National Institute of Technology Calicut
Department of Computer Science and Engineering
Third Semester B. Tech.(CSE)
CS2092D Programming Laboratory
Assignment 1

Submission deadline (on or before):

- 06.08.2023, 11:00 PM

Policies for Submission and Evaluation:

- You must submit your assignment in the Eduserver course page, on or before the submission deadline.
- Ensure that your programs will compile and execute without errors in the Linux platform.
- During the evaluation, failure to execute programs without compilation errors may lead to zero marks for that evaluation.
- Detection of ANY malpractice related to the lab course can lead to awarding an F grade in the course.

Naming Conventions for Submission

- Submit a single ZIP (.zip) file (do not submit in any other archived formats like .rar, .tar, .gz). The name of this file must be

  `ASSG<NUMBER>_<ROLLNO>_<FIRST-NAME>.zip`

  (Example: *ASSG*1_*BxxyyyyCS_LAXMAN.zip*). DO NOT add any other files (like temporary files, input files, etc.) except your source code, into the zip archive.

- The source codes must be named as

  `ASSG<NUMBER>_<ROLLNO>_<FIRST-NAME>_<PROGRAM-NUMBER>.c`

  (For example: *ASSG*1_*BxxyyyyCS_LAXMAN*_1.*c*). If you do not conform to the above naming conventions, your submission might not be recognized by our automated tools, and hence will lead to a score of 0 marks for the submission. So, make sure that you follow the naming conventions.

Standard of Conduct

- Violation of academic integrity will be severely penalized. Each student is expected to adhere to high standards of ethical conduct, especially those related to cheating and plagiarism. Any submitted work MUST BE an individual effort. Any academic dishonesty will result in zero marks in the corresponding exam or evaluation and will be reported to the department council for record keeping and for permission to assign F grade in the course. The department policy on academic integrity can be found at: http://cse.nitc.ac.in/sites/default/files/Academic-Integrity_new.pdf.

General Instructions

- Programs should be written in C language and compiled using C compiler in Linux platform. **Submit the solutions to questions 1 and 2 through the submission link in Eduserver**.

QUESTIONS

1. Eve needs to find the frequency of a given character in a given string. Write a C programming code to help Eve implement it. Note that the characters are not case-sensitive. (i.e. Both upper and lowercase is considered to be the same character.)

   Input Format:

   - The first line is an input string that contains English alphabets with uppercase, and lowercase characters. That is characters can be $\in [A-Z, a-z]$.
   - The second line is the character whose frequency needs to be computed.

   Output Format:

   - An integer representing the frequency of the corresponding character.

   Sample Input 1:
   This is a test string
   i
   Sample Output 1:
   3

   Sample Input 2:
   Malayalam
   m
   Sample Output 2:
   2

2. You are given a positive integer N. Print all integers from 1 to N without using any of the looping constructs.

   Input Format:

   - The first line is a positive integer $N \in [1, 10^3]$.

   Output Format:

   - A single line of integers from 1 to N each separated by a single space between them.

   Sample Input:
   5
   Sample Output:
   1 2 3 4 5

3. Alice and Bob were studying trigonometric functions and they planned to code a program to compute an approximate value of $sin(x)$ for given a value of x. They decided to use the following Taylor's series of $sin(x)$ for computing the same.

$$sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{51} - \frac{x^7}{7!} + \frac{x^9}{9!} - \cdots$$

   Given x and n, compute the sine of x using the series. The computation should use all terms in the series, whose degree of x is less than or equal to n. (That is including the term containing x^n if present).

   Note 1 : Convert x to radian value $x = x * (3.1415/180)$
   Note 2: Restrict the precision of the output to 4 decimal places.

   Input Format:

- The first line of the input contains a real-valued number $\in [0 - 360]$ which is the value of x.
- The second line of the input contains a positive integer $n \in [1 - 10^3]$.

Output Format:

- The output is a real-valued number with exactly 4 decimal point precision.

Sample Input 1:
40
5
Sample Output 1:
0.6428

Sample Input 2:
20
2
Sample Output 2:
0.3420

4. We are given an input string *str* of length n, which is transformed into a fancy string $fancystr$. The fancy string $fancystr$ is created by repeating the i-th element in the string *str*, i times consecutively for $1 \leq i \leq n$. Design a program to identify the character that appears the most number of times in this fancy string $fancystr$. For example, if the given input string *str* is 'bbbcca', the fancy string is 'bbbbbbccccccccaaaaaa'. Thus the character that appears the most number of times in the fancy string $fancystr$ is 'c'. If multiple characters have the same frequency, print the character that appears first in the input string. Assume that all the string indexing starts at 1.
Note 1: While computing the frequency the characters are considered to be case-sensitive. (That is lower and upper case characters are considered to be different characters.)
Input Format:

- The input is a string with uppercase, lowercase characters belonging to $[A - Z, a - z]$

Output Format:

- A single character belongs to [A-Z, a-z]

Sample Input 1:
PpQpq
Sample Output 1:
p

Sample Input 2:
AcbBCcAD
Sample Output 2:
A