Name: _____

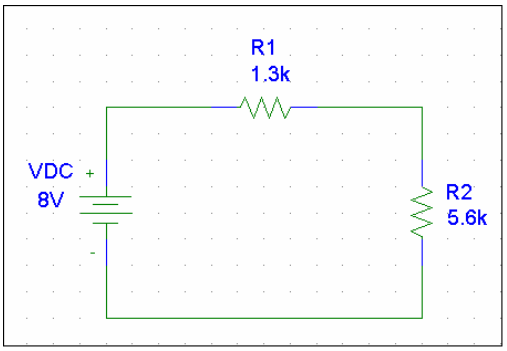
Basic DC Lab - ELEC 101L

LAB #9: Voltage and Current Dividers

In this lab you will explore the concepts of the Voltage and Current Dividers. These two concepts are very important to circuit analysis. Remember to show all calculations and use complete sentences when answering questions.

PART I: The Voltage Divider (26.5 pts)

Given:



Voltage Divider Formula:

$$V_x = \left(\frac{R_x}{R_T}\right)V_T$$

1. Calculate VR1 and VR2 using the Voltage Divider formula. (10 pts)
SHOW ALL WORK!

V_{R1} = _____ V_{R2} = _____

Calculate the following quantities: (4 pts)

I_T = _____ P_{R1} = _____

P_{R2} = _____ P_T = _____

2. Construct the circuit and make the following measurements and REMEMBER to disconnect the power supply to measure the resistance: (4.5 pts)

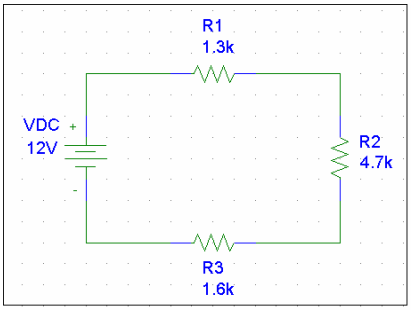
	R	V	I
R1			
R2			
TOTAL			

3. Demonstrate two (2) random measurements of your circuit to the instructor. (4 pts)

Instructor's Initials: _____ Date: _____

4. If an 820Ω resistor (**R3**) is added ***IN PARALLEL*** to R1, what are the values of V_{R1} and V_{R2} using the Voltage Divider formula? (4 pts)

PART II: Voltage Dividers Part 2 (22.5 pts)



Given the circuit at right:

1. Calculate the VR1, VR2 and VR3 using the Voltage Divider formula. (6 pts)
SHOW ALL WORK!

V_{R1} = _____ V_{R2} = _____ V_{R3} = _____

Calculate the following quantities: (5 pts)

I_T = _____ P_{R1} = _____

P_{R2} = _____ P_{R3} = _____ P_T = _____

2. Construct the circuit and make the following measurements. Remember to disconnect the power supply when measuring resistance: (7.5 pts)

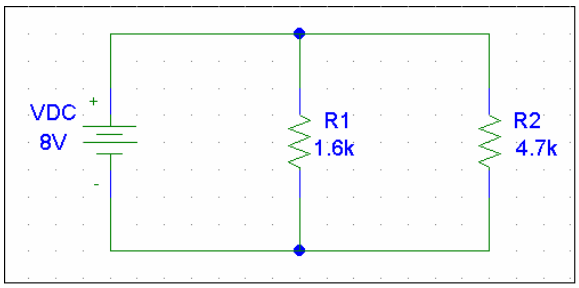
	R	V	I
R1			
R2			
R3			
Total			

3. Demonstrate two (2) random measurements of your circuit to the instructor. (4 pts)

Instructor's Initials: _____ Date: _____

PART III: The Current Divider (26 pts)

Given:



Current Divider Formulas

General formula: $I_x = \left(\frac{R_T}{R_x}\right) I_T$

or with only two resistors in parallel

$I_1 = \left(\frac{R_2}{R_1 + R_2}\right) I_T$ and $I_2 = \left(\frac{R_1}{R_1 + R_2}\right) I_T$

1. Calculate the I_{R1} and I_{R2} using the Current Divider formula. (10 pts) SHOW ALL WORK!

I_{R1} = _____ I_{R2} = _____

Calculate the following quantities: (3 pts)

P_{R1} = _____ P_{R2} = _____ P_T = _____

2. Construct the circuit and make the following measurements and REMEMBER to disconnect the power supply to measure the resistance: (4 pts)

	R	V	I
R1			
R2			
TOTAL			

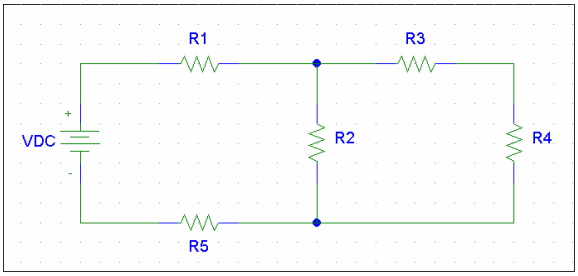
3. Demonstrate two (2) random measurements of your circuit to the instructor. (4 pts)

Instructor's Initials: _____ Date: _____

4. If an 8.2 kΩ resistor (**R3**) is added ***IN SERIES*** to R1 and R2, what are the values of V_{R1} and V_{R3} using the Voltage Divider formula? (5 pts)

Part IV: Design (25 pts)

Given:



Use Pspice to design a circuit that follows the given circuit topology that obeys the following constraints:

1. Vs cannot exceed 15V.
2. V_{R4} equals 4.4V. (8 pts)
3. I_{R4} is less than 5 mA. (2 pts)
4. NONE of the resistors may be the same value. (1 pt)
5. Resistors must be less than 6.2 kΩ and greater than 1 kΩ. (1 pt)
6. YOU CAN CHOOSE ANY RESISTOR BUT ALL RESISTORS MUST BE **AVAILABLE** IN THE LAB AND FOLLOW CONSTRAINT 5. (2 pts)
7. You MUST give ALL Power Ratings for each resistor using the 50% Design Rule.

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1. Give all of your values in the following table.

	R	V	I	P
R1				
R2				
R3				
R4				
R5				
	RT =	VDC =	IT =	PT =

2. What are the power ratings necessary for your resistors using the Fifty Percent Design Rule? (5 pts)

3. Simulate your circuit in Pspice, **print** the results and attach to your lab. (5 pts)

4. Do your results meet ALL of the constraints? Why? (1 pt)