Section 14

PDS Lab **Assignment - 4** **30.11.2022**

Instructions:

- **Give sufficient comment against each statement in your program.**
- **You should save each program with the file name as specified against each problem.**
- **There is a partial credit even if your program does not run successfully for all the test cases as mentioned.**
- **No Moddle submission will attract zero credit in the evaluation.**
  Name the files as {ROLL}_A{#}_Q{#}.c, without the { and }. For ex: 19CS91R05_A2_Q1.c
- **Consult your TA for any confusion. Penalty if the file names do not stick to this convention.**
- **Do not use Arrays, Functions or other advanced concepts to solve the problems.**

1. Read an integer number from the keyboard.
   Write a program to display all the factors of the number.
   (Assume input is in the range [-999999 , 999999])

TEST CASE	INPUT	OUTPUT
1	10	1 2 5 10
2	100	1 2 4 5 10 20 25 50 100
3	0	0
4	-13	1 13

[20 Minutes] [15 marks]

2. Read any integer number from the keyboard and then print the sum of its digits.
   For negative number print the sum as negative.
   (Assume input is in the range [-999999, 999999])

TEST CASE	INPUT	OUTPUT
1	100000	1
2	5641	16
3	-5641	-16
4	0	0

[20 Minutes] [15 marks]

3. Read an integer value having less than or equal to 10 digits.
Display the different digits **in reverse in words**.
(Assume input is in the range [0 , 9999999999])

TEST CASE	INPUT	OUTPUT
1	2345	Five Four Three Two
2	0	Zero
3	2345432	Two Three Four Five Four Three Two
4	9999999999	Nine Nine Nine Nine Nine Nine Nine Nine Nine Nine

[40 Minutes] [20 marks]

4. Write a program that prints out a pattern based on the user input
(Assume input is in the range [2 , 10])

TEST CASE	INPUT	OUTPUT
1	3	1 1 0 1 0 1
2	4	1 1 0 1 0 1 1 0 1 0
3	5	1 1 0 1 0 1 1 0 1 0 1 0 1 0 1
4	6	1 1 0 1 0 1 1 0 1 0 1 0 1 0 1 1 0 1 0 1 0

[40 Minutes] [20 marks]

5. In this problem you will find an approximate root of a cubic polynomial, by a method described below. It is mandatory to stick to this method.

1. The program accepts the coefficients of a univariate cubic polynomial as input from the user.
   Assume that the coefficients are all integers in the range [-5,5] .
   Assume further that the leading coefficient (coefficient of x^3) is non-zero.
   Call the polynomial p().
2. Define two variables of type double, named and a and b.
   Initialize them so that a< b , and p(a) and p(b) are of opposite signs
   (that is one of them is positive and the other is negative).
   Note that the interval [a,b] contains a root of p().
   The idea is to shrink the interval over iterations and converge to the root.
3. Repeat:
   1. Let (c,0) be the point where the straight line segment joining points (a, p(a)) and (b, p(b)) intersects the X-axis. Find c and compute p(c) .
   2. If the absolute value of p(c) is less than 0.001, then print c as a root and terminate.
   3. If the signs of p(a) and p(c) are the same, then update a to c . Otherwise update b to c .
      You should consider all real-domain computations in double precision.

TEST CASE	INPUT	OUTPUT
1	Enter coefficient of x^0: 3 Enter coefficient of x^1: -2 Enter coefficient of x^2: 4 Enter coefficient of x^3: 1	Root of the polynomial: -4.5797
2	Enter coefficient of x^0: 1 Enter coefficient of x^1: -4 Enter coefficient of x^2: 3 Enter coefficient of x^3: 4	Root of the polynomial: -1.5175
3	Enter coefficient of x^0: 1 Enter coefficient of x^1: 2 Enter coefficient of x^2: 4 Enter coefficient of x^3: 5	Root of the polynomial: -0.6553
4	Enter coefficient of x^0: 4 Enter coefficient of x^1: 3 Enter coefficient of x^2: -2 Enter coefficient of x^3: 1	Root of the polynomial: -0.7760

[60 Minutes] [30 marks]