COEN 311 Section W (Computer Organization and Software)
Assignment 1

Due Monday January 31, 2022

Note: Please submit only one PDF file through Moodle.

Question 1 (Data Representation) *15 points*

(a) Convert the following pairs of decimal numbers to 5-bit, signed, 2's complement numbers and add them. State, whether or not overflow occurs in each case.
   1) 5 and 10
   2) 7 and 13
   3) -14 and 11
   4) -10 and -13

(b) Repeat Part (a) for the subtract operation, where the second number of each pair is to be subtracted from the first number. State whether or not overflow occurs in each case.

Question 2 (Data Representation) *15 points*

Give an interpretation to the following string of bits assuming it is:

1100 0110 1001 0111

- Unsigned Integer
- Signed Integer
- BCD number
- String of ASCII characters
- IEEE 754 Floating Point number

Question 3 (Memory) *10 points*

Consider a computer that has a *byte organized* memory. A program reads numbers entered at a keyboard and stores them as *words* in successive byte locations, starting at location 1000. Show the contents of memory locations when decimals (-14) and (11) are entered, and their addition is stored in the successive location(s).

Question 4 (Memory) *10 points*

Consider a microprocessor system where the processor has 16-bit data bus and 22-bit address bus. What is the maximum size of the byte addressable memory that can be connected with this processor?

Question 5 (Memory) *50 points*

A byte organized memory chip with 12 bit address bus is used as a building block in a larger memory organization.

a) Calculate the capacity of the above chip. *(10 points)*

b) If the above chip is used to build a 64 KByte word organized (16 bit) memory, how many address lines should the CPU have, and how many of these address lines are used for the decoder. *(15 points)*

c) Draw the memory Connections to the CPU for this new Memory System. *(25 points)*