ENGR 120  Homework 4

NOTE: Use engineering format for problems 1 and 2. Use non-engineering format for problems 3 and 4. This is an individual assignment.

1. Consider the circuit given.
   a. What is the overall voltage drop over the resistor in Loop1? 5V
   b. What is the overall voltage drop over the resistors in Loop 2? 5V
   c. Using Ohm's law, what is the current that passes through the 200Ω resistor? 25mA
   d. Looking at the resistors in Loop 2, do you think the voltage drop for the 100Ω resistor will be greater than or less than the 50Ω resistor? Can you predict by how much more or less?
   e. What is the equivalent resistance of the resistors in Loop 2? 150Ω
   f. Find the current passing through the resistors in Loop 2 (Hint: use Ohm's Law and the Req of the two resistors in the loop). 33mA
   g. Find the voltage drop across the 100Ω and the 50Ω resistor (Hint: current stays the same through both resistors). \( \Delta V_{100\Omega} = 3.3V \) & \( \Delta V_{50\Omega} = 1.7V \)
   h. Compare your answers from part g to your predictions in part d. Were your predictions accurate? Do the calculated answers make sense? Explain.

2. Consider the circuit given where \( V_1 = 9V \), \( R_1 = 470\Omega \), \( R_2 = 220\Omega \), \( R_3 = 1000\Omega \), and \( R_4 = 100\Omega \).
   a. Compute the equivalent resistance for the entire circuit. 750.3Ω
   b. If the current that passes through \( R_1 \) is the same as the current leaving the power source, then what current passes through \( R_1 \)? 12mA
   c. What is the voltage drop across \( R_1 \)? 5.64V
   d. If the current that passes through \( R_4 \) is the same as the current leaving the power source, then what is the voltage drop across \( R_4 \)? 1.20V
   e. Does \( R_2 \) and \( R_3 \) have the same voltage drop?
   f. Using KVL and your knowledge of the voltage drop for \( R_1 \) and \( R_4 \), determine the voltage drop across \( R_2 \) and \( R_3 \). 2.16V
   g. Current is different for \( R_2 \) than it is for \( R_1 \) and \( R_4 \), find the current that passes through \( R_2 \). 9.8mA
   h. Find the current that passes through \( R_3 \). 2.2mA

3. Install two LED/resistor pairs on your breadboard that are driven by a digital input/output pins 11 and 12. Use “for loops” to make your Arduino cause the two LEDs to blink in the following pattern:
   a. LED1=on and LED2=off for 200 ms
   b. LED1=off and LED2=on for 200 ms
   c. Repeat parts (a) and (b) a total of 12 times
   d. Both LEDs off for \( \frac{3}{4} \) of a second
   e. LED1=on and LED2=off for 500 ms
   f. LED1=off and LED2=off for 500 ms
   g. repeat parts (e) and (f) a total of 6 times
   h. Both LEDs off for 1 second
   i. Repeat the entire pattern above indefinitely

Your program should have two for loops, one for parts (a) and (b) and another one for parts (e) and (f). Bring your Arduino to class ready to demonstrate your implementation of this problem.

4. Refer to the connecting a switch presentation found in class 4. Wire and connect at least one of your switches to your Arduino chassis following the instruction found on the presentation.