Programming and Data Structures Laboratory | 2021-22 Autumn semester, Section 20
Assignment 3 | December 28, 2021

Submission instructions

* Submit one .c file for each part of the assignment. Each of your .c files should be named as:

<your roll number>_A<assignment number>_<part number>.c

For instance, if your roll number is 21CS10023, and if you are presently doing Assignment 3 which has 4 parts, then you should submit 4 separate .c files named as:
21CS10023_A3_1.c 21CS10023_A3_2.c 21CS10023_A3_3.c 21CS10023_A3_4.c

***** Submissions must be through the course Moodle, before the end of Lab session (11:55 AM). Late submissions will be penalized / not accepted.

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1. [15 marks] With a positive integer *n* and a real number *x* as inputs, compute the Taylor series for the exponential function e^x, up to *n* terms. For the formula, you can refer to https://www.mathsisfun.com/algebra/taylor-series.html. You should check whether the input *n* is a positive integer. If not, you should print out a suitable error message, and then ask the user to enter the number again. This process should continue until the user enters a valid positive integer. You should try to code in such a way that the number of multiplications is minimized. [Hint: Use a do..while loop for taking the input. To minimize the number of multiplications, think how the (j+1)-th term can be easily computed from the j-th term of the series.]

2. [10 marks] We want to identify all integers between 1 and 1000, whose sum of digits is greater than a given integer *n.* For instance, if *n* = 21, then some integers in [1, 1000] whose sum of digits is greater than *n* are 958, 959, etc. Write a program that takes *n* as input, and then prints out all integers in the range [1, 1000] whose sum of digits is greater than *n.*

3. [10 marks] Write a program that takes an integer *n* between 1 and 9 as input, and prints out on the terminal a pattern similar to the following. An example is shown for *n* = 6; note that your program should work for all inputs *n* between 1 and 9.

```
6
55
444
3333
22222
111111
```

4. [15 marks] Write a program that takes an integer *n* between 1 and 9 as input, and prints out on the terminal a pattern similar to the following (example shown for *n* = 5).

```
1            1
22          22
333       333
4444    4444
5555555555
```