

ECET102/CPET101
Lab 7 Series/Parallel Circuit Lab
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Required Devices & Equipment:

Resistors: 1k, 2.2k, 3.3k

Objectives:

1. Find and measure the equivalent circuit of a Series-Parallel circuit.
2. Measure, calculate, and verify KVL for Series-Parallel Circuits
3. Measure, calculate, and verify KCL for Series-Parallel Circuits
4. Measure and calculate node voltages using single and double subscript notation.

General Information:

Series resistor rules, parallel resistor rules, Kirchoff's voltage and current laws, and power calculations that have been studied are all applicable to series-parallel circuits. The keys to series-parallel circuits is recognizing which elements are in series and which are in parallel and being able to redraw the circuit to find equivalent circuits.

Procedure:

Part 1: Calculating the Equivalent Circuit of a Series-Parallel Circuit

a. For the circuit of Figure 1, combine R1 and R2 in parallel and SEPARATELY combine R3, R4, and R5 in parallel. Write the equivalent resistances below:

$R_{eq1} (R1 || R2) =$ _____

$R_{eq2} (R3 || R4 || R5) =$ _____

b. The first equivalent circuit is shown in Figure 2. Write in the correct values for R_{eq1} and for R_{eq2} in Figure 2 next to the equivalent resistors.

c. The final equivalent circuit contains just one voltage source and one resistor. Draw the final equivalent circuit below.

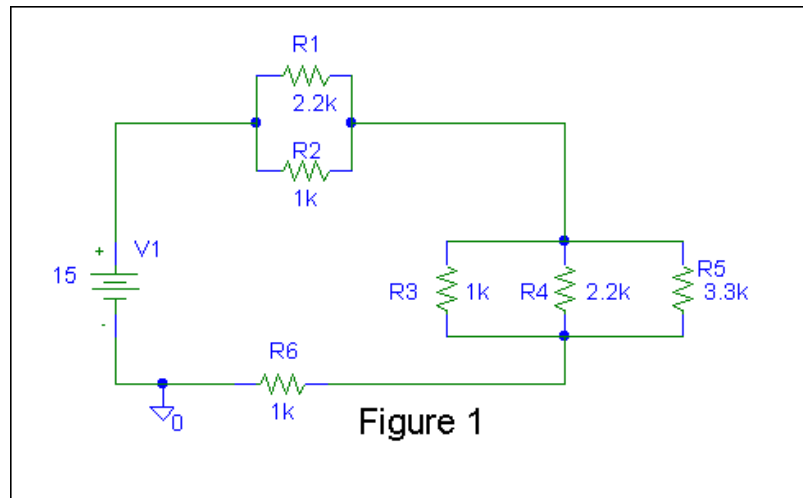


Figure 1

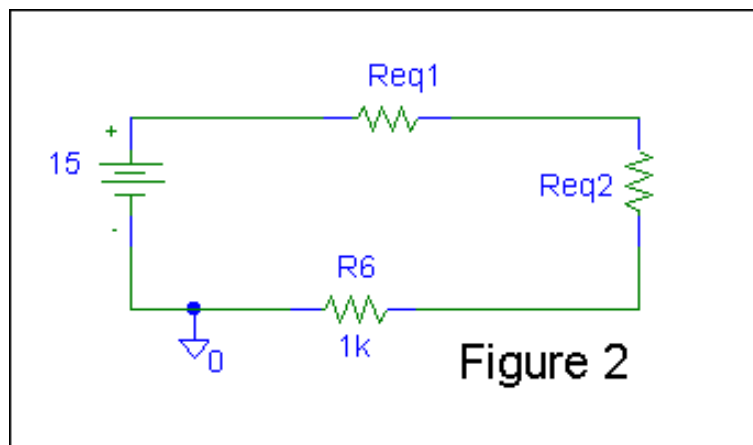


Figure 2

d. Find the total circuit current produced by the battery from the final equivalent circuit and write the value below:

$$(\text{calculated}) I_{\text{Battery}} = \underline{\hspace{2cm}}$$

e. Find the power produced by the battery and write the value below:

$$(\text{calculated}) P_{\text{Battery}} = \underline{\hspace{2cm}}$$

f. In Figure 1, find:

i. The voltage across and the current through R1 and write the values below

$$(\text{Calculated}) V_{R1} = \underline{\hspace{2cm}} \quad (\text{Calculated}) I_{R1} = \underline{\hspace{2cm}}$$

ii. The voltage across and the current through R4 and write the values below

$$(\text{Calculated}) V_{R4} = \underline{\hspace{2cm}} \quad (\text{Calculated}) I_{R4} = \underline{\hspace{2cm}}$$

Part 2: Circuit Measurements

a. Construct the circuit of Figure 1.

b. Measure the total circuit current produced by the battery and write the value below

$$(\text{Measured}) I_{\text{Battery}} = \underline{\hspace{2cm}}$$

Compare this with the calculated value in Part 1d. Explain the difference between the calculated and measured values below:

c. Find the power produced by the battery and write the value below:

$$(\text{Measured}) P_{\text{Battery}} = \underline{\hspace{2cm}}$$

Compare this with the calculated value in Part 1e. Explain the difference between the calculated and measured values below:

d. Find:

- i. The voltage across and the current through R1 and write the values below

(Measured) $V_{R1} =$ _____ (Measured) $I_{R1} =$ _____

Compare this with the calculated values in Part 1fi. Explain the difference between the calculated and measured values below:

- ii. The voltage across and the current through R4 and write the values below

(Measured) $V_{R4} =$ _____ (Measured) $I_{R4} =$ _____

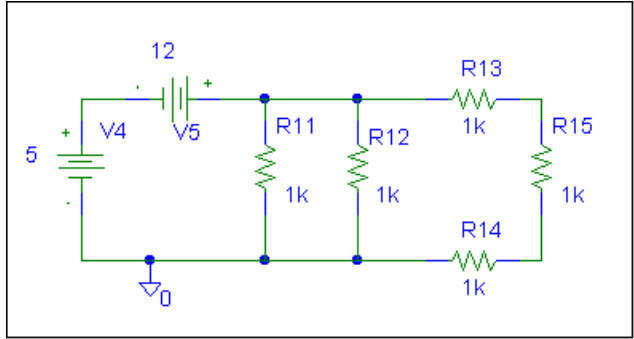
Compare this with the calculated value in Part 1fii. Explain the difference between the calculated and measured values below:

- e. Verify Kirchoff's Current Law by showing that the sum of the measured currents through R3, R4, and R5 equals the total circuit current. Show your work below.

- f. Verify Kirchoff's Voltage law by showing that: $V_{R2} + V_{R3} + V_{R6} = 15$ volts by measuring the three voltages. Show your work below.

Part 3: Problem

- a. For the circuit shown, Find:
- The equivalent circuit with one battery and one resistor and sketch the circuit below:



- The current through R15 and write the value below:

$$I_{R15} = \underline{\hspace{2cm}}$$

- The power produced by each battery and write the values below:

$$P_{V4} = \underline{\hspace{2cm}}$$

$$P_{V5} = \underline{\hspace{2cm}}$$

- The power dissipated in R11 and in R15 and write the values below:

$$P_{R11} = \underline{\hspace{2cm}}$$

$$P_{R15} = \underline{\hspace{2cm}}$$