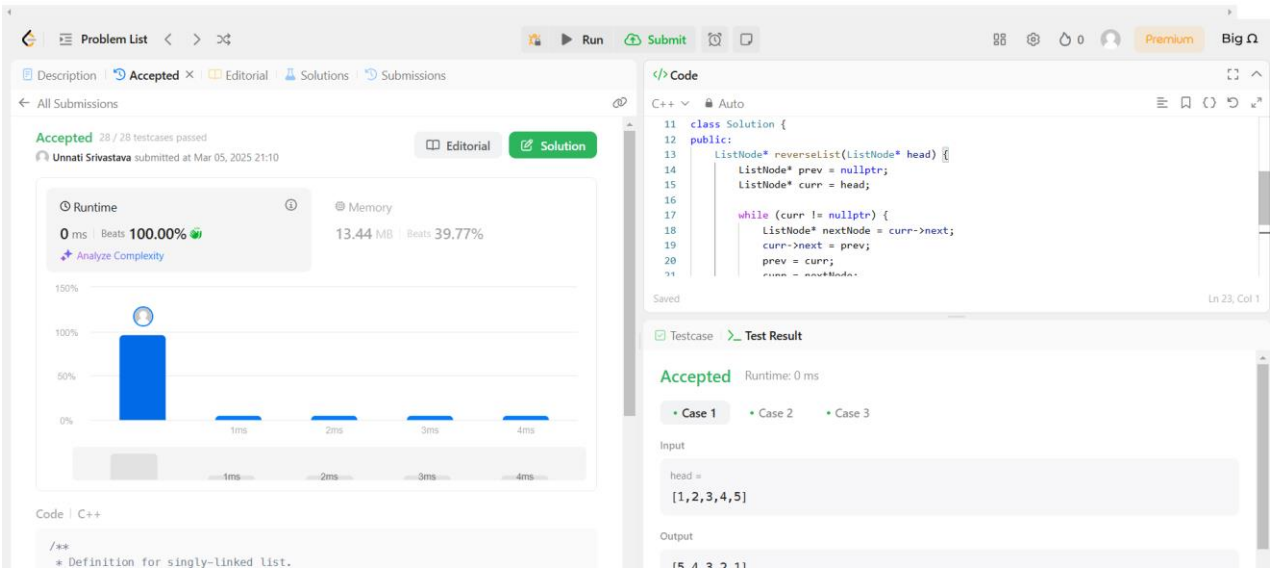


QUES 3: Reverse a linked list

Solution:

```
class Solution {
public:
    ListNode* reverseList(ListNode* head) {
        ListNode* prev = nullptr;
        ListNode* curr = head;

        while (curr != nullptr) {
            ListNode* nextNode = curr->next;
            curr->next = prev;
            prev = curr;
            curr = nextNode;
        }

        return prev;
    }
```

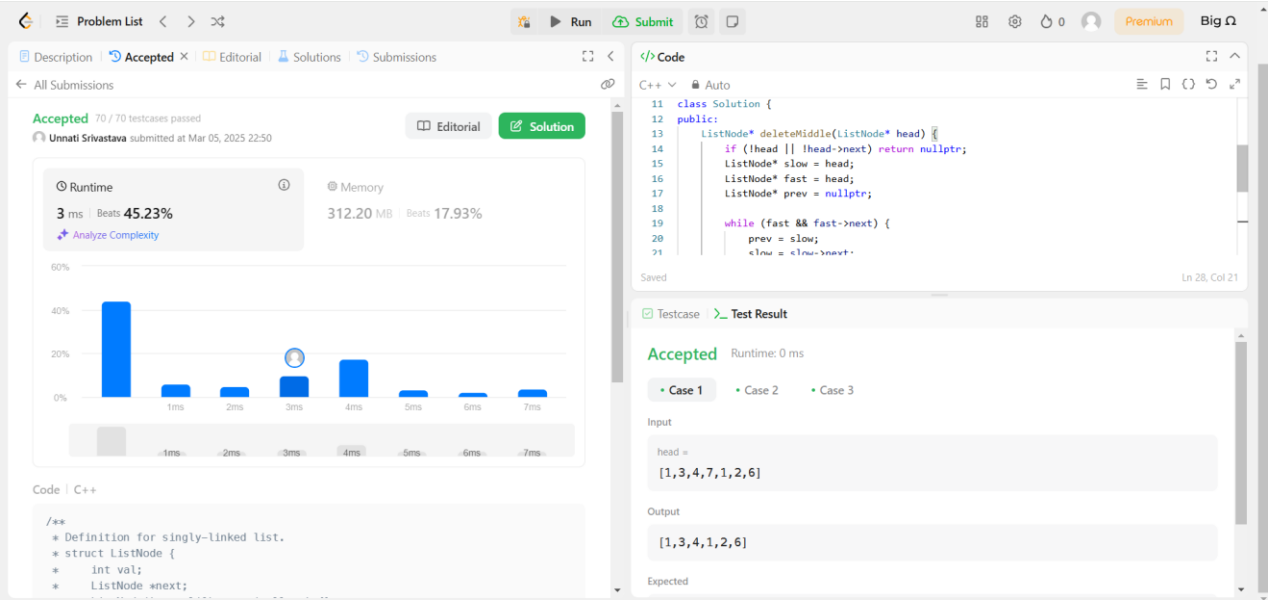
};



QUES 4: Delete middle node of a list

Solution:

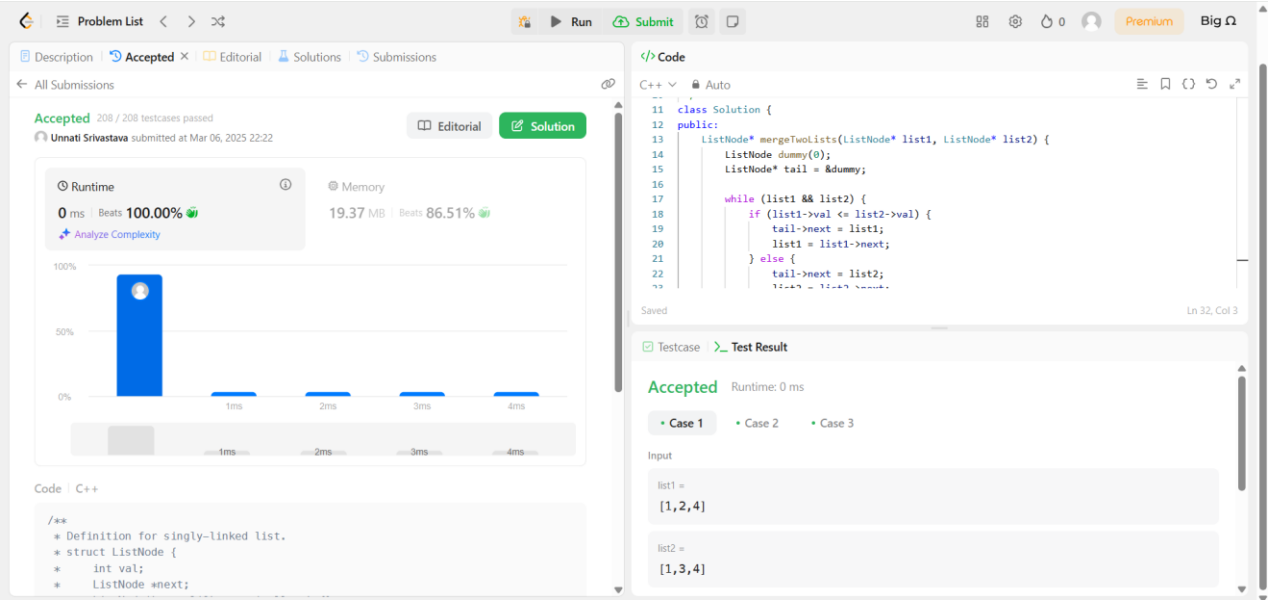
```
class Solution {
public:
    ListNode* deleteMiddle(ListNode* head) {
        if (!head || !head->next) return nullptr;
        ListNode* slow = head;
        ListNode* fast = head;
        ListNode* prev = nullptr;

        while (fast && fast->next) {
            prev = slow;
            slow = slow->next;
            fast = fast->next->next;
        }

        prev->next = slow->next;
        delete slow;

        return head;
    }
};
```



QUES 5: Merge Two Sorted Lists

Solution:

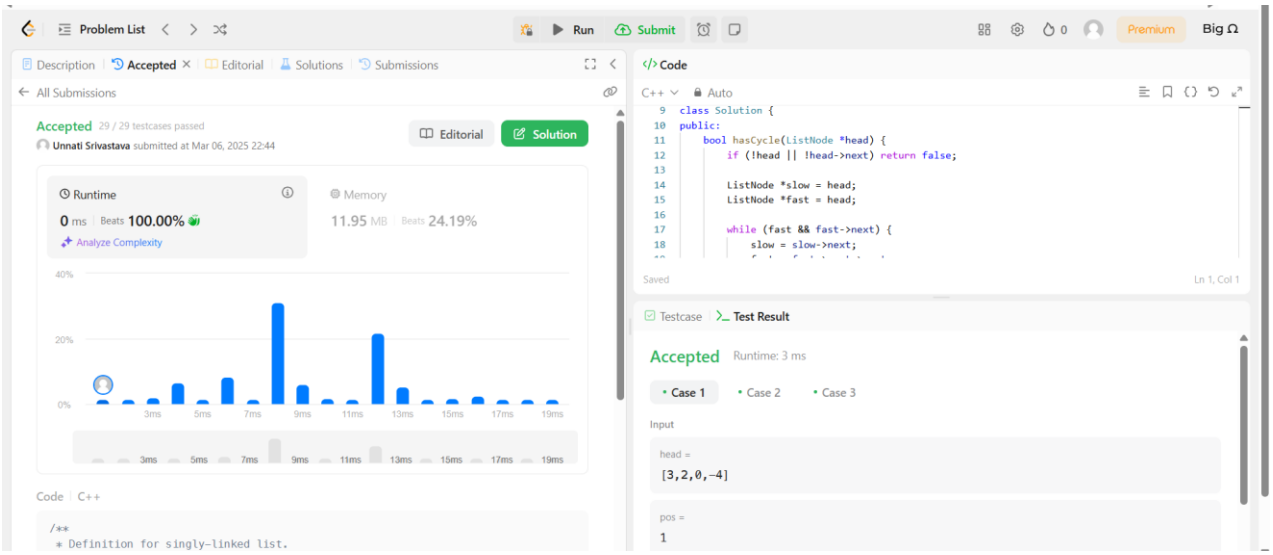
```
class Solution {
public:
    ListNode* mergeTwoLists(ListNode* list1, ListNode* list2) {
        ListNode dummy(0);
        ListNode* tail = &dummy;

        while (list1 && list2) {
            if (list1->val <= list2->val) {
                tail->next = list1;
                list1 = list1->next;
            } else {
                tail->next = list2;
                list2 = list2->next;
            }
            tail = tail->next;
        }
        if (list1) tail->next = list1;
        if (list2) tail->next = list2;

        return dummy.next;
    }
};
```



QUES 6: Detect a cycle in a linked list

Solution:

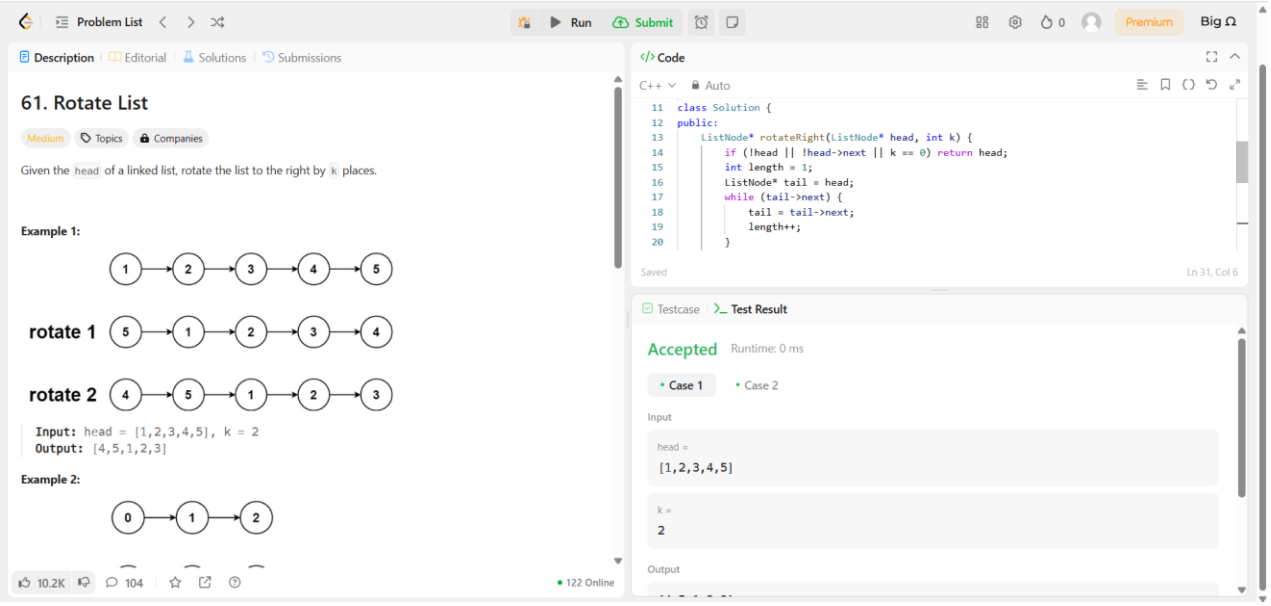
```
class Solution {
public:
    bool hasCycle(ListNode *head) {
        if (!head || !head->next) return false;

        ListNode *slow = head;
        ListNode *fast = head;

        while (fast && fast->next) {
            slow = slow->next;
            fast = fast->next->next;

            if (slow == fast) return true;
        }

        return false;
    }
};
```



QUES 7: Rotate a list

Solution:

```
class Solution {
public:
    ListNode* rotateRight(ListNode* head, int k) {
        if (!head || !head->next || k == 0) return head;
        int length = 1;
        ListNode* tail = head;
        while (tail->next) {
            tail = tail->next;
            length++;
        }
        tail->next = head;
        k = k % length;
        int stepsToNewHead = length - k;
        ListNode* newTail = head;
        for (int i = 1; i < stepsToNewHead; i++) {
            newTail = newTail->next;
        }
        ListNode* newHead = newTail->next;
        newTail->next = nullptr;
        return newHead;
    }
};
```

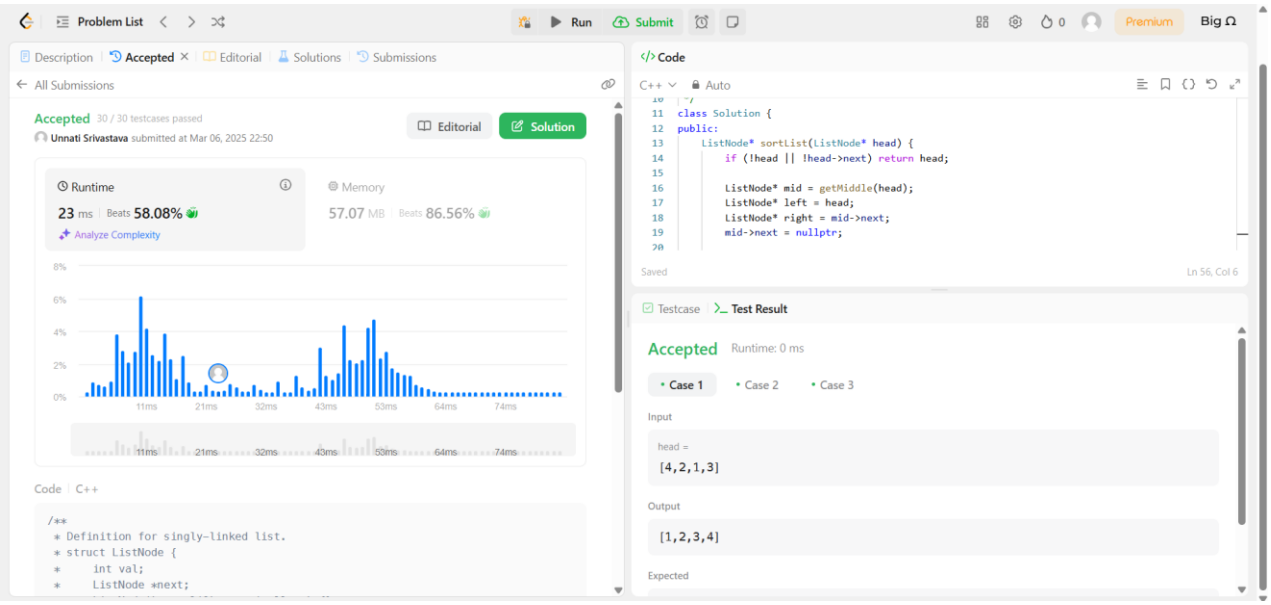


QUES 8: Sort list

Solution:

```
class Solution {
public:
    ListNode* sortList(ListNode* head) {
        if (!head || !head->next) return head;

        ListNode* mid = getMiddle(head);
        ListNode* left = head;
        ListNode* right = mid->next;
        mid->next = nullptr;

        left = sortList(left);
        right = sortList(right);

        return merge(left, right);
    }

private:

    ListNode* getMiddle(ListNode* head) {
        ListNode* slow = head;
        ListNode* fast = head->next;
        while (fast && fast->next) {
            slow = slow->next;
            fast = fast->next->next;
        }
        return slow;
    }

    ListNode* merge(ListNode* l1, ListNode* l2) {
        ListNode dummy(0);
        ListNode* tail = &dummy;
```

```
        while (l1 && l2) {
            if (l1->val < l2->val) {
                tail->next = l1;
                l1 = l1->next;
            } else {
                tail->next = l2;
                l2 = l2->next;
            }
            tail = tail->next;
        }

        tail->next = l1 ? l1 : l2;
        return dummy.next;
    }
};
```



QUES 9: Merge k sorted lists

Solution:

```
class Solution {
public:
    ListNode* mergeKLists(vector<ListNode*>& lists) {
        auto compare = [](ListNode* a, ListNode* b) {
            return a->val > b->val;
        };

        priority_queue<ListNode*, vector<ListNode*>, decltype(compare)> minHeap(compare);

        for (auto list : lists) {
            if (list) minHeap.push(list);
        }
```

```
        ListNode dummy(0);
        ListNode* tail = &dummy;

        while (!minHeap.empty()) {
            ListNode* node = minHeap.top();
            minHeap.pop();

            tail->next = node;
            tail = tail->next;

            if (node->next) minHeap.push(node->next);
        }

        return dummy.next;
    }
};
```