ECE 109L - SERIES AND PARALLEL CIRCUITS - LAB 11
EQUIVALENT RESISTANCES

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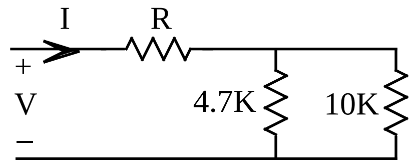
OBJECTIVE

The objective of this lab is to calculate and measure equivalent resistances of series and parallel resistor circuits like the following

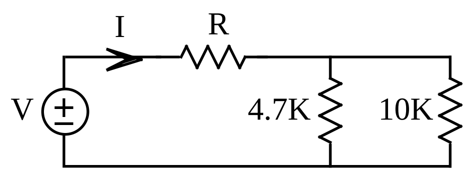


PARTNER 1: R = 1K PARTNER 2: R = 2K

LAB

1. Our objective in this first problem is to verify that V is proportional to I for the above circuit and then use the result to find R_{EQ}
   a. Measure your resistor values. Compare with the nominal values
   b. Experimentally determine how V (in volts) is related to I (in amps) for the circuit above using the same method as in Lab 5 where we found the resistances of single resistors as follows

      (1) Connect up a voltage source as follows

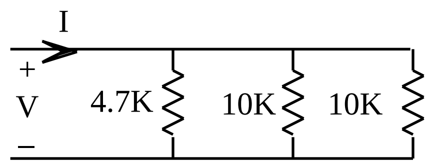
      

      (2) Measure I (in amps) for "a bunch" of positive as well as negative values of V (in volts)
      (3) Plot your data points on a graph of V as a function of I and draw the "best fit" line through them. Make sure that your line for V as a function of I goes through the origin since resistor circuits cannot have any current flowing through them if the voltage across them is zero
      (4) Find the slope of your line equal to the equivalent resistance $R_{EQ} = V/I$ of the resistor circuit
      (5) And finally make use of your slope to obtain an equation for V (in **volts**) as a function I (in **amps**)

   c. Use an ohmmeter to measure R_{EQ} for your circuit
   d. Compare your results for R_{EQ} in parts (b) and (c)
   e. Now make use of your R_{EQ} from part (c) to predict I for when V = 2.5 volts. Be sure to redraw the circuit with the original resistors replaced by R_{EQ}
   f. Then measure I when V = 2.5 volts
   g. Compare your measured and calculated values for I in parts (e) and (f)

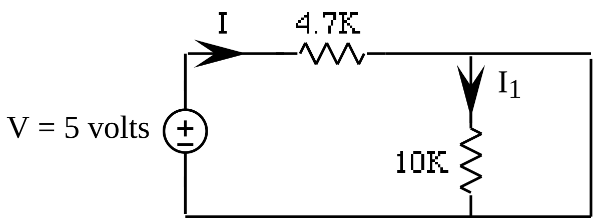
h. Why do we only need one data point - as measured by an ohmmeter - to determine R_{EQ} of a resistor circuit

2. Given the following parallel resistor circuit



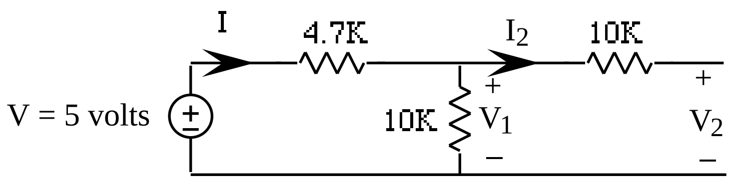
a. Measure your resistor values. Compare with nominal values
b. Use an ohmmeter to measure R_{EQ}
c. Calculate R_{EQ} by analyzing the circuit with your measured resistor values
d. Compare your measured value for R_{EQ} in part (b) with your calculated value in part (c)

3. Given the following circuit



a. Measure I_1
b. Explain why I_1 has the value it does
c. Analyze the circuit to calculate $R_{EQ} = V/I$
d. Measure R_{EQ} with an ohmmeter
e. Compare your calculated and measured values of R_{EQ}

4. Given the following circuit



a. Measure I_2, V_1 and V_2
b. Explain why I_2, V_1 and V_2 have the values they do
c. Analyze the circuit to calculate $R_{EQ} = V/I$
d. Measure R_{EQ} with an ohmmeter
e. Compare your calculated and measured values of R_{EQ}