ET304A
Electric Circuits Laboratory
Lab 1
Kirchhoff's Voltage and Current Laws

PURPOSE: This laboratory demonstrates Kirchhoff's Voltage and Current Laws (KVL, KCL). Branch circuit analysis is introduced and used to solve for the theoretical values of voltage and current in simple electrical networks. Measurements from the circuits constructed in the lab are compared to the theoretical values. The sources of error between the theoretical and measured values are examined and computed.

PROCEDURE: See attached summary of the circuit analysis method used. This procedure includes a detailed example.

STEP 1: Construct the circuit shown in Figure 1. Note the tolerances of the resistors used to construct it for later use and record them in the attached table. All resistor values are given in ohms or kilo-ohms. Measure the voltages across all resistors and record them in the attached table.
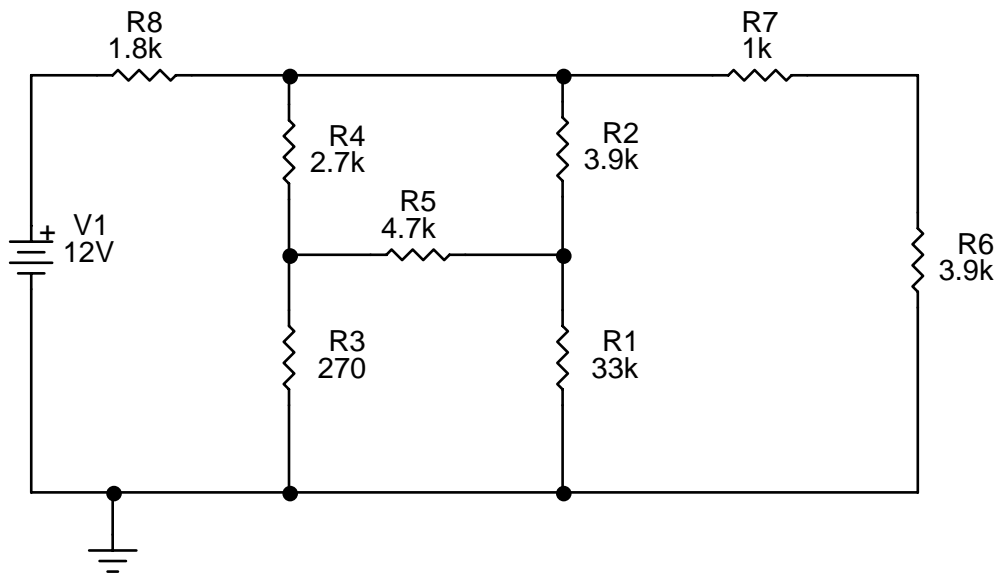

Figure 1. Circuit 1.

STEP 2: Compute the theoretical values of the resistor voltages using the technique shown in the attached handout. Record these values for future use in the lab report in the attached table.

STEP 3: Calculate the percent error between the voltages calculated and the measured values using the following formula:

$$\left[\frac{V_{measured} - V_{theoretical}}{V_{theoretical}} \right] \cdot 100\% = error .$$

Where: $V_{measured}$ = the measured value of circuit voltage,
          $V_{theoretical}$ = the calculated value of circuit voltage.

Record these values for use in the lab report.

STEP 4: Construct the circuit shown in Figure 2. Note the tolerance of the resistors used to construct the circuit and record them in the attached table. Measure all the voltages across the resistors and record them in the table provided.
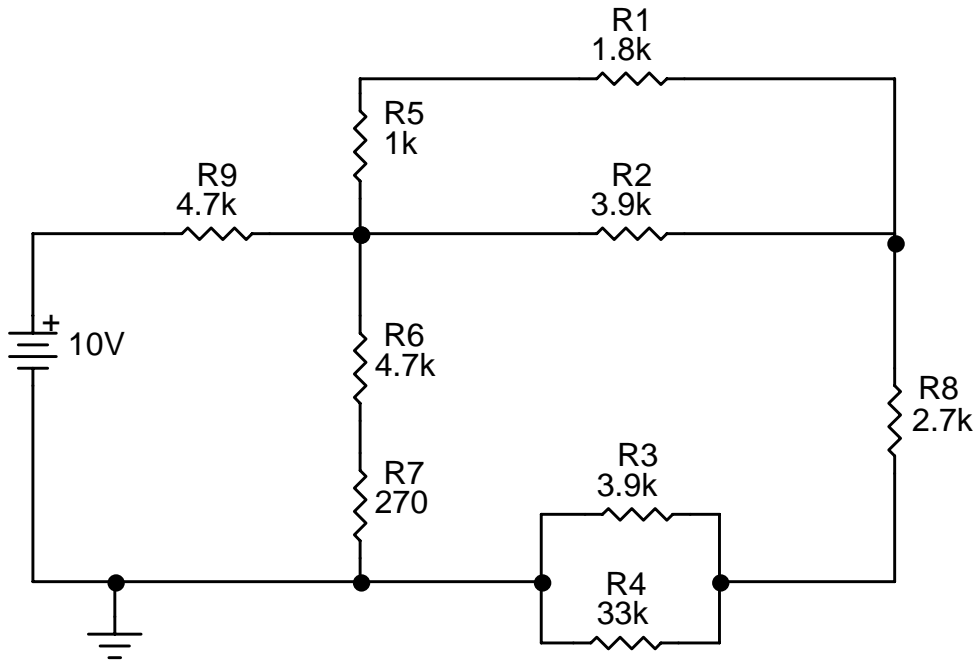

Figure 2. Circuit 2.

STEP 5: Use Ohm's law to calculate the current through each resistor using the **measured** value of resistor voltage and the **measured** value of resistance. Enter these currents into the data table provided.

STEP 6: Calculate the percentage error for each resistor voltage and record the values in the provided table.

What to Include in the Report

1.)   The calculations for the voltages in Circuit 1 should be included in an appendix. The calculations should be neat and orderly. These calculations should be done on Engineering paper or typing paper.

2.)   The table of data for Circuit 1 should be reproduced in the report and titled.

3.) The calculations for the voltages and currents in Circuit 2 should be included in an appendix. All the calculations should be neat and orderly. These calculations should be done on Engineering paper or typing paper.

4.) The data table for Circuit 2 should be reproduced in the report and titled.

5.) Analyze and comment on the percentage error between the computed and measured values for both the circuits. Consider the effects of resistor tolerance and meter accuracy in your discussion. Do all the theoretical values for voltages match the measured values within the expected error limits? If they do not, explain why.

6.) Solve for the values of V_x and I_y in Figure 3. Include the calculations in an appendix.
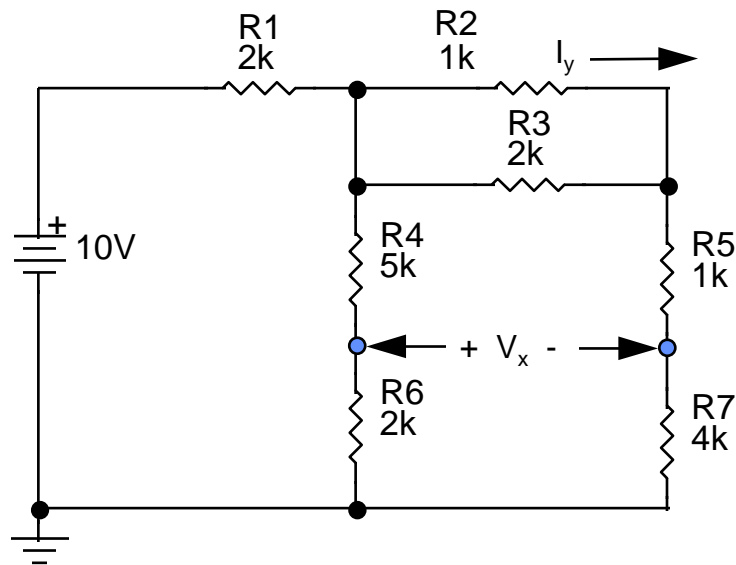

Figure 3. Circuit 3.

Lab 1

Data Tables

Figure 1 Data

Resistor	Resistor Value (Ohms)	Tolerance (%)	Measured Voltage (V)	Calculated Voltage (V)	Error (%)
R1					
R2					
R3					
R4					
R5					
R6					
R7					
R8					

Figure 2 Data

Resistor	Resistor Value (Ohms)	Tolerance (%)	Measured Voltage (V)	Calculated Resistor Currents	Calculated Voltage	Error (%)
R1						
R2						
R3						
R4						
R5						
R6						
R7						
R8						
R9						

Figure 2 Resistor Measurements

Resistor	Marked Value (ohms)	Measured Value (ohms)
R1		
R2		
R3		
R4		
R5		
R6		
R7		
R8		
R9		