Name_____ Lab Section_____ Date_____

INTRODUCTION:

This laboratory reinforces Ohm's Law and the Reduce and Return approach to circuit analysis of series-parallel circuits. Students will begin by analyzing a theoretical circuit in order to determine the voltage across each resistor and the current flowing through each resistor in the circuit as a "prelab" assignment. The students will then construct the circuit in the laboratory and take measurements in order to determine the resistor voltages and currents. The Agilent 34401A bench-top DMM will be used to take the voltage and current measurements.

PRELAB:

1. Use the Reduce and Return circuit analysis approach to solve for all voltages and currents in the ladder circuit of Figure 4.1 using the following circuit parameters:

Vs = 10V, R_1 = 1kΩ, R_2 = 1 MΩ, R_3 = 10 kΩ, R_4 = 100 Ω, R_5 = 1 kΩ, R_6 = 3.6 kΩ, R_7 = 2 kΩ

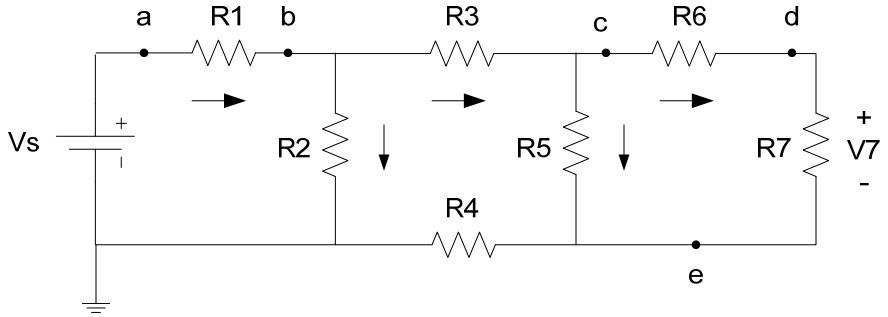

Figure 4.1 – Series-Parallel Ladder circuit

2. Record the calculated values in the Table 4.1.

Vs=10V	**R_1**=1 kΩ	**R_2**=1 MΩ	**R_3**=10 kΩ	**R_4**=100 Ω	**R_5**=1 kΩ	**R_6**=3.6 kΩ	**R_7**=2 kΩ
V_{Rn}							
I_{Rn}							

Table 4.1 –Calculated Voltages and Currents

Notes – You must complete your prelab calculations on blank paper, which will then be scanned and attached to the back of your lab report as Appendix A. The handwritten calculations must be neat and well-organized. Additionally, you must accurately redraw and completed label the simplified circuit each time you reduce the original circuit during you Reduce and Return analysis.

PROCEDURE:

1. Construct the ladder circuit shown in Figure 4.1 on a proto-board and set the source voltage to Vs=10V_{DC}. (Note – current-limit the supply to 50mA).

2. Using the Agilent 34401A bench-top multimeter, measure the source voltage Vs and then measure the voltages across each resistor followed by the current through each resistor. Record the measured values in Table 4.2.

   Note – When measuring current, remember to move the lead to the "Amp" terminal on the meter and that you have to break the circuit for each measurement.

3. Place a wire connecting node **b** to node **e**. Repeat the measurements described in Step 2 and record the data in Table 4.3.

4. Have your instructor check your results before disassembling your circuit.

DATA:

Vs=10V	**R1**=1 kΩ	**R2**=1 MΩ	**R3**=10 kΩ	**R4**=100 Ω	**R5**=1 kΩ	**R6**=3.6 kΩ	**R7**=2 kΩ
V_{Rn}							
I_{Rn}							

Table 4.2: Measured Voltages and Currents

Vs=10V	**R1**=1 kΩ	**R2**=1 MΩ	**R3**=10 kΩ	**R4**=100 Ω	**R5**=1 kΩ	**R6**=3.6 kΩ	**R7**=2 kΩ
V_{Rn}							
I_{Rn}							

Table 4.3: Measured Voltages and Currents with "Short" Across Nodes b and e

Approved by: _____ **Date:** _____

REPORT GUIDE:

1. Calculate the relative difference (%) between the nominal (prelab calculated) voltages and currents in the original circuit and those measured in the lab. Tabulate the results.

2. Discuss the overall effects that resistors R2 and R4 have on the operation of the circuit.

3. Draw the equivalent circuit when the wire was placed connecting nodes **b** to **e** and calculate the all the voltages and currents. Tabulate the results and compare the calculated values to the measured values recorded in Table 4.3.

You are required to submit an "Informal Report" for this experiment. Your instructor will discuss the details of this assignment at the end of the lab experiment.