ECE-301-204

Lab3 Combinational Circuits

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Objective:

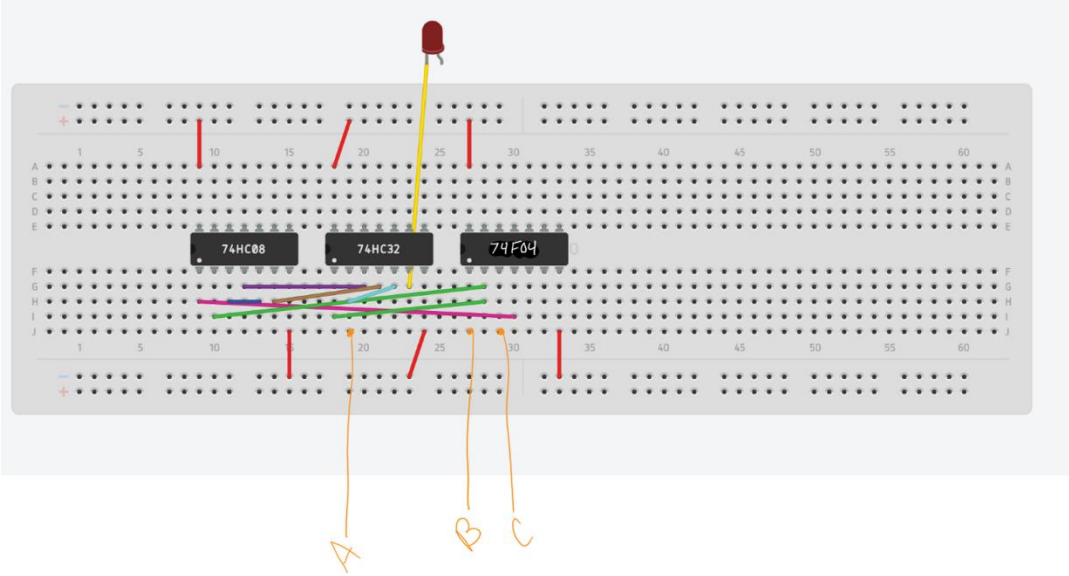
To learn basic combinational circuit design and construction.

To learn to build and troubleshoot combinational logic circuits.

Materials and Equipment:

- ET-1000 Trainer
- Wires
- 1 7xx04 (NOT gates), 1 74xx08 (AND gates), 1 74xx32 (OR gates)
- Breadboard

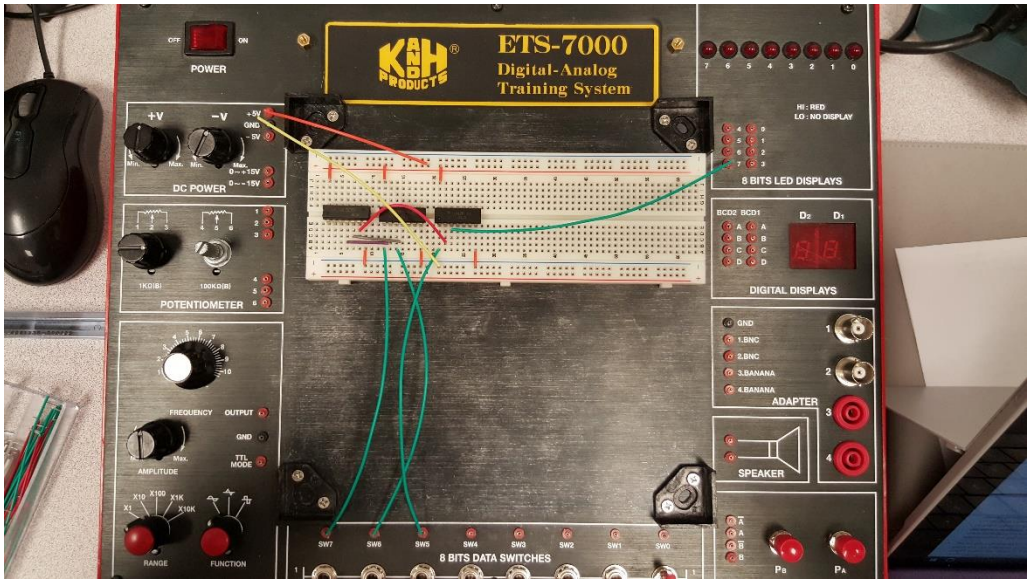
Laboratory Data:



This is the circuit for the original equation. As you can see the breadboard looks very clustered and the wires are a little hard to follow.

The simplified equation of the equation given is $f = A + (A + \overline{B}) \cdot (\overline{B} \cdot \overline{C}) = A + (\overline{B} \cdot \overline{C})$

And the circuit looks like this:



As you can see the circuit is much simpler when you simplify the function.

And the truth table for both of them is:

A	B	C	$\overline{B}$	$\overline{C}$	f
0	0	0	1	1	1
0	0	1	1	0	0
0	1	0	0	1	0
0	1	1	0	0	0
1	0	0	1	1	1
1	0	1	1	0	1
1	1	0	0	1	1
1	1	1	0	0	1

6. $f = \overline{A} + (A + \overline{B}) \cdot (\overline{B}C)$, for the logic circuit. If $A = 1$, then:

$f = 0 + (1 + \overline{B}) \cdot (\overline{B}C) = \overline{B}C = X$

7. 8. 9. $f = \overline{A} + (A + \overline{B}) \cdot (\overline{B}C)$

A	B	C	V	W	X	Y	Z	f
0	0	0	0	1	0	1	1	1
0	0	1	1	1	1	1	1	1
0	1	0	0	0	0	0	1	1
0	1	1	0	0	0	0	1	1
1	0	0	0	1	0	1	0	0
1	0	1	1	1	1	1	0	1
1	1	0	0	1	0	0	0	0
1	1	1	0	1	0	0	0	0

$Z = \overline{A}$

$Y = \overline{B}$

$W = A + Y = A + \overline{B}$

$X = YC = \overline{B}C$

$V = WX = (A + \overline{B}) \cdot (\overline{B}C)$

In the truth table of the nodes and values of (A,B,C) above, each box that is highlighted yellow are the nodes that appear in the output for the given inputs of (A,B,C).

Comments and Conclusion:

This lab gives insight to circuit organization. If you have a really big function to start off, first you want to take the steps you can to simplifying it. Once you have simplified as far as you can then you want to begin designing your circuit. This allows the circuit to be more organized and easier to understand. Also breaking down a circuit into several circuits can also help to understand a circuit and search for faults and flaws.