

Department of Computer and Electronics Engineering Technology

CEET 1140

Lab 3

Title: Series Circuits.

Objective: The student will be able to construct and analyze a series circuit and use a multimeter to measure voltage, current and resistance in a series circuit. The student will also compute the power for each element and verify Kierchhoff's voltage law and the voltage divider rule.

Equipment: Power Supply
Digital Multimeter (2)
Proto Board

Parts: 1 47 Ω Resistor, $\frac{1}{4}$ watt
1 100 Ω Resistor, $\frac{1}{4}$ watt
1 160 Ω Resistor, $\frac{1}{4}$ watt

Preparation: Write the title and a short description of this lab in your lab book. Make sure the page is numbered and make an entry in the table of contents for this lab.

Measure the actual resistance of your resistors with an ohmmeter and record them in your lab book.

In your lab book, draw a schematic of a series circuit with all three resistors and a 12V DC voltage source. Use the measured resistances, not the resistance shown on the color bands.

Determine the current through the circuit, the voltage drop across all three resistors, and the power dissipated by each resistor analytically.

Using PSPICE or Multisim, simulate your circuit. Make sure to output the voltage across each resistor and the current through the circuit. Print the output of the simulation and affix it to your lab notebook.

Bring your lab notebook and the parts, above, to your lab period.

Set up: Construct your series circuit using the power supply as the 12V DC voltage source. Include an ammeter in your circuit to measure the

current (Note, the current should not exceed 50mA, so you can use the mA socket instead of the 10A socket to get more precision).

Procedure: Turn on the power and adjust the voltage to 12V with enough current that the CV LED is on. (Use a voltmeter accurate to 0.01V or better to set the voltage.). Measure the current in the circuit and record it in your lab book. Use a voltmeter to measure the voltage drop across each resistor and the power supply. Record these values in your lab book. Do they agree with your analytical solution and your simulation?

Carefully check the temperature of each resistor. Note which resistor is hottest and which is coolest to the touch. Does this agree with your power calculations?

According to Kirchhoff's voltage law, the sum of the voltage drops should equal the sum of voltage rises. Using the voltages you measured, verify that Kirchhoff's voltage law is true.

According to the voltage divider rule, the voltage across a resistor is proportional to the supply voltage according to the equation:

$$V_x = E \frac{R_x}{R_T}$$

Calculate R_x/R_T for each resistor and use it to predict the voltage drop across each resistor if the supply voltage is reduced to 8V. Adjust the power supply voltage to 8V and re-measure the voltage drops. Was your prediction accurate?

Cleanup: Turn off the power. Configure the multimeter(s) to be voltmeter(s).

Conclusions: In the conclusion section, write a short summary of what you did and what you learned. Make sure your conclusion answers the following question(s):

Were the values of voltage and current that you calculated exactly equal to the values you measured? If not, why might that be?

Is it necessary to compute the current through the circuit to use the voltage divider rule?