CSC 106 Summer 2019
Assignment 2
Due Sunday June 16, 11:55 pm

To complete this assignment, you should hand in **one PDF file on connex**. Do not hand in any other files such as Microsoft Word files (e.g. doc). **Your PDF file should be named as "V00XXXXXX_CSC106_A2.pdf".**

Q1) Boolean and Logic [10 marks]

a. Use only AND, OR and NOT gates to create an XOR circuit for inputs A and B.

A	B	A $\oplus$ B
T	T	F
T	F	T
F	T	T
F	F	F

The XOR truth table

b. Write a <u>logical expression</u> that produces the truth table depicted. You may use AND, OR and NOT gates.

a	b	c	
F	F	F	F
F	F	T	F
F	T	F	T
F	T	T	F
T	F	F	F
T	F	T	T
T	T	F	T
T	T	T	T

c. Prove if the logic equals to $((a \wedge c) \vee (b \wedge \neg c))$ by deducting the truth table.

Q2) Machine Code [10 marks]

Let's assume we are working with a CPU that has the following specifications:

- 8-bit word size
- a main memory of 6 locations (0 to 5)
- 2 registers:
    - one register R
    - one *Condition Code* register CC: a <u>3-bit</u> register with bit GT, EQ and LT
    This register holds the results of the latest computed comparison.
    e.g. if memory > R, then CC will be 100. If memory >= R, CC is 110

- the following instruction table:

Opcode	Argument	Instruction value
0000	0000	Stop execution
0001	Memory address	Load from memory into R
0010	Memory address	Store R into memory
0011	Memory address	Add memory value to R
0100	Value	Set R to argument value
0101	Memory address	Compare memory value to R: If memory > R , then GT = 1, else GT = 0 If memory = R , then EQ = 1, else EQ = 0 If memory < R , then LT = 1, else LT = 0
0110	0000	If GT=1, process next instruction, else jump to the instruction after next
0111	0000	If EQ=1, process next instruction, else jump to the instruction after next
1000	0000	If LT=1, process next instruction, else jump to the instruction after next
1001	Memory address	Output, in decimal notation, the value stored in memory at address

Write a program in machine code that:

     a) add 3 and 6 and store the result in memory at address 3
     b) compare the results with the results of 4+4 and store the greatest results (3+6 or 4+4) in memory at address 3

In order to get full marks you need to show the steps and give comments for each line of your machine code. You can refer to the example from the lecture slides. There could be multiple ways of finishing task a and task b, which is acceptable as long as it works correctly.

The staff at the Computer Science Assistance Center (ECS 251) are there to help you! They can't "do" the assignment for you, but they can help out with application problems, printer problems, understanding questions, saving documents, uploading and moving files, etc. Call on them for help.

Web page: https://connex.csc.uvic.ca/portal/site/cscassist