DOMAIN WINTER CAMP

(Department of Computer Science and Engineering)

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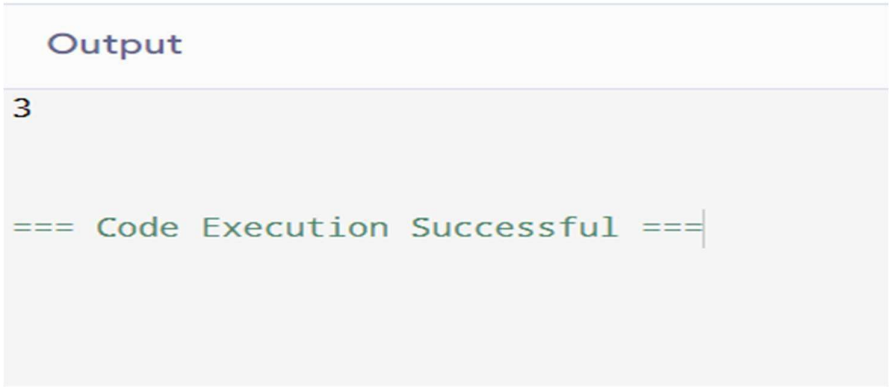
DAY 5

Ques 1. Given an integer k and array arr. Your task is to return the position of the first occurrence of k in the given array and if element k is not present in the array then return -1.

Program code:

```
#include <iostream> #include <vector> using

namespace std; int findFirstOccurrence(int k, const

vector<int>& arr) {

   for (int i = 0; i < arr.size(); i++) {

if (arr[i] == k) {            return i + 1;

      }    }

return -1;

} int main() {     int k = 16;

vector<int> arr = {9, 7, 16, 16, 4};


   int result = findFirstOccurrence(k, arr);

cout << result << endl; // Output: 3


   return 0;

}
```

Output:



Ques 2. Given an array of integers nums sorted in non-decreasing order, find the starting and ending position of a given target value.

If target is not found in the array, return [-1, -1].

You must write an algorithm with O(log n) runtime complexity.

Program code:

```
#include <iostream> #include <vector> using namespace std;
vector<int> searchRange(const vector<int>& nums, int target) {
auto findBound = [&](bool isFirst) -> int {        int left = 0, right
= nums.size() - 1;        int bound = -1;
      while (left <= right) {            int
mid = left + (right - left) / 2;            if
(nums[mid] == target) {
bound = mid;                if (isFirst) {
right = mid - 1;
            } else {
left = mid + 1;
            }
```

```
            } else if (nums[mid] < target) {
left = mid + 1;             } else {
right = mid - 1;
            }
        }
        return bound;
    };
    int start = findBound(true);
int end = findBound(false);
return {start, end};
} int main() {     vector<int> nums = {5,
7, 7, 8, 8, 10};
    int target = 8;
    vector<int> result = searchRange(nums, target);     cout <<
"[" << result[0] << ", " << result[1] << "]" << endl;
    return 0;
}
```

Output:

Ques 3 You are given an integer array arr[]. Your task is to find the smallest positive number missing from the array.

Program Code:

```
#include <iostream> #include <vector> using
namespace std; int
findSmallestMissingPositive(vector<int>& arr) {
   int n = arr.size();     for (int i = 0; i < n; i++) {         while (arr[i]
> 0 && arr[i] <= n && arr[arr[i] - 1] != arr[i]) {
           swap(arr[i], arr[arr[i] - 1]);
       }
}
   for (int i = 0; i < n; i++) {
if (arr[i] != i + 1) return i + 1;
   }
   return n + 1;
}

int main() {     vector<int> arr = {2, -3, 4, 1, 1, 7};
cout << findSmallestMissingPositive(arr) << endl;
   return 0;
}
```

Output:

Ques 4. You are given an m x n matrix mat that has its rows sorted in nondecreasing order and an integer k.
You are allowed to choose exactly one element from each row to form an array.
Return the kth smallest array sum among all possible arrays.

Program Code:

```
#include <iostream>
#include <vector> #include <queue> using
namespace std; int
kthSmallest(vector<vector<int>>& mat, int k) {
priority_queue<int, vector<int>, greater<>>
minHeap;     minHeap.push(0);     for (const auto&
row : mat) {         priority_queue<int, vector<int>,
greater<>> nextHeap;         while
(!minHeap.empty()) {             int sum =
minHeap.top();             minHeap.pop();             for
(int num : row) {                 nextHeap.push(sum +
num);                 if (nextHeap.size() > k)
nextHeap.pop();
            }
        }
        minHeap.swap(nextHeap);
    }
    return minHeap.top();
} int main() {       vector<vector<int>> mat = {{1, 3,
11}, {2, 4, 6}};
    int k = 5;
```

```
    cout << kthSmallest(mat, k) << endl;
return 0;
}
```

Output:

```
Output
7

=== Code Execution Successful ===
```

Ques 5. You are given an array of k linked-lists lists, each linked-list is sorted in ascending order.

Merge all the linked-lists into one sorted linked-list and return it.

Program Code:

```
#include <iostream>
#include <vector>
#include <queue> using
namespace std; struct
ListNode {
    int val;
    ListNode* next;
    ListNode() : val(0), next(nullptr) {}
    ListNode(int x) : val(x), next(nullptr) {}
    ListNode(int x, ListNode* next) : val(x), next(next) {}
};
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  (ListNode*  list  :  lists)  {
if (list) minHeap.push(list);         }

       ListNode dummy(0);         ListNode* current =
&dummy;         while (!minHeap.empty()) {
ListNode* node = minHeap.top();
minHeap.pop();              current->next = node;
current = current->next;              if (node->next)
minHeap.push(node->next);
       }
       return dummy.next;
   }
};

int main() {
   ListNode* l1 = new ListNode(1, new ListNode(4, new ListNode(5)));
ListNode* l2 = new ListNode(1, new ListNode(3, new ListNode(4)));
ListNode* l3 = new ListNode(2, new ListNode(6));     vector<ListNode*>
lists = {l1, l2, l3};

   Solution solution;
   ListNode* result = solution.mergeKLists(lists);
```

```
    while (result) {         cout <<
result->val << " ";         result =
result->next;
    }
    return 0;
}
```

Output: