Technical Assessment

Assessment No.	**: 1**
Topic	**: Introduction to Java, Control Flow Statements, Arrays, Functions and Strings**
Date	**: 15-05-2024**
Time	**: 9:15 a.m. to 11:15 a.m.**
Duration	**: 2 hours**
Total Marks	**: 50**

PART A: Problem Solving Questions

Implement the Java code to solve the following problems:

1. **Running Sum of 1d Array** **(5 marks)**

   Given an array nums. We define a running sum of an array as runningSum[i] = sum(nums[0]…nums[i]). Return the running sum of nums.

   Sample Input and Output 1:

   Input: nums = [1,2,3,4]

   Output: [1,3,6,10]

   Explanation: Running sum is obtained as follows: [1, 1+2, 1+2+3, 1+2+3+4].

   Sample Input and Output 2:

   Input: nums = [1,1,1,1,1]

   Output: [1,2,3,4,5]

   Explanation: Running sum is obtained as follows: [1, 1+1, 1+1+1, 1+1+1+1, 1+1+1+1+1].

   Sample Input and Output 3:
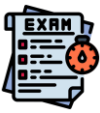
   Input: nums = [3,1,2,10,1]

   Output: [3,4,6,16,17]

   Constraints:

   1 <= nums.length <= 1000

   -10^6 <= nums[i] <= 10^6

2. **ATM Withdrawal Transaction Calculator** **(5 Marks)**

   Pooja would like to withdraw X $US from an ATM. The cash machine will only accept the transaction if X is a multiple of 5, and Pooja's account balance has

enough cash to perform the withdrawal transaction (including bank charges). For each successful withdrawal, the bank charges 0.50 $US.

Calculate Pooja's account balance after an attempted transaction.

Sample Input and Output1:

Withdraw: $1500.

Initial account balance : $2000.00.(The cash machine accepts the transaction because the withdrawal amount is a multiple of 5 and within the balance).

Bank charges: 0.50 $US (for the transaction)/

After the successful withdrawal and bank charge deduction: $499.50.

Sample Input and Output2:

Withdraw: $600

Initial account balance : $800.00.(The cash machine accepts the transaction because the withdrawal amount is a multiple of 5 and within the balance).

Bank charges: 0.50 $US (for the transaction)/

After the successful withdrawal and bank charge deduction: $199.50.

Constraints:

Amount of Cash to Withdraw (X):

- Should be a positive integer.
- $0 < X <= 2000$ (inclusive).

Initial Account Balance (Y):

- Should be a non-negative number.
- $0 <= Y <= 2000$ (inclusive).
- The balance can have up to two digits of precision (e.g., 1234.56).

These constraints ensure that the amount Pooja wishes to withdraw is within a reasonable range and that her initial account balance is valid for the transaction.

3. **Remove Consecutive Duplicates** **(5 marks)**

For a given string(str), remove all the consecutive duplicate characters.

Sample Input and Output1:
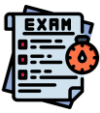
Input String: "aaaa"

Expected Output: "a"

Sample Input and Output2:

Input String: "aabbbcc"

Expected Output: "abc"

Constraints:

$0 <= N <= 10^6$

Where N is the length of the input string.

4. Length of the longest substring (10 marks)

Given a string S, find the length of the longest substring without repeating characters.

Sample Input and Output 1:

Input :

S = "abcabcbb"

Output:

3

Explanation:

The longest substring without repeating characters is "abc", "bca", and "cab".

Sample Input and Output 2:

Input:

S = "abdefgabef"

Output:

6

Explanation:

Longest substring without repeating characters is

"abdefg" , "bdefga" and "defgab".

Constraints:

0 <= N <= 10^6

Where N is the length of the input string.

5. The Celebrity Problem (10 marks)

A celebrity is a person who is known to all but does not know anyone at a party. If you go to a party of N people, find if there is a celebrity in the party or not.

A square NxN matrix M[][] is used to represent people at the party such that if an element of row i and column j is set to 1 it means ith person knows jth person.
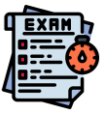
Here M[i][i] will always be 0.

Return the index of the celebrity, if there is no celebrity return -1.

Note: Follow 0 based indexing.

Sample Input and Output1:

Input:

N = 3

M[][] = {{0 1 0},

     {0 0 0},

     {0 1 0}}

Output: 1

Explanation: 0th and 2nd person both know 1. Therefore, 1 is the celebrity.

Sample Input and Output2:

Input:

N = 2

M[][] = {{0 1},

    {1 0}}

Output: -1

Explanation: The two people at the party both know each other. None of them is a celebrity.

Constraints:

1 <= N <= 3000

0   <= M[][] <= 1

6. **Valid String**   **(15 marks)**

You have been given a string 'S' containing only three types of characters, i.e. '(', ')' and '*'.

A Valid String is defined as follows:

1. Any left parenthesis '(' must have a corresponding right parenthesis ')'.

2. Any right parenthesis ')' must have a corresponding left parenthesis '('.

3. Left parenthesis '(' must go before the corresponding right parenthesis ')'.

4. '*' could be treated as a single right parenthesis ')' or a single left parenthesis '(' or an empty string.
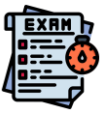
5. An empty string is also valid.

Your task is to find out whether the given string is a Valid String or not.

Sample Input and Output 1:

Input :

3

*())

(*)

())*

Output :

Yes

Yes

No

Explanation :

In the first test case, we can replace '*' with '(' so that the string becomes "(())"

In the second test case, we can replace '*' with an empty string so that the string becomes "()"

In the third test case, there is no way to make the string a valid string.

Sample Input and Output 2:

Input :

1

((***

Output :

Yes

Constraints:

1 <= T <= 100

1 <= N <= 5000

Where 'N' is the length of the string 'S'.