

## Experiment-3

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**Branch:** BE-IT

**Semester:** 6th

**Subject Name:** AP LAB-II

**UID:** 22BET10063

**Section/Group:** IOT/702/B

**Date of Performance:** 30/01/25

**Subject Code:** 22ITT-351

### PROBLEM 1

#### 1. Aim:

To develop an efficient algorithm that removes all nodes with duplicate values from a sorted linked list, ensuring that only distinct elements remain while maintaining the sorted order.

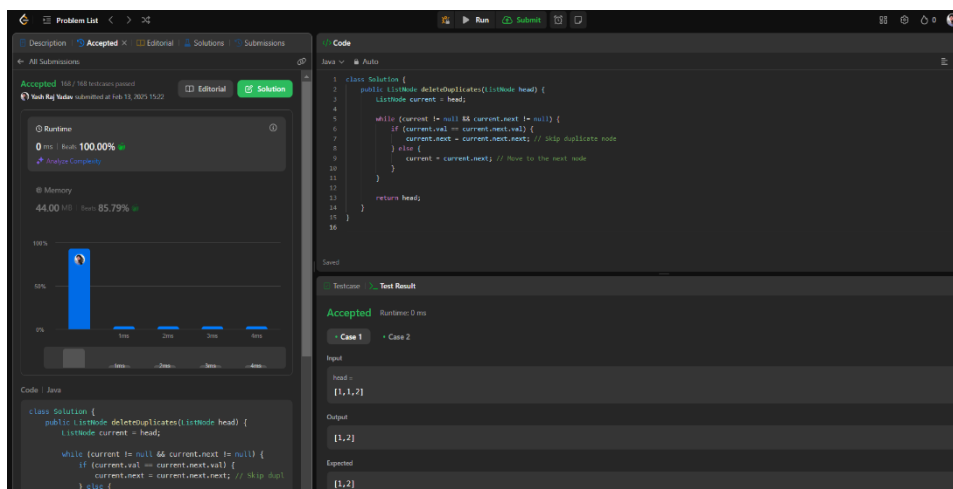
#### 2. Code:

```
class Solution {
    public ListNode deleteDuplicates(ListNode head) {
        ListNode current = head;

        while (current != null && current.next != null) {
            if (current.val == current.next.val) {
                current.next = current.next.next; // Skip duplicate node
            } else {
                current = current.next; // Move to the next node
            }
        }

        return head;
    }
}
```

#### 3. Output:



```
class Solution {
    public ListNode deleteDuplicates(ListNode head) {
        ListNode current = head;

        while (current != null && current.next != null) {
            if (current.val == current.next.val) {
                current.next = current.next.next; // Skip duplicate node
            } else {
                current = current.next; // Move to the next node
            }
        }

        return head;
    }
}
```

Accepted

Runtime: 0 ms

Case 1

Input: head = [1,1,2]

Output: [1,2]

Expected: [1,2]

## PROBLEM 2

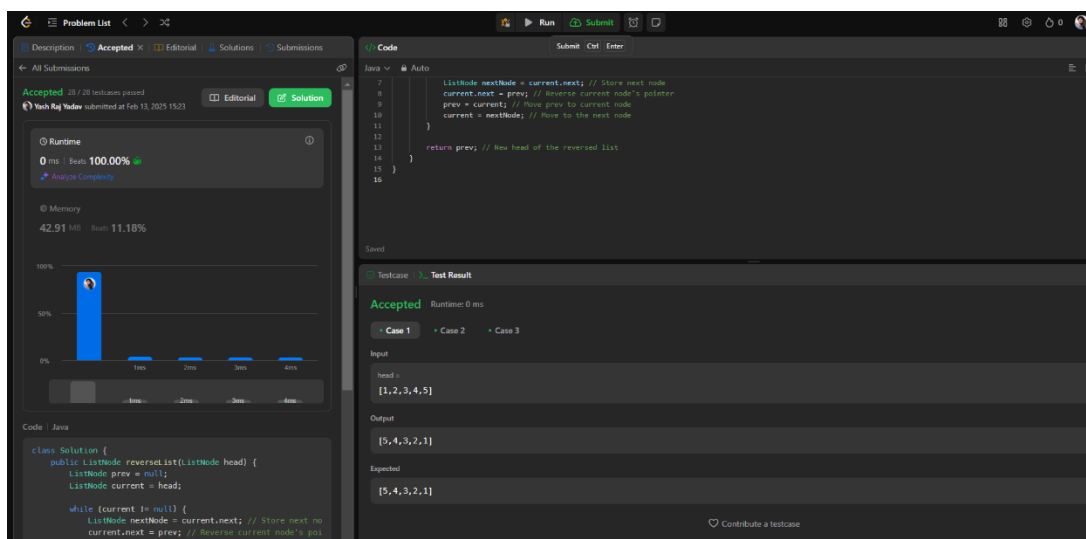
### 1. AIM:

To develop an algorithm that reverses a singly linked list, changing the direction of pointers so that the last node becomes the head and the original head becomes the tail.

### 1. CODE:

```
class Solution {  
    public ListNode reverseList(ListNode head) {  
        ListNode prev = null;  
        ListNode current = head;  
  
        while (current != null) {  
            ListNode nextNode = current.next; // Store next node  
            current.next = prev; // Reverse current node's pointer  
            prev = current; // Move prev to current node  
            current = nextNode; // Move to the next node  
        }  
  
        return prev; // New head of the reversed list  
    }  
}
```

### 2. Output:



The screenshot displays a code editor interface with a dark theme. On the left, a sidebar shows the 'Problem List' and 'Submissions' tabs. The 'Submissions' tab is active, showing a submission by 'Yash Raj Yadav' with a runtime of 0 ms and 100.00% memory usage. The main editor area shows the Java code for the 'reverseList' function. The code is as follows:

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The right side of the editor shows the 'Test Results' tab, which indicates that the solution is 'Accepted' with a runtime of 0 ms. The input is 'head = [1,2,3,4,5]' and the output is '[5,4,3,2,1]', which matches the expected output.

## PROBLEM 3

### 1. AIM:

To develop an algorithm that efficiently deletes the middle node of a singly linked list, ensuring that the list remains properly linked after deletion.

### 2. CODE:

```
class Solution {
    public ListNode deleteMiddle(ListNode head) {
        if (head == null || head.next == null) {
            return null; // If the list is empty or has only one node, return null
        }

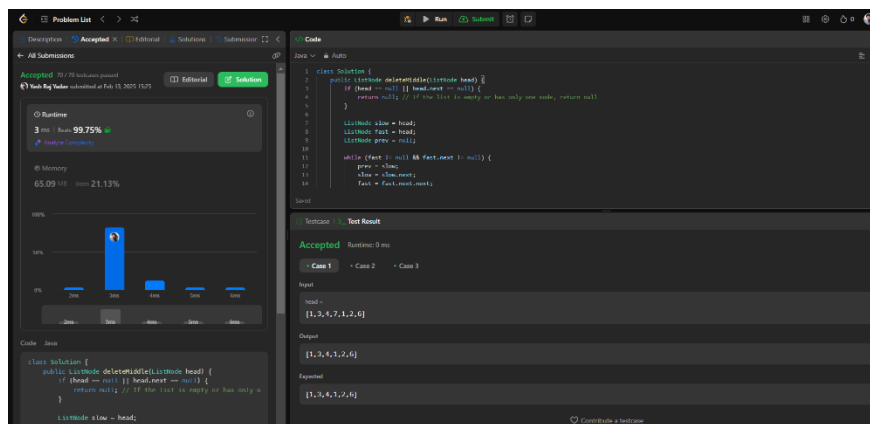
        ListNode slow = head;
        ListNode fast = head;
        ListNode prev = null;

        while (fast != null && fast.next != null) {
            prev = slow;
            slow = slow.next;
            fast = fast.next.next;
        }

        // Delete the middle node
        prev.next = slow.next;

        return head;
    }
}
```

### 3. Output:



## PROBLEM 4

### 1. AIM:

To design an algorithm that removes all nodes from a sorted singly linked list that contain duplicate values, ensuring that only distinct elements remain in the modified list.

### 2. CODE:

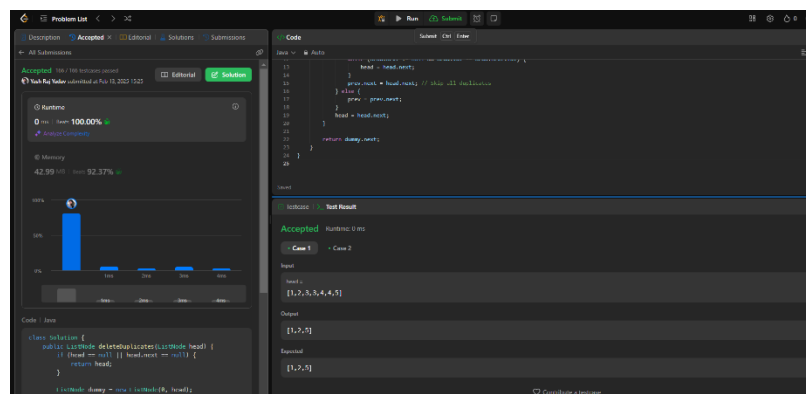
```
class Solution {
    public ListNode deleteDuplicates(ListNode head) {
        if (head == null || head.next == null) {
            return head;
        }

        ListNode dummy = new ListNode(0, head);
        ListNode prev = dummy;

        while (head != null) {
            if (head.next != null && head.val == head.next.val) {
                while (head.next != null && head.val == head.next.val) {
                    head = head.next;
                }
                prev.next = head.next; // Skip all duplicates
            } else {
                prev = prev.next;
            }
            head = head.next;
        }

        return dummy.next;
    }
}
```

### 3. Output:



## PROBLEM 5

### 1. AIM:

The goal is to merge  $k$  sorted linked lists into a single sorted linked list and return the merged list.

### 2. CODE:

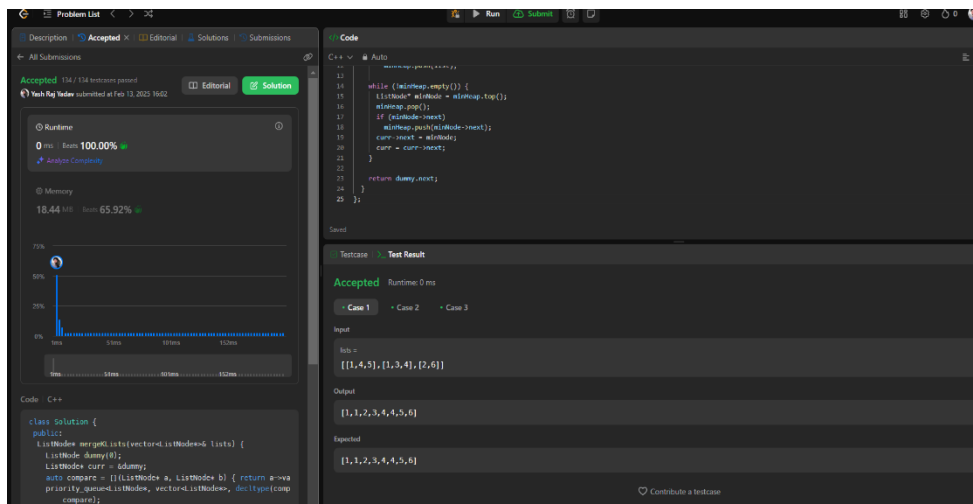
```
class Solution {
public ListNode mergeKLists(ListNode[] lists) {
    ListNode dummy = new ListNode(0);
    ListNode curr = dummy;
    Queue<ListNode> minHeap = new PriorityQueue<>((a, b) -> Integer.compare(a.val, b.val));

    for (final ListNode list : lists)
        if (list != null)
            minHeap.offer(list);

    while (!minHeap.isEmpty()) {
        ListNode minNode = minHeap.poll();
        if (minNode.next != null)
            minHeap.offer(minNode.next);
        curr.next = minNode;
        curr = curr.next;
    }

    return dummy.next;
}
```

### 3. Output:



## PROBLEM 6

### 1. AIM:

The goal of this problem is to detect whether a given singly linked list contains a cycle. A cycle occurs if a node in the list points back to a previous node, forming a loop instead of terminating at null.

### 2. CODE:

```
class Solution {  
    public boolean hasCycle(ListNode head) {  
        ListNode slow = head;  
        ListNode fast = head;  
  
        while (fast != null && fast.next != null) {  
            slow = slow.next;  
            fast = fast.next.next;  
            if (slow == fast)  
                return true;  
        }  
  
        return false;  
    }  
}
```

### 3. Output:

