

Experiment 5 Series-Parallel circuits

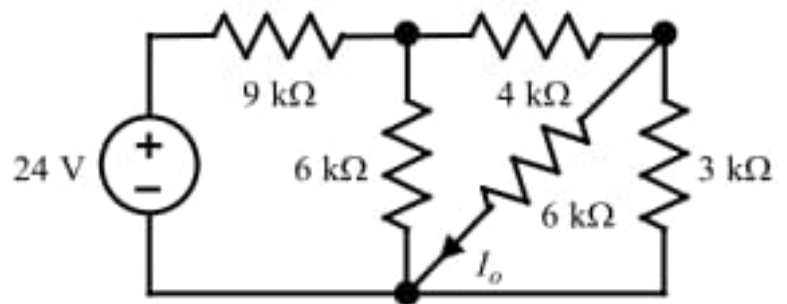
Name	Group	Grade
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Objectives:

1. To measure voltages and currents of series and parallel circuits and compare with calculated results.
2. To verify the notions of current and voltage division in series and parallel circuits.

Pre-Lab

Find I_0 in the circuit shown.

**Solution:****The experiment**

1. You are given four resistors. Measure the resistance of each resistor. The smallest resistor is labeled R_1 , the next resistor is R_2 and the largest is R_4 .

2. Consider the circuit of Figure 1 with $E = 10$ volts. Determine the theoretical voltages at points A, B, and C with respect to ground. Record these values in Table 1. Construct the circuit. Set the multimeter to read DC voltage and apply it to the circuit from point A to ground. Record this voltage in Table 1. Repeat the measurements at points B and C, determine the deviations, and record the values in Table 1.

$$\text{Deviation} = \frac{|V_{\text{calculated}} - V_{\text{measured}}|}{V_{\text{calculated}}} \times 100$$

3. Applying KCL to the parallel sub-network (made up of R_2 and R_3) the current entering node B (i.e., the current through R_1) should equal the sum of the currents flowing through R_2 and R_3 . These currents may be determined through Ohm's Law and/or the Current Divider Rule. Compute these currents and record them in Table 2. Using the multimeter as an ammeter, measure these three currents and record the values along with deviations in Table 2.

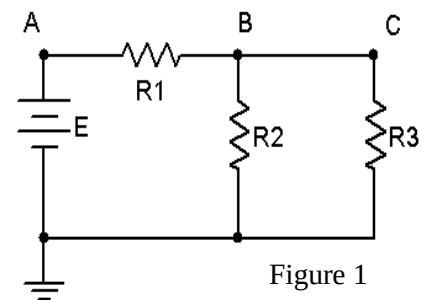


Table 1

Voltage	Theory	Measured	Deviation
V_A			
V_B			
V_C			

Table 2

Current	Theory	Measured	Deviation
R_1			
R_2			
R_3			

Calculations

- Consider the circuit of Figure 2. R_2 , R_3 and R_4 create a series sub-network. This sub-network is in parallel with R_1 . The voltages at nodes A, B and C should be identical. The same current flows through R_2 , R_3 and R_4 . The voltages across R_2 , R_3 and R_4 should sum up to the voltage at node C. Finally, the source current must equal the sum of the currents entering R_1 and R_2 .
- Build the circuit of Figure 2 with $E = 20$ volts. Using the series and parallel relations noted in Step 4, calculate the voltages at points B, C, D and E. Measure these values with the multimeter, determine the deviations, and record the values in Table 3.
- Calculate the currents leaving the source and flowing through R_1 and R_2 . Record these values in Table 3. Using the multimeter as an ammeter, measure those currents, compute the deviations, and record the results in Table 4.

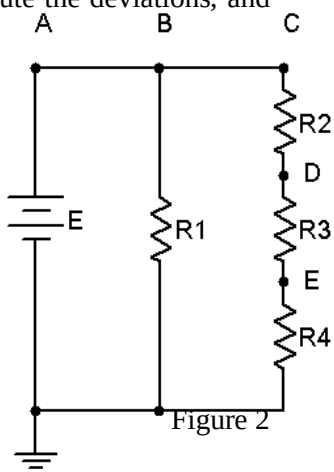


Table 3

Voltage	Theory	Measured	Deviation
V_B			
V_C			
V_D			
V_E			

Table 4

Current	Theory	Measured	Deviation
Source			
R_1			
R_2			

Conclusion

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