Homework #1

(10% of the total grade, 40 points)

Part-1

For the following tasks, please draw a flowchart, or write an algorithm or program (in a language of your choice but make sure you use the same language throughout)

A. Convert a given decimal number to another number with base r **[5 points]**

B. Convert a given number with base r to a decimal number **[5 points]**

C. Subtract $(1237)_{10}$ and $(237)_{10}$ using complement method. Convert $(1237)_{10}$ and $(237)_{10}$ to binary and perform the subtraction using 1's and 2's complement. Can you generlize the complement subtraction process for any radix (or base) r? Write an algo, or draw a flowchart, or write code for the generialized version of the process. **[10 points]**

Part-2

Compare the methods for swapping values of two variables along the following lines: **[20 points]**

Correct code files: [7 points]

Timing analysis: [7 points]

Report on what learned and limitations: [6 points]

- Methods (using temp variable, addition/subtraction, multiplication/division, XOR)
- Language (Python, C, C++, Java)
- Time is taken by each of the languages, and each of the methods. Test on 1000 random pair of values and average the time.
- Describe the limitations of each of the methods. The limitations could be in terms of the type and range of values the variables can handle or anything else you can think of.

Swapping the values of two variables mean the following in this case:

Var1 = 1000

Var2 = 2000

[.....method for swap....]

Var1 = 2000

Var2 = 1000

Remember a correct solution (method) solves all the instances i.e. for all the valid inputs. We cant change the method based on input because that's like changing the rules of the game while playing the game.

Submission checklist:

Part 1:

One single pdf document named Part1.pdf consisting of solutions for Part1.A, Part1.B, and Part1.C

Part 2:

The correct code files: the code you have written to implement the above methods in the above languages.

[I am fine if you take the code from online sources as long as you understand it as I am not expecting you to know all the languages at this point. But I am expecting you would be able to do these tasks if online access is allowed and discussion among your classmates is permitted]

Time analysis:

Time	Temp variable	Add/Sub	Mul/Div	XOR
Python				
C				
C++				
Java				

Report on limitations and learning: Discuss your observation about each method, language, and associated limitations. You should write about the process you followed to solve this problem, what did you struggle with, and what did you learn from this experience.