

NAME _____

EET 1150 Lab 10 Superposition Principle

OBJECTIVE:

- To build and make measurements on circuits with more than one voltage source.
- To find out whether the superposition principle correctly predicts currents and voltages in such circuits.
- To find out whether Kirchhoff's laws apply to such circuits.

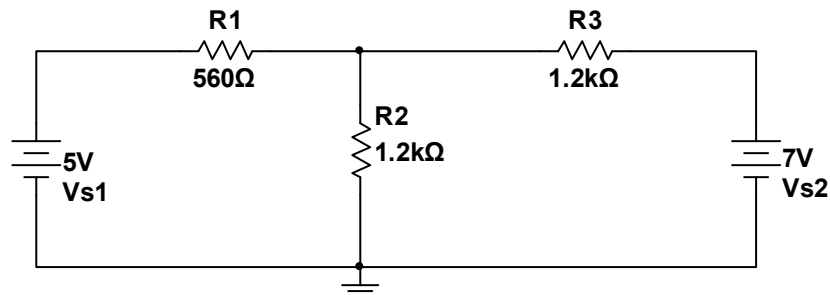
PROCEDURE:

1. Select the resistors shown in Table A. Measure and record their actual resistances.
Throughout this lab, round all predicted values, measured values, and percentage errors to three significant digits.

TABLE A: Resistor's Values

Resistor I.D.	Nominal Value	Actual Value
R ₁	560 Ω	
R ₂	1.2 k Ω	
R ₃	1.2 k Ω	

2. Use the superposition principle to calculate the quantities ($V_1, V_2, V_3, I_1, I_2, I_3$) for the circuit 1.



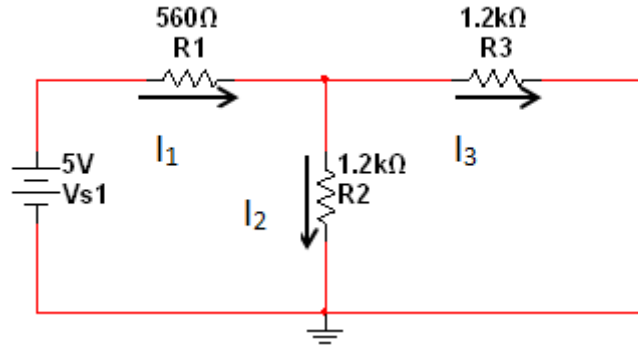
Circuit.1

3. After completing all measurements, answer the questions listed below.

Superposition theorem applied to voltages and currents levels

Determining the effect of V_{s1}

1. Construct the circuit shown below.



Circuit.2

2. Calculate ($I_{1s1}, I_{2s1}, I_{3s1}, V_{1s1}, V_{2s1}, V_{3s1}$) in circuit.2 . Measure ($I_{1s1}, I_{2s1}, I_{3s1}, V_{1s1}, V_{2s1}, V_{3s1}$) and record the results in Table B.

V_{1s1} : Voltage across R_1 caused by V_{s1}

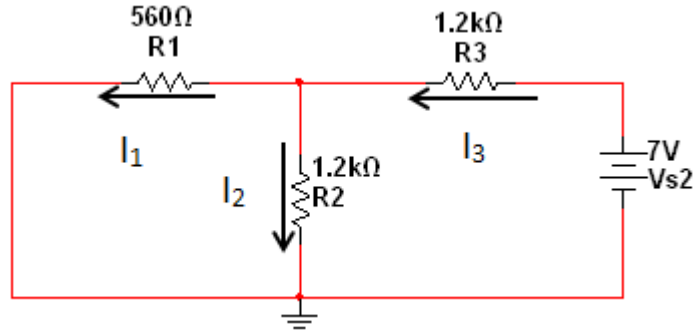
I_{1s1} : Current through R_1 caused by V_{s1}

TABLE B: Currents and Voltages in Circuit 2

Quantity	Calculated value	MultisimValue	Measured Value	DMM Range Used	% Error Col.(2&4)
I_{1s1}					
I_{2s1}					
I_{3s1}					
V_{1s1}					
V_{2s1}					
V_{3s1}					

Determining the effect of Vs2

1. Construct the circuit shown below.



Circuit.3

2. Calculate ($I_{1s2}, I_{2s2}, I_{3s2}, V_{1s2}, V_{2s2}, V_{3s2}$) in this circuit. Measure ($I_{1s2}, I_{2s2}, I_{3s2}, V_{1s2}, V_{2s2}, V_{3s2}$) and record the results in Table C.

V_{1s2} : Voltage across R₁ caused by Vs₂,

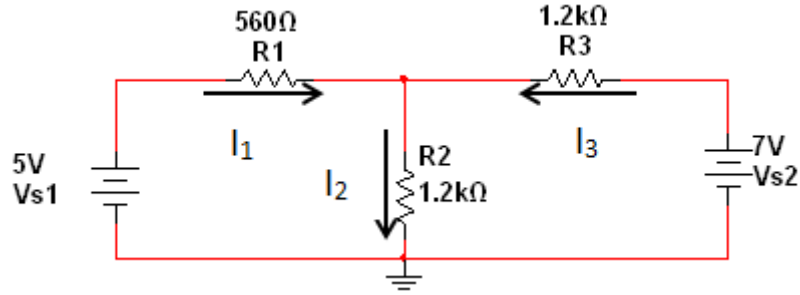
I_{1s2} : Current through R₁ caused by Vs₂

TABLE C: Currents and Voltages in Circuit 3

Quantity	Calculated value	MutisimValue	Measured Value	DMM Range Used	% Error Col.(2&4)
I_{1s2}					
I_{2s2}					
I_{3s2}					
V_{1s2}					
V_{2s2}					
V_{3s2}					

Determining the effect of V_{s1} and V_{s2}

1. In the circuit shown below.



Circuit.4

2. Measure the quantities ($I_1, I_2, I_3, V_1, V_2, V_3$) and record the results in column 3 in Table D.
3. By using the measured values of voltages and currents in Table B and C, calculates the voltages and currents and record the results in the fourth column in Table D.

TABLE D: Currents and Voltages in Circuit 4

Quantity	Multisim Value	Measured Value	Superposition Theorem's Value From Table B&C (use measured values)	% Error (columns 3&4)
I_1				
I_2				
I_3				
V_1				
V_2				
V_3				

QUESTIONS: (Type your answers on another sheet.)

1. Based on your data for Circuit 1, is **Kirchhoff's Voltage Law** satisfied in circuits having more than one voltage source? Explain, giving **one specific example** of how this law either is or is not satisfied in that circuit, using actual *measured* values, not predicted values. As part of your answer, show your calculation, and discuss the percentage error between your calculated and measured values.
2. Repeat Question 1 for **Kirchhoff's Current Law**.
3. From Table D, show that the superposition principle satisfied and give the reasonable values or not?

TECHNICAL CONCLUSION: Re-read the objectives at the beginning of this lab. For each objective, briefly state what you've learned from the lab. Include some discussion of how far off (percentage errors) your measured values were from your predicted values.