CSC 180, Exam II

Exam II Notes

- You may bring one page of notes (front and back) to the exam. This page may be handwritten or typed.
- Computer access will not be permitted during the exam.
- Cell phones must be put away at all times – but you may use calculators
- Don't hesitate to contact me if you have any questions!

Exam II Concepts

- Machine representation of data
  - Conversion from binary to decimal and decimal to binary
  - Conversion from hexadecimal to decimal, hexadecimal to binary, and binary to hexadecimal
  - Finding a two's complement from a binary value, and interpreting the two's complement
- Boolean Logic and Gates
  - Interpreting a transistor diagram: whether the switch is "open" or "closed", and whether the transistor is "on" or "off"
  - Construction of truth tables
  - Boolean operations: AND, OR, NOT, NOR, NAND, and XOR
  - Circuit construction using logic gates
  - Sub-circuits, half adder, and full adder
- Computer architecture terminology
  - Transistor
  - Gate
  - Combinational vs Sequential Circuit
  - Central processing unit (CPU)
  - Random access memory (RAM)
  - Memory address register (MAR) and memory data register (MDR)
  - Fetch vs Store
  - Decoder and multiplexer
  - Machine language
  - Instruction set
  - Program counter
  - Instruction register
  - Fetch/Decode/Execute phases
  - SR-Latch
  - Flip-Flop
  - Clock pulses

Additional Practice Problems

1. See the Jupyter Notebook for practice converting between decimal, binary, and hex, and for finding the two's complement of a number

2. Use Boolean logic to write a condition corresponding to the following:

    a. A number (*num*) is between 1 and 100

    b. A person is not a sophomore

3. Complete the following Truth Table:

a	b	NOT a AND b
0	0	
0	1	
1	0	
1	1	

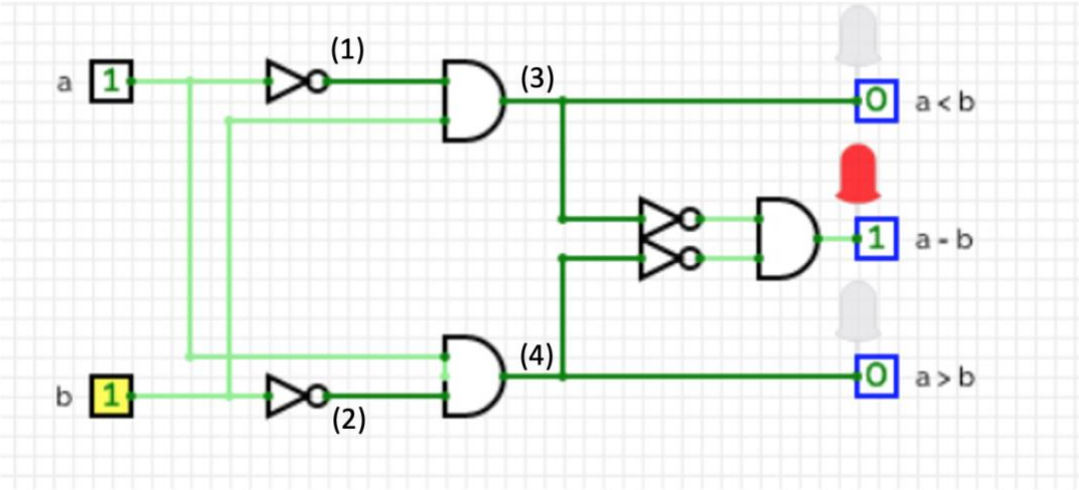
4. Specify the Boolean expression corresponding to the following Truth Table:

a	b	??
0	0	0
0	1	1
1	0	0
1	1	1

5. Specify the Boolean expression corresponding to the following Truth Table:

a	b	c	???
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

6. The circuit for a single bit magnitude comparator is shown below. For (1) through (4), specify the output of the circuit at that point, based on the circuit diagram below.



7. Construct a circuit diagram that implements the following Boolean expression: a AND b OR (NOT a AND c)

8. Consider the machine language instruction example below, and fill in the blanks to describe (partially) how this instruction is executed.

ADD	X	Y
00001001	0000000000001001	000000000001100
op code for ADD	address of X	address of Y

For this instruction to execute, the address of X is copied to the _____ and the value of X is copied to the _____. The value of X is next copied to a register connected to the ALU. The ALU executes several arithmetic and logical operations, and a _____ is used to select the output of the ADD operation.