Experiment-5

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Section/Group: KPIT-901/B
Semester: 6th
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Subject Name: Advanced Programming Lab - 2
Subject Code: 22CSP-351

1. Aim: Divide and Conquer

1. Problem: 88. Merge Sorted Array.
2. Problem: 347. Top K Frequent Elements.

2. Objective:

1. Merge two sorted arrays nums1 and nums2 in-place without using extra space.
2. Find the k most frequent elements in an array using an optimized approach.

3. Implementation/Code:

1.)

```
class Solution {
public:
    void merge(vector<int>& nums1, int m, vector<int>& nums2, int n) {
        int i = m - 1, j = n - 1, k = m + n - 1;
        while (i >= 0 && j >= 0) {
            if (nums1[i] > nums2[j]) {
                nums1[k--] = nums1[i--];
            } else {
                nums1[k--] = nums2[j--];
            }
        }
        while (j >= 0) {
            nums1[k--] = nums2[j--];
        }
```

```
    }
};
```

2.)

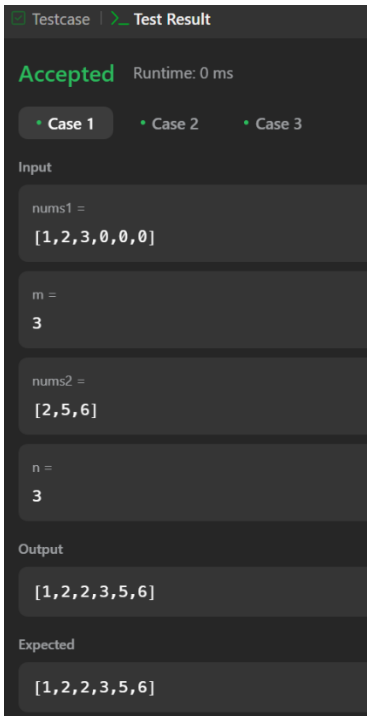
```
class Solution {
public:
    vector<int> topKFrequent(vector<int>& nums, int k) {
        unordered_map<int, int> freq;
        for (int num : nums) {
            freq[num]++;
        }

        vector<vector<int>> buckets(nums.size() + 1);
        for (auto& [num, count] : freq) {
            buckets[count].push_back(num);
        }

        vector<int> result;
        for (int i = nums.size(); i >= 0 && result.size() < k; --i) {
            for (int num : buckets[i]) {
                result.push_back(num);
                if (result.size() == k) return result;
            }
        }
        return result;
    }
};
```

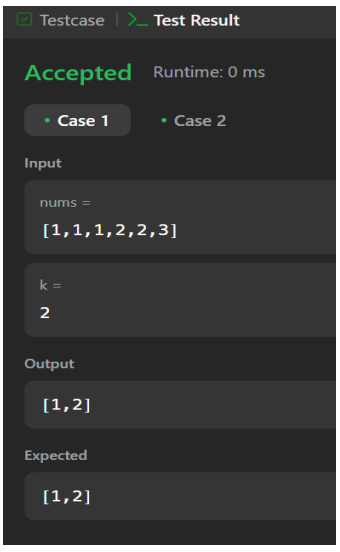
4. Output:

1.


Testcase | Test Result
Accepted Runtime: 0 ms
Case 1
Case 2
Case 3
Input
nums1 =
[1,2,3,0,0,0]
m =
3
nums2 =
[2,5,6]
n =
3
Output
[1,2,2,3,5,6]
Expected
[1,2,2,3,5,6]


Description
Accepted
Editorial
Solutions
Submissions
All Submissions
Accepted 59 / 59 testcases passed
Mohammad Saiful Haque submitted at Mar 05, 2025 16:12
Editorial
Solution
Runtime
0 ms | Beats 100.00%
Analyze Complexity
Memory
12.36 MB | Beats 39.43%
100%
50%
0%
1ms
2ms
3ms
4ms
Code | C++
class Solution {
public:
void merge(vector<int>& nums1, int m, vector<int>& nums2, int n) {
int i = m - 1, j = n - 1, k = m + n - 1;
while (i >= 0 && j >= 0) {
if (nums1[i] > nums2[j]) {
nums1[k--] = nums1[i--];
} else {
View more

2.


Testcase | Test Result
Accepted Runtime: 0 ms
Case 1
Case 2
Input
nums =
[1,1,1,2,2,3]
k =
2
Output
[1,2]
Expected
[1,2]


Description
Accepted
Editorial
Solutions
Submissions
All Submissions
Accepted 21 / 21 testcases passed
Mohammad Saiful Haque submitted at Mar 05, 2025 16:13
Editorial
Solution
Runtime
8 ms | Beats 10.67%
Analyze Complexity
Memory
19.77 MB | Beats 15.48%
40%
20%
0%
2ms
4ms
6ms
8ms
10ms

5. **Time Complexity:**
    1. O(m+n)
    2. O(n)

6. **Space Complexity:**
    1. O(1)
    2. O(n)

7. **Learning Outcome:**
    1. Efficient merging using the two-pointer technique.
    2. Modifying arrays in-place to optimize space.
    3. Working with sorted arrays efficiently.
    4. Hash maps for frequency counting.
    5. Bucket sort for frequency-based grouping.
    6. Optimized O(n) approach instead of sorting (O(n log n)).