

ECE 109L - SERIES AND PARALLEL CIRCUITS - LAB 12

VOLTAGE AND CURRENT DIVISION

SUMMER 2007

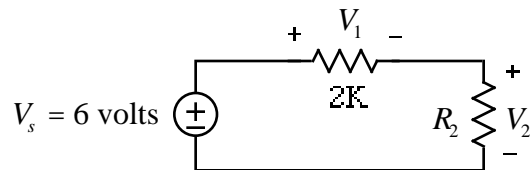
A.P. FELZER

OBJECTIVE

The objective of this lab is to verify the basic properties of voltage and current division in resistor circuits

LAB

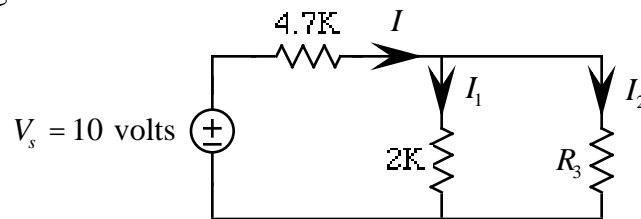
1. Given the following circuit



PARTNER 1: $R_2 = 1K$ PARTNER 2: $R_2 = 4.7K$

- Measure your resistor values. Compare with their nominal values
- PreLab** - Use voltage division equations to calculate V_1 and V_2
- Measure V_1 and V_2
- Compare your measured and calculated values for V_1 and V_2

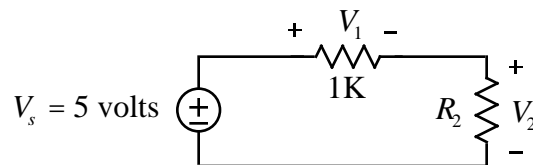
2. Given the following circuit



PARTNER 1: $R_3 = 1K$ PARTNER 2: $R_3 = 4.7K$

- Measure your resistor values. Compare with their nominal values
- Measure I
- Make use of your measured value of I to calculate I_1 and I_2 using current division equations
- Measure I_1 and I_2
- Compare your measured and calculated values for I_1 and I_2

3. Given the following circuit

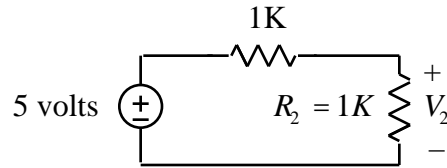


- PreLab** - Derive equations for V_1 and V_2 as functions of R_2
- PreLab** - Use Mathcad to graph your equations for V_1 and V_2 as functions of R_2 on separate graphs. R_2 should go from 0 to at least $5K$. Describe your curves. Make each graph large enough to fill a page. *And be sure to do these graphs carefully because you*

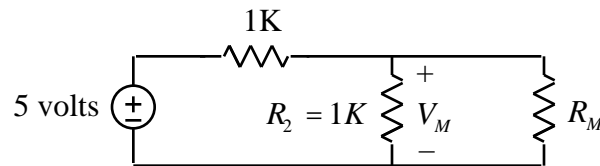
will need them for the lab demo

- Take enough data points to see how V_1 and V_2 vary as a function of R_2 . Use a potentiometer for R_2
- Now add your data points to your graph in part (b)
- How closely do your data points match your derived curves

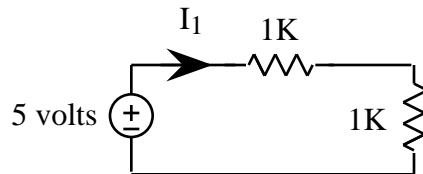
4. Suppose we take a nice simple circuit as follows



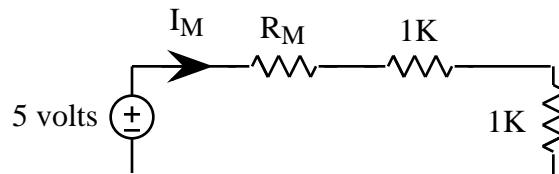
and add a parallel resistor as follows



- Measure V_2 in the original circuit
 - What do you think will happen to the voltage across R_2 if R_M is relatively small. Why
 - Connect a relatively small resistor $R_M = 1K$ across R_2 and see what happens. Were you right in part (b)
 - Now measure the voltage across R_2 for a much larger R_M
 - Based on the results of this problem would you buy a voltmeter with a large equivalent resistance or a small equivalent resistance. Why
5. Now suppose we take the same nice simple circuit as in Problem (4)



but this time add a series resistor as follows



- Measure I_1 in the original circuit
- What do you think will happen to I_M if R_M is relatively small. Why
- Put a small resistor R_M in the circuit and see what happens. Were you right in part (b)
- Now measure I_M for a much larger R_M
- Based on the results of this Problem would you buy ammeter with a large equivalent resistance or a small equivalent resistance. Why

