ESE 111 – Intro to Electrical/Computer/Systems Engineering

Post-Lab Assignment #1

1. In the MATLAB section of Lab 1, you used the digital multimeter (DMM) to measure the value $M$ of some resistor of nominal value $N$ (the value specified by the color bands). You then used MATLAB to calculate the average experimental resistance value $E$.

a. Fill in your values for $N$, $M$, and $E$. Remember to label your units!
   i. $N =$ ____________
   ii. $M =$ ____________
   iii. $E =$ ____________

b. Using the percent difference formula ($\text{Percent Difference} = \frac{A-B}{A} \times 100$), calculate the percent difference between:
   i. the measured value $M$ and the nominal value $N$
   ii. the experimental value $E$ and the nominal value $N$

Recall that the fourth band on the resistor indicates the level of tolerance in the resistor’s nominal value (specified by the first three bands). The resistors that you used in lab have a gold fourth band, which specifies that a tolerance of 5%. This means that the actual resistance could be within ±5% of the nominal value.

c. Are the measured and experimental values both within the tolerance of the resistor?

d. Which value is closer to the labeled value? Which value is more representative of the true resistance? Why?

2. In Lab 2 you implemented an AND gate and an OR gate using two simple pushbutton switches each. In order to implement more elaborate logic functions, we’ll often use a NOT gate, also known as an ‘inverter.’ The symbol for an inverter is shown below:
The inverter has one input and one output. As the name implies, the inverter makes its output the opposite of the logical state of the input. Like the others, this gate can also be implemented using switches.

a. Fill in the truth table for the NOT gate.

<table>
<thead>
<tr>
<th>X (input)</th>
<th>Y (output)</th>
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b. Implement a NOT gate using a single switch in the following circuit. In other words, where would you place a pushbutton switch such that the LED turns off when the switch is pressed. (Be careful not to short the two terminals of the power supply!)

3. Draw a schematic for a circuit that lights an LED only if switch A is pressed AND either (or both) switch B OR switch C is pressed. You can draw your solution in the green box in the circuit below.
3. *Optional:* What was most difficult for you in labs 1 and 2?

4. *Optional:* What did you most enjoy about these labs?

5. *Optional:* Any suggestions for improvement?