BME 3511 Laboratory 5 Combination Series & Parallel Circuits

Objective:

The objective of this exercise is to use the understanding of how to connect resistors in series and parallel while using the NI myDAQ to measure resistance and voltage. Upon the completion of this lab, the student will:

- Connect resistors in series and parallel in the same circuit.
- Measure individual resistance as well as equivalent resistance.
- Measure voltage across a combination circuit.

Background:

When resistors are connected in series, then they have the following properties:

- The current at all points of the circuit is equivalent since there is only one path for the current to travel.
- The equivalent resistance of a series circuit is obtained by adding all the resistances. Here is a generic formula for the equivalent resistance across a circuit:

$$R_{eq} = R_1 + R_2 + R_3 + \ldots$$

- The voltage in a series circuit varies across each resistive component and can be calculated using ohms law:

  Total Voltage: $V=I*R_{eq}$
  Voltage across resistor n: $V=I*R_n$

When resistors are connected in parallel, then they have the following properties:

- The voltage at all points of the circuit is equivalent since the potential difference between any two points in the circuit is the same.
- The equivalent resistance of a parallel circuit is obtained by following formula:

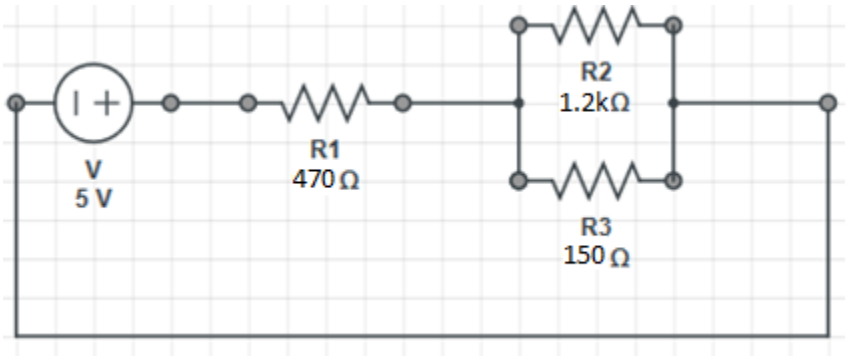
$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots \ldots$$

Now we will do an example of how to measure these values using the NI myDAQ. The first step is to open the DMM on the computer and assemble your myDAQ components.

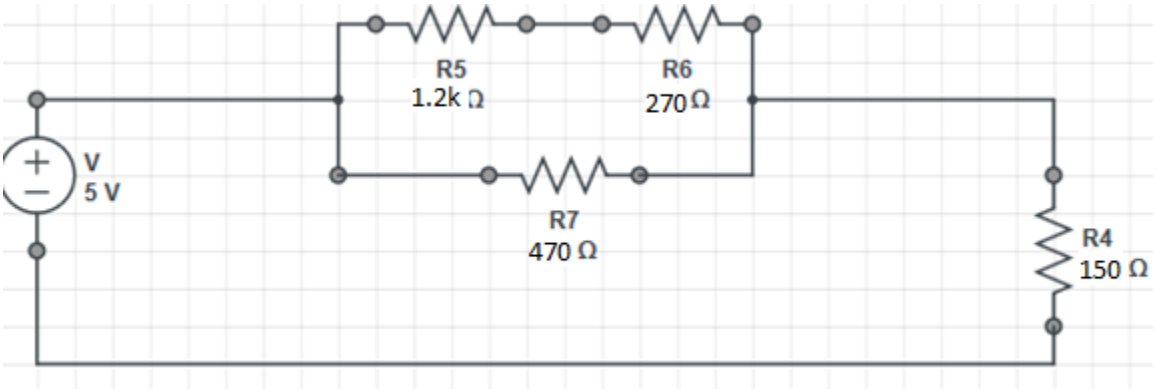
Lab Procedure:

1) Set up the first circuit using your bread board and the appropriate resistors as shown. The NI myDAQ will be used as a 5V power source in this lab.

Circuit 1



Circuit 2



NOTE: Be sure to have a TA check your circuit before continuing.

2) Measure the individual resistance of all of the resistors as well as the equivalent resistance. Then, using the measured values of the individual resistances calculate what the equivalent resistance should be.
3) Given the source of 5 volts calculate the total current through the circuit.

NOTE: Keep in mind that this may not be the current through each individual resistor.

4) Measure the voltage across each resistor as well as the total voltage in the circuit.

5) Calculate the current that would pass through each resistor.

HINT: Remember Kirchoff's Node Law.

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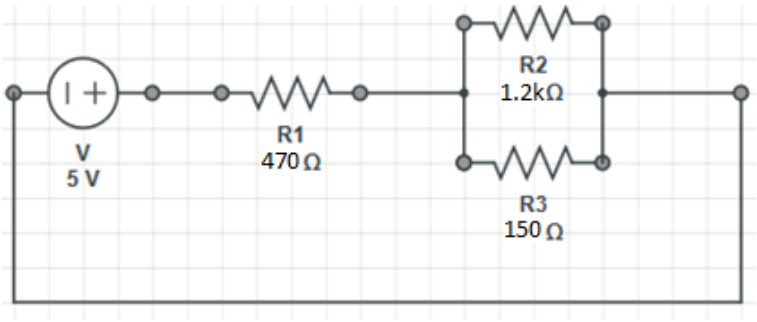
Student Name: _____

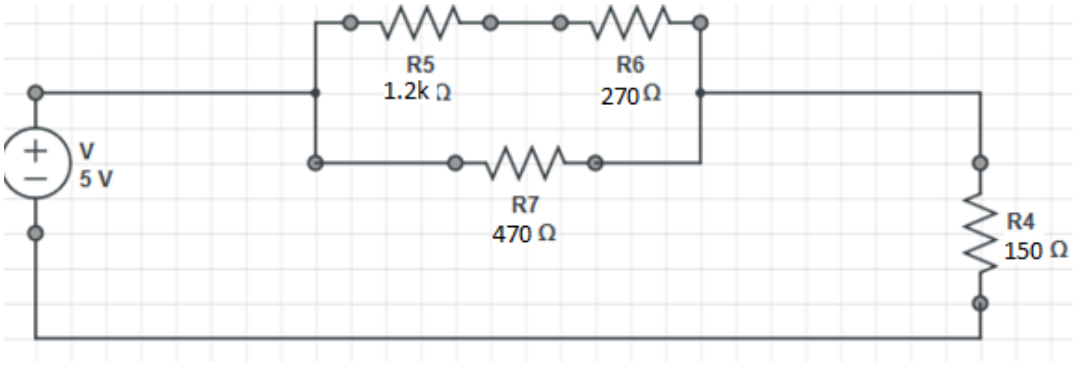
Date Submitted:_____

Lab Partner(s):_____

Data Collection:



Circuit 1					
R_1		Total Current (I)		V_s	
R_2		I_1		V_{total}	
R_3		I_2		V_1	
R_{eq}(calculated)		I_3		V_2	
				V_3	



Circuit 2					
R_4		Total Current (I)		V_s	
R_5		I_4		V_{total}	
R_6		I_5		V_4	
R_7		I_6		V_5	
R_{eq}(calculated)		I_7		V_6	
				V_7	