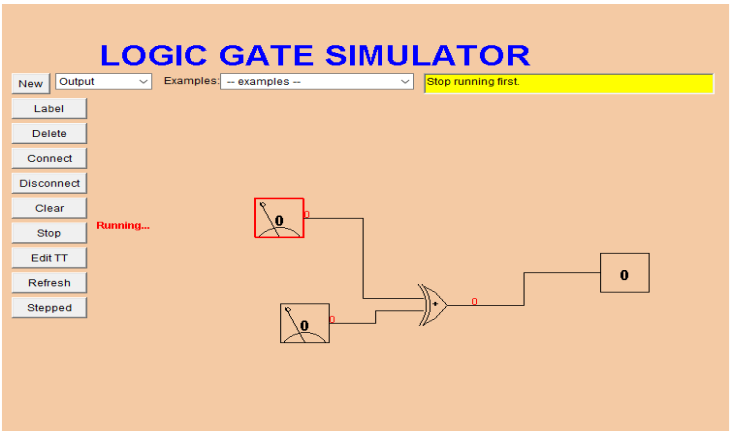
Exercise 1

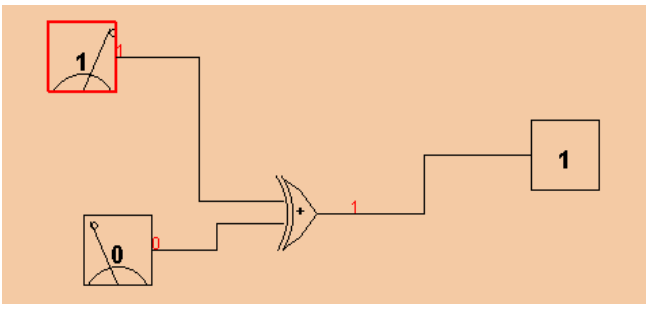
Name Shakir Ali Date 2015/09/24

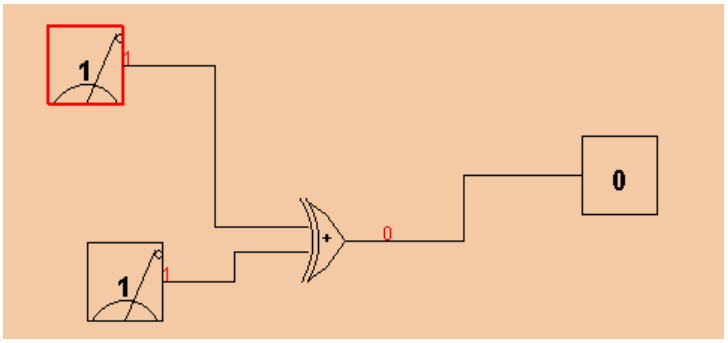
Section M03

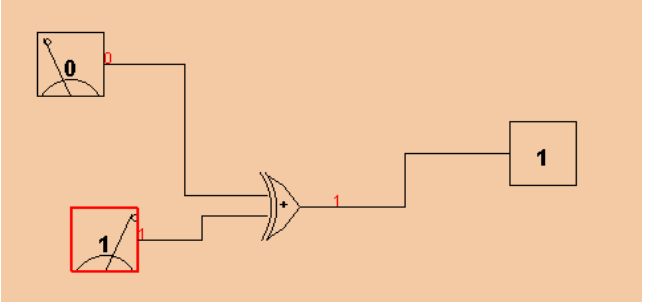
1) Start the “LogicGates” applet.
2) Add two switches, one XOR and one output, and connect them.
3) Press the *Run* button and try out all four combinations of inputs for the switches, recording the results in a truth table. Take screenshots for each combination.

Switch1	Switch2	output
F	F	F
T	F	T
F	T	T
T	T	F









Exercise 2

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Section M03

1) Start the “LogicGates” applet.
2) Create the same circuit as previously, but this time insert a NOT box between XOR and the output.
3) Press the *Run* button and try out all four values by changing the switch values. You do not have to take screenshots, but again record the results in a truth table so you can see the values.
4) What does this circuit do? Study your truth table to determine its function. (Hint: It yields a true result only when inputs A and B share a particular relationship. What is that relationship?)

Switch1	Switch2	output
F	F	T
T	F	F
F	T	F
T	T	T

The Circuit returns a True value only hen both the inputs are same.

Exercise 3

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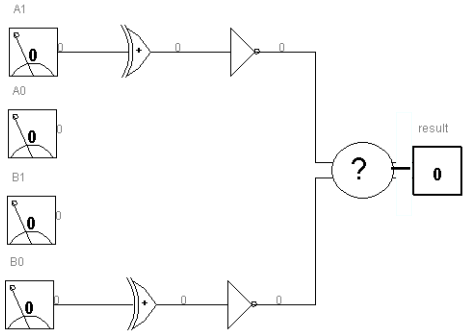
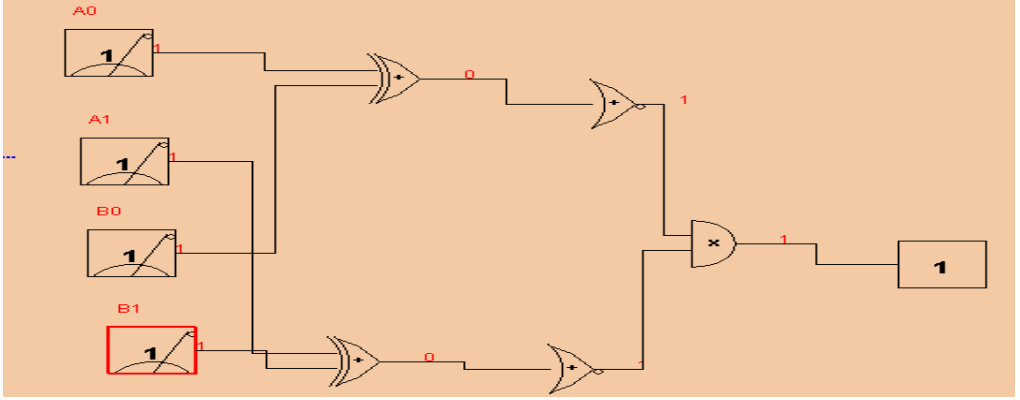
1) Start the "LogicGates" applet.
2) Build a new circuit that will be a larger version of the one you created in Exercise 2. There will be four switches. Assign them the labels A1, A0, B1, and B0. (Note: A1 is a way of specifying A_1 when you can't really have a subscript.)
3) The circuit will have two XORs, two NOTs, an output, and a mystery box, arranged as shown below:



4) The purpose of this circuit is to compare two 2-bit binary numbers to see if they are the same number. For example, suppose A (that is, the two-digit number comprised of A_1A_0) is 10 and B (the two-digit number B_1B_0) is 10, then the output box will display 1. If A is 10 but B is 11, the output box will show 0, which is Boolean-ese for "false."
5) Connect the XOR boxes to the proper input switches. (Just think about how you compare two numbers for equality. What digits do you compare?)
6) The "mystery gate" is either AND or OR. You can either experiment until you get the right answer, or, better for your brain (and more impressive to your teacher) you can reason out which it should be.
7) Take a screenshot showing your circuit getting the correct result.



Exercise 5

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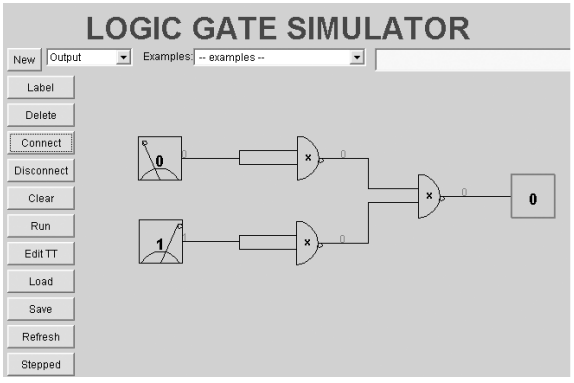
1) Start the "LogicGates" applet and build the following circuit. It has 2 switches, one output, and three NAND gates.

2) The wiring between the switches and the NAND gates is a little unusual. For both switches, connect the switch to the NAND gate adjacent to it *twice*. This will cause both the wires coming out of the switch to the same NAND gate, though the simulator will spread them out visually. (To do this, click on the *Connect* button, then click once on the top switch, then the top left NAND. Repeat this: click once again on the top switch and then on the top left NAND.)



3) Experiment with the circuit by running it (click on the *Run* button) and change the switch values. Write down the 4 possible inputs and the output you see below:

Top switch	Bottom switch	Output
0	0	0
0	1	1
1	0	1
1	1	1

4) What logic gate has the same output?

OR Gate

5) EXTRA CREDIT: Replace the three NAND gates with NOR gates and run the circuit. What logic gate has the same output? Hint: it won't be the same as the answer to number 4.

AND Gate