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Lab 1

Theory

In this lab we are introduced to LogicWorks, how to operate it, and some of the logic gates that we will be using. We learned and were introduced to how NOT, AND, and OR logic gates operate along with signal operators and output displays. For NOT gates, they take in either a high, 1, or low, 0, signal then flip it to the other. For AND gates, all outputs are 0 unless the signal inputs are all 1's which then it outputs 1. This is the opposite for OR gates, all outputs are 1 unless the signal inputs are all 0's which then it outputs 0. To connect together three input signals, you use a combination of 2 gates. For example if we wanted to connect three signals to an AND gate we use 2, 2 input AND gates with one outputting to the next. We first take in two of the input signals and feed it into the 2 input AND gate, then we take the output of that and feed it into the second AND gate with the third input signal connected to that one. With this we successfully created an output of three input signals into an AND logic. This works due to the logic of the input signals into the AND gates being like the associative property of multiplication with one finished operation, multiplied by the next operation becoming like an equation. This method also works with OR gates.

Three Signal Input AND Gate Truth Table:

C	B	A	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Deliverables

C	B	A	X	Y	Z	Hex
0	0	0	0	0	0	0
0	0	1	0	0	1	1
0	1	0	0	1	0	2
0	1	1	0	1	1	3
1	0	0	0	1	1	3
1	0	1	1	0	0	4
1	1	0	1	0	1	5
1	1	1	1	1	0	6
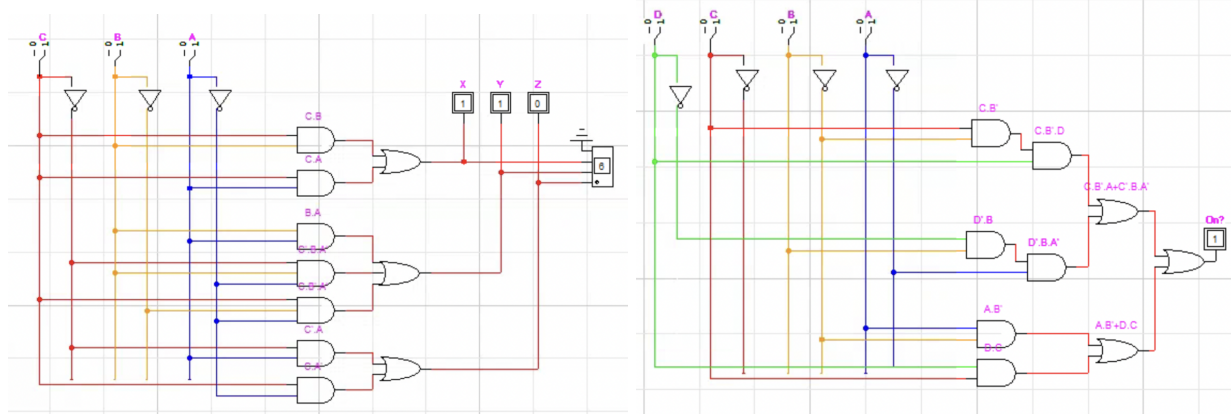
The HEX output is determined by the outputs of the signal inputs from the binary switches through the logic gates. The HEX display output, outputs the Hexadecimal conversion of the binary outputs from the output logic. For the HEX display, it takes in 4 input values but we only have 3 outputs from the logic so we ground the MSB of the HEX display to 0. For each combination of XYZ, it will not exceed the hexadecimal number of 7 which is 0111 in binary due to the MSB of the HEX display being grounded to 0. Overall, the HEX output is determined by what the outputted binary numbers are from CBA, which are XYZ, that are then converted from binary to hexadecimal.

Discussion

In this lab we learned about how LogicWork works and operates and how logic gates work in tandem with each other. LogicWorks seems like a very useful software but is very frustrating due to the glitches that appear sometimes. I also liked learning about how logic gates worked in tandem with each other to create equations of what to output.

Questions

QUESTION 1: We have a LED in series with 5K-ohm resistors with 12 V applied across the combination. The voltage across the LED is 2 V. What is the value of the current flowing through the circuit? (indicate the units) (Conner said 2, 5K-ohm resistors) (12V-2V)/10000 ohms = .001 A *1000 = 1 mA

1 mA

QUESTION 2: What are the range of voltage levels that define the logic 1s and 0s in TTL gates?

LOW(0) = 0 V - 0.8 V
UNDEFINED = .8 V - 2 V
HIGH(1) = 2 V - 5 V