

TECH 3232
 Fall 2019
 Lab #3
 VER 1.00
 Combinational Logic Circuits

Name: _____

Using SimcirJS (<http://tech-uofm.info/simcirjs/blank.html>) (available on the class website). Draw and simulate the circuit for the equation below using the 4 input AND gates and a 8 input OR gate. Please label inputs A, B, C and D by double clicking on the label, an edit box will pop up. Once it is working, hold down the ctrl key and left-click on the mouse within the simulation window (text should appear). Copy all the text in the window and paste it into notepad++ and save it as a .txt file. Submit that file as lab3 sim via the online submission system at <http://tech-uofm.info/upload/upload1.php>

NOTE: the bars in the equation below are NOT CONNECTED, DeMorgan's Theorem should not be needed):

$$Z = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + ABCD + ABC\bar{D} + A\bar{B}CD + A\bar{B}C\bar{D}$$

Fill in the following truth table, using the circuit simulation:

Inputs				Output
A	B	C	D	Z

On the back of this sheet, minimize the above equation using Boolean algebra. Make sure to place the rule numbers (as per the Boolean Algebra sheet on the website) by the steps.

Draw the new circuit BELOW:

Below, give a detailed parts list to build the above circuit (ie Part Designation, Part Description Part value (where applicable):

Label the circuit diagram above by placing the part designation (ie.. U1A, R1, D1 etc) and the gate pin numbers (refer to the data sheet for the ICs) appropriately.

Build the circuit as drawn.

Verify the truth table using the circuit:

Inputs				Output
A	B	C	D	Z

Demonstrate your circuit to the instructor.

Answer the following Questions:

1. Describe how the Truth Table (on page 1) could have been derived from the Boolean algebra equation?

2. How do the above truth tables prove the circuits are equivalent? **Explain in detail!!!!!!**

3. What benefits does the simplified circuit have over the original (list a minimum of 4 things) – put answer on back of this page.