Name_____ **Lab Section**_____ **Date**_____

INTRODUCTION:

In this lab Nodal Circuit Analysis will be applied to a complex circuit. The circuit shown in Figure 1 is a common textbook circuit with two voltage sources and resistor branches that are neither in series or parallel. The key concept of Nodal analysis is to write KCL equations for each unknown node of a network circuit.

PRELAB:

1. Use Nodal Circuit Analysis to solve for all voltages and currents in the circuit shown in Figure 6.1 using the following circuit parameters:

V_1=15V, V_2=5V, R_1=1kΩ, R_2=2kΩ, R_3=1MΩ, R_4=2kΩ, R_5=1kΩ, R_6=3.6kΩ, R_7=1kΩ, R_8=2kΩ

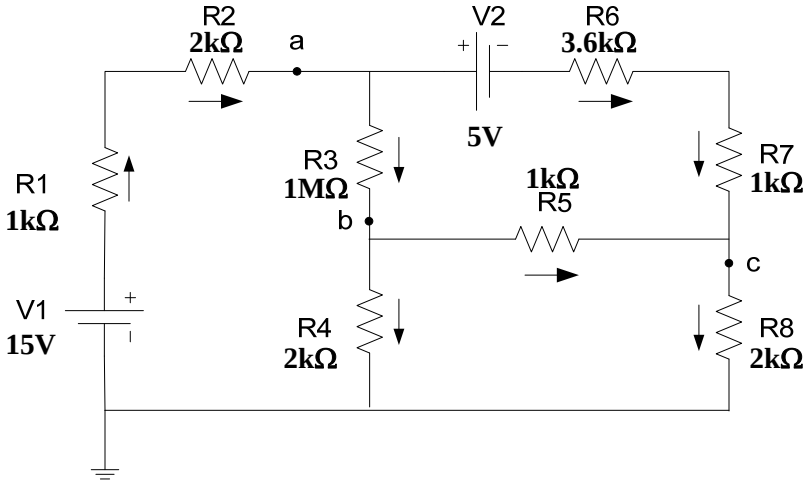

Figure 6.1: Network circuit.

2. Write Nodal equations at each labeled node in the space provided below.

Node **a** Equation: _____

Node **b** Equation: _____

Node **c** Equation: _____

3. Using your calculator, solve the equations and record your results below.

Va = _____ Vb = _____ Vc = _____

4. Use the node voltages to calculate the voltages across each resistor. Record the results in Table 6.1.

Table 6.1: Prelab Calculation of Voltages and Current of each Resistor

	R1 1 kΩ	**R2** 2 kΩ	**R3** 1 MΩ	**R4** 2 kΩ	**R5** 1 kΩ	**R6** 3.6 kΩ	**R7** 1 kΩ	**R8** 2 kΩ
$\mathbf{V_{Rn}}$								

5. Prior to lab, use PSpice to simulate the circuit and determine the currents and voltages across each resistor. Print the schematic and record the results in Table 6.2.

Table 6.2: Prelab PSpice Voltages and Current of each Resistor

	R1 1 kΩ	**R2** 2 kΩ	**R3** 1 MΩ	**R4** 2 kΩ	**R5** 1 kΩ	**R6** 3.6 kΩ	**R7** 1 kΩ	**R8** 2 kΩ
$\mathbf{V_{Rn}}$								
$\mathbf{I_{Rn}}$								

PROCEDURE:

1. Use a multimeter and measure all resistors values. Record the results in Table 6.3

2. Construct on a protoboard the circuit shown in Figure 6.1. Two "floating" voltage sources will be needed. One source will be set to 15.0V and the other to 5.0V.

3. Using a multimeter, measure the source voltages V_1 and V_2, the node voltages, and the voltages across each resistor. Record the results in Tables 6.4 and 6.5.

Once the measurements are complete, **turn off both power supplies**. Check your data with the prelab work before moving to the next step.

4. Move the red banana lead at the positive binding post of voltage source V_1 to the supply's binding post with the black banana lead. Doing so will create a short in the circuit at the V_1 power supply.

Turn on supply V_2. Repeat all of the measurements and record the results in Tables 6.6 and 6.7.

Once the measurements are complete, **turn off both power supplies**.

5. Restore the leads of voltage source V_1 to normal operation, and then move red banana lead at the positive binding post of voltage source V_2 to the supply's binding post with the black banana lead as was done in the last step.

Turn on supply V_1. Repeat all of the measurements and record the results in Tables 6.8 and 6.9.

Once the measurements are complete, turn off both power supplies. Have your instructor look at your measured data before disconnecting the circuit.

RESULTS:

1. In another table, add the measured data in Tables 6.6 and 6.8 together. Add the data of Tables 6.7 and 6.9 together. Tabulate the results. Compare the measured data of Tables 6.4 and 6.5 to the newly-tabulated summed data. Comment on any error and explain the relationship.

Name: _____ **Lab Section:** _____ **Date:** _____

MEASURED DATA:

Table 3: Measured Resistor Values

	R_1 1 kΩ	R_2 2 kΩ	R_3 1 MΩ	R_4 2 kΩ	R_5 1 kΩ	R_6 3.6 kΩ	R_7 1 kΩ	R_8 2 kΩ
Resistance								
Measured								

Table 4: Measured Resistor Voltages

	R_1 1 kΩ	R_2 2 kΩ	R_3 1 MΩ	R_4 2 kΩ	R_5 1 kΩ	R_6 3.6 kΩ	R_7 1 kΩ	R_8 2 kΩ
V_{Rn}								

Table 5: Measured Node Voltages

Va	Vb	Vc

Table 6: V1 Off (shorted), V2 On, Measured Resistor Voltages

	R_1 1 kΩ	R_2 2 kΩ	R_3 1 MΩ	R_4 2 kΩ	R_5 1 kΩ	R_6 3.6 kΩ	R_7 1 kΩ	R_8 2 kΩ
V_{Rn}								

Table 7: V1 Off (shorted), V2 On, Measured Node Voltages

Va	Vb	Vc

Table 8: V1 On , V2 Off (shorted), Measured Resistor Voltages

	R_1 1 kΩ	R_2 2 kΩ	R_3 1 MΩ	R_4 2 kΩ	R_5 1 kΩ	R_6 3.6 kΩ	R_7 1 kΩ	R_8 2 kΩ
V_{Rn}								

Table 9: V1 On, V2 Off (shorted), Measured Node Voltages

Va	Vb	Vc

Approved by: _____ **Date:** _____