

Principles of EE I Laboratory

Lab 2

Kirchhoff's Current And Voltage Laws

Student A	Student B
Full name:	Full name:
Student number:	Student number:

I. Objectives

In this laboratory, you will investigate:

1. The relationship of Ohm's Law.
2. The Kirchhoff's Current Law (KCL).
3. The Kirchhoff's Voltage Law (KVL).
4. The "equivalent resistance" for both series and parallel circuits.

II. Procedure

****You must provide all calculations in-details in separate sheets OR simulation results as attachments.**

Student A	Student B
<p>A. Kirchhoff's Laws</p> <p>Using the adjustable <u>D.C. power supply</u> and <u>circuit bread board</u>, connect the <u>resistors into a two-node circuit</u> as shown below. Note that all four circuit elements are connected between those two nodes, and the source voltage V_s is across each of the three resistors. Let $R_1 = 8.2 \text{ k}\Omega$, $R_2 = 15 \text{ k}\Omega$, and $R_3 = 39 \text{ k}\Omega$.</p> <div data-bbox="248 1161 1292 1486"> </div> <p style="text-align: center;">Figure II-1</p>	
<p>1. Note the color code on each resistor and match it up with its nominal value.</p>	<p>1. Measure and record the actual value for each resistor. Fill the table below with nominal value versus the measured value. Are the measured values within the specified tolerance of the resistor values?</p>

2. Measure all four currents, (I_s , I_1 , I_2 , and I_3), in your actual <u>circuit with $V_s = 16$ V D.C.</u> Fill in the table below with nominal value versus the measured value. Are the measured values within the specified tolerance of the nominal values?	2. Calculate** and fill in the table below all four currents (I_s , I_1 , I_2 , and I_3), using the actual resistor values, with $V_s = 16$ V D.C.
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Table II-1

	Color code	Nominal Values	Actual Values
R_1			
R_2			
R_3			
	Calculated Values	Measured Values	% Differences
I_s			
I_1			
I_2			
I_3			

Use your measured current values to determine if KCL is verified. Make a chart to compare measured current values with calculated values. Include the % differences in this chart. Are the differences found using the nominal values for calculations within the tolerance limits of the resistors?

B. Using the adjustable D.C. power supply and the circuit bread board, connect the resistors into a circuit as shown in Figure II-2. Note that the three resistors are in series so that the same current (I_s) flows thru each resistor. Let $R_1 = 1.5$ k Ω , $R_2 = 820$ Ω , and $R_3 = 2.2$ k Ω . Student A and B do the calculations and measurements to fill in the Table II-2 below.

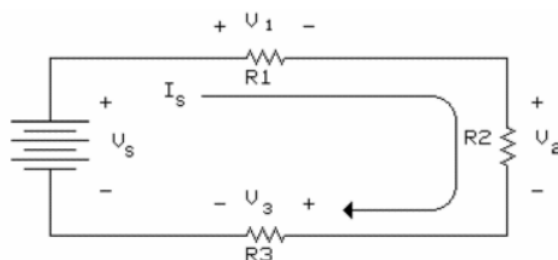


Figure II-2

Table II-2

	Color code	Nominal Values	Actual Values
R_1			
R_2			
R_3			
	Calculated Values	Measured Values	% Differences
I_s			
V_1			
V_2			
V_3			

Use your measured voltage values to determine if KVL is verified is verified. Make a chart to compare these calculated voltage values with the measured voltage values. Are all differences within the expected limits of accuracy?

C. Series-parallel circuit

Build the following circuit.

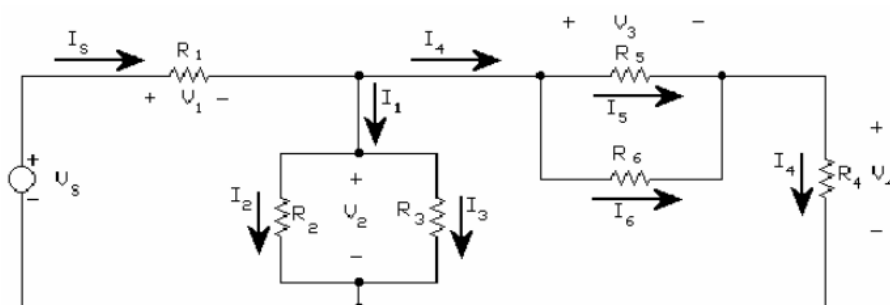


Figure II-3

Calculate**, measure and record all the currents and voltages in Circuit 3 setting $V_s = 20$ V DC.

Table II-3

	Color code	Nominal Values	Actual Values
R_1		1.2k Ω	
R_2		3.3k Ω	
R_3		3.3k Ω	
R_4		2.7k Ω	
R_5		5.6k Ω	
R_6		4.7k Ω	
	Calculated Values	Measured Values	% Differences
I_s			
V_1			
V_2			
V_3			
V_4			
I_1			
I_2			
I_3			
I_4			
I_5			
I_6			

Apply KVL or KCL. How closely do the voltages and currents add up to the values predicted? Were Kirchhoff's laws verified? A Comparison chart is required.

Build the following circuit.

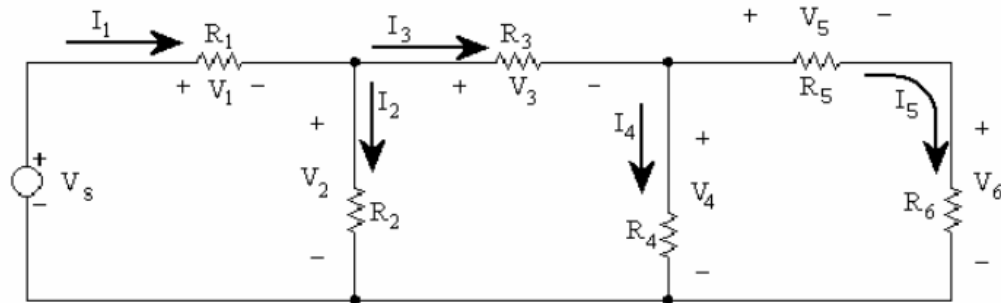


Figure II-4

Calculate**, measure and record all the currents and voltages in Circuit 4 setting $V_s = 20\text{ V DC}$

Table II-4

	Color code	Nominal Values	Actual Values
R_1		1.2k Ω	
R_2		5.6k Ω	
R_3		3.3k Ω	
R_4		4.7k Ω	
R_5		2.7k Ω	
R_6		1.2k Ω	
	Calculated Values	Measured Values	% Differences
V_1			
V_2			
V_3			
V_4			
V_5			
V_6			
I_1			
I_2			
I_3			
I_4			
I_5			

Apply KVL to each loop and KCL to each node. How closely do the voltages and currents add up to the values predicted? Were Kirchhoff's laws verified? Comparison charts are required.