ECE 109L - EQUIVALENT CIRCUITS - LAB 17
EQUIVALENT RESISTANCE

**FALL 2006**   **A.P. FELZER**

OBJECTIVE

From this point on we will be using node equations to generalize and expand on our results for series and parallel circuits. We begin with equivalent circuits. From Lab 11 we know that series and parallel circuits like the following

have equivalent resistances R_{EQ}. The objective of this lab is to make use of node equations to demonstrate that all resistor circuits like the following have equivalent resistances
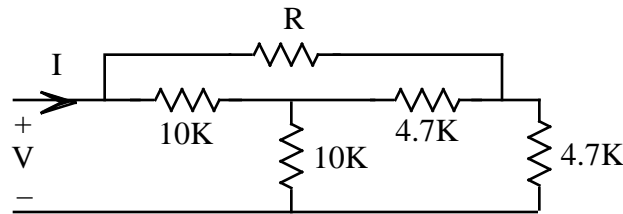
PARTNER 1: R = 4.7K   PARTNER 2: R = 10K

LAB

1. For the circuit above

    a. Measure your resistor values. Compare with the nominal values

    b. Experimentally determine an equation for how V (in volts) is related to I (in amps) in the above circuit using the following method used in Lab 11 for series and parallel circuits. In particular

        (1) Connect up a voltage source V as follows
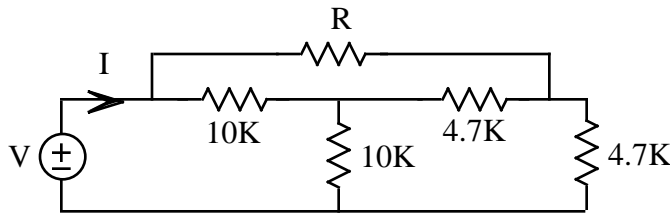
        (2) Measure I (in amps) for "a bunch" of positive as well as negative values of V (in volts)

        (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 of your R_{EQ} from part (b) to predict I for when $V = 2.5$ volts
d. Then measure I when $V = 2.5$ volts
e. Compare your prediction in part (d) with your result in part (d)
f. Use an ohmmeter to measure R_{EQ} for your circuit
g. Compare your calculated and measured values of R_{EQ}
h. Why do we actually only need one data point - as measured by an ohmmeter - to determine R_{EQ} of a resistor circuit

2. Given the following circuit
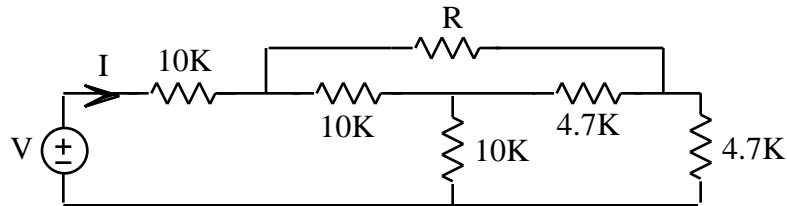
a. Make use of your equivalent resistance in Problem (1) to calculate I in the following circuit if $V = 5$ volts Be sure to draw the equivalent circuit.
b. Measure I
c. Compare your measured and calculated values of I