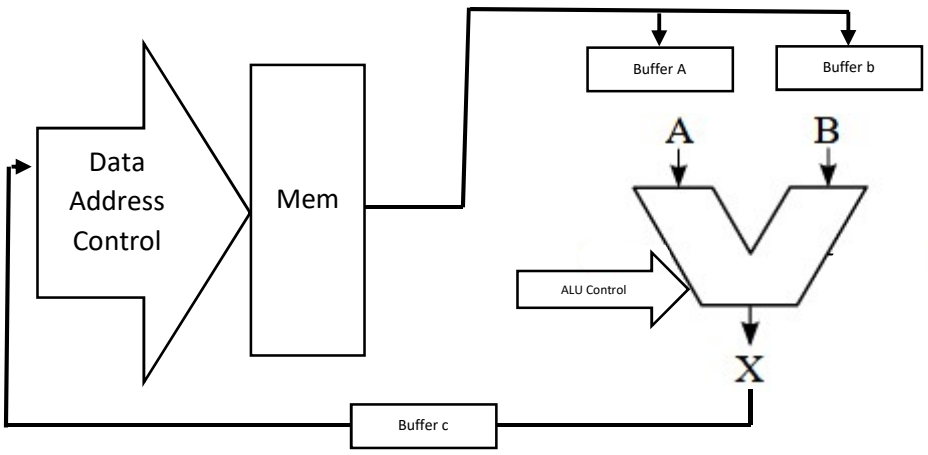
Cosc 2P12
Assignment 2

(Due date for assignment is Thursday October 25th,4:00 p.m. ., Late date Monday October. 29th, 4:00 p.m.)

In this assignment you will be creating a small 4 bit computer. The majority of this computer will have already been completed during lab. If you have not completed the labs, then I suggest you do so.

Create a new Logic Circuit project. You can import components from your lab project(s) using the import function, located under File. At the very least you will need the ALU and Memory. Other components as required.

Consider the following block diagram:



This is the basic block diagram for most simple computers. Typically one would have data stored in memory. As an instruction is decoded, the operands from memory are moved to the appropriate input buffers for the ALU. Once there, ALU function control is specified allowing the ALU to do its work. The result of the ALU computation is temporarily stored in buffer c, prior to being written back to memory.

Your assignment will be to implement this basic system using logic circuit and the components you have built so far. You are free to add any other components you feel you need. All control signals will be manual inputs. That is ALU control will be a sensor. Buffer A, B, and C will have manual write enable buttons. Memory control will have a sensor to Address the memory (see lab 4), sensor for Data input; and controls to write, and enable the outputs.

The goal is for you to be able to place 2 operands into memory, and move them through the computer manually to produce a result.

Here is the tricky part, to write the ALU result back into memory, you will need the data-in to switch between the sensor input and the buffer c output. Think tri-state!

Don't fret, you will have buttons and toggles all over the place in order to control the CPU. Normally this would be done with control logic governed by the opcode decode and timed with a clock pulse, but that is another course. For now, you will be the control logic.

To test your implementation consider the following.

- Store 8 in memory word 0
- Store 5 in memory word 1
- Move memory word 0 to buffer b
- Move memory word 1 to buffer a
- ALU function Subtract
- Move ALU output to buffer c
- Move buffer c to memory word 2

You can place probes on the buses to see the data as it is moved through the CPU. In fact, you should do this so the marker can see a running implementation.

Does this sound like an awful torturous assignment? No, the fact is with the lab material, you should be able to complete this in under 2 hrs, for the average student. Don't start it the night before unless you are confident you are average or above.

Submission

This submission will be physical and electronically submitted. Thus, it will be your responsibility to ensure that it is printed and submitted in due course prior to the due date as listed above. Marks will be awarded for completion, correctness, and neatness. Your circuit will be run.

To submit electronically your logic circuit project will need to be stored on Sandcastle. From the assignment directory run the script submit2p12. It will prompt you for the requisite details and then electronically package the contents of the directory and submit your work.

For the physical submission, print out any logic diagrams which you have created. Your name and student number should appear as comment blocks in the circuits.

- Your submission should be contained in a large (8.5 inch x 11 inch) envelope.
- **Cover Sheet** completely filled out, available from: "http://www.cosc.brocku.ca/forms/cover" **Note**: your assignment will not be marked unless one is submitted with the assignment on the assignment due date. This should be stapled to the outside of the envelope.
- Printout of your logic circuit diagrams, with proper identification on each circuit printout. See lab 1.

The End