ENGR 120  Homework 5

NOTE: Use engineering format for problems 1-3 and non-engineering format for problems 4-7. This is an individual assignment.

1. Consider the given circuit. Find
   a. The current leaving the power source. \( I = 62.5 \text{mA} \)
   b. The current through each resistor.
      \( I_{15\Omega} = 62.5 \text{mA}, I_{20\Omega} = 62.5 \text{mA}, I_{45\Omega} = 62.5 \text{mA} \)
   c. The voltage drop across each resistor.
      \( \Delta V_{15\Omega} = 0.9 \text{V}, \Delta V_{20\Omega} = 1.3 \text{V}, \Delta V_{45\Omega} = 2.8 \text{V} \)
   d. The power dissipated by the circuit. \( P = 0.31 \text{W} \)
   e. The power dissipated by the 20Ω resistor. \( P_{20\Omega} = 0.08 \text{W} \)

2. Consider the given circuit. Find
   a. The current leaving the power source. \( I = 12.4 \text{mA} \)
   b. The current through each resistor. \( I_{1k\Omega} = 9.8 \text{mA}, I_{220\Omega} = 9.8 \text{mA}, I_{4.7k\Omega} = 2.6 \text{mA} \)
   c. The voltage drop across each resistor. \( \Delta V_{1k\Omega} = 9.8 \text{V}, \Delta V_{220\Omega} = 2.2 \text{V}, \Delta V_{4.7k\Omega} = 12 \text{V} \)
   d. The power dissipated by the 1kΩ resistor. \( P_{1k\Omega} = 96 \text{mW} \)
   e. Which loop does more current pass through? Does this make sense? Explain.

3. Find the equivalent resistance of the given circuit. (Hint: Think about how current passes in and out of nodes.)

4. Circuits do not have to be draw as clean straight lines. Sometimes the lines are curved and messy (think about the actual wires on your breadboard; they are not straight). Use your knowledge of circuits and of how current flows to redraw the circuit below using clean lines. Then, in your own words, describe how current flows through the circuits. Identify locations where the current splits. You can use color or notations to illustrate your explanation.
5. Finish the activity discussed in class to show a working switch by printing its status on the serial monitor. The serial monitor should display a 0 if the switch is not pressed and a 1 if the switch is pressed. Provide a screen shot of your sketch along with a screen shot of your serial monitor displaying 0s and 1s.

Tips:
- When you unplug your Arduino, you can scroll through the values printed on the serial monitor without new values printing.
- If you can’t find a location to show both 0s and 1s, take a screen shot of the 0s and another screen shot of the 1s.
- For PCs, to take a screen shot of just one window (i.e., the serial monitor window) and not the entire desktop, you can press ALT+Prtscn. You can also use the snipping tool.
- For Macs, to take a screen shot of just one window (i.e., the serial monitor window) and not the entire desktop, you can press Command+Shift+4 at once then hit space.

6. You will need both of your switches wired eventually, so finish the second switch when you get a chance (not required before the next class).

7. Review the “learning to solder” presentation in the class 5 notes.
   a. Write a brief definition of soldering.
   b. What are some practical applications of soldering?
   c. Take the soldering safety quiz through the ENGR 120 Meta Moodle. We will be soldering in class 6, so you MUST complete the quiz before soldering.