LAMAR UNIVERSITY
CIRCUITS LABORATORY

EXPERIMENT 2:

Voltage and Current Division

Objective:

Verify the voltage and current division properties.

Equipment:

- NI – ELVIS board
- Assorted Resistors (1 KΩ, 2.4 KΩ, 5.6 KΩ and 1.2 KΩ)

Theory:

Voltage and Current division allow us to simplify the task of analyzing a circuit.

Voltage Division allows us to calculate what fraction of the total voltage across a series string of resistors is dropped across any one resistor.

For the circuit of Figure 1, Voltage Division formulas are:

$$V_1 = \frac{R_1}{R_1 + R_2} V_S \tag{1}$$

$$V_2 = \frac{R_2}{R_1 + R_2} V_S \tag{2}$$

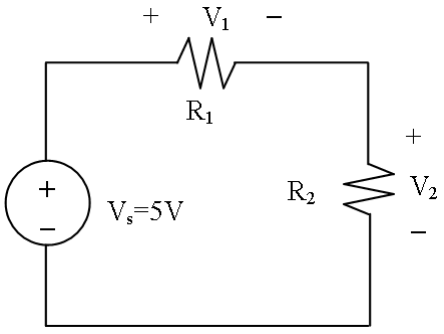


Figure 1. Voltage Divider

Current Division allows us to calculate what fraction of the total current into a parallel string of resistors flows through any one of the resistors.

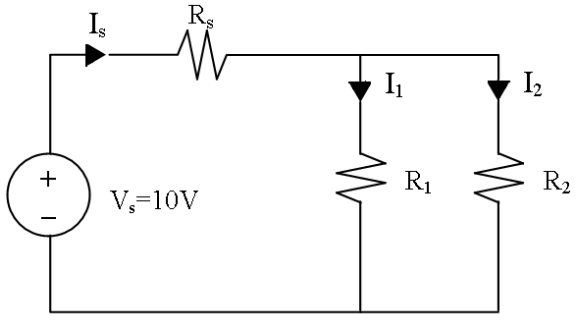


Figure 2. Current Divider

For the circuit of Figure 2, Current Division formulas are:

$$I_1 = \frac{R_2}{R_1 + R_2} I_S \tag{3}$$

$$I_2 = \frac{R_1}{R_1 + R_2} I_S \tag{4}$$

Procedure:

1. Verifying the voltage division:

   a) Construct the circuit as shown in Figure 1. Measure the voltages v_1 and v_2 by choosing R_1 = 5.6 KΩ, R_2 = 1.2 KΩ and setting the variable power supply voltage V_s = 5V. Repeat this step for $R_1 = R_2 = 5.6$ KΩ and note down the measurements.

   b) Calculate the voltages V_1 and V_2 by using the formulas (1) and (2) in each case.

   c) Compare the results from steps 1a and 1b.

2. Verifying the current division:

   a) Construct the circuit as shown in figure 2. Measure the currents I_s, I_1 and I_2 by choosing $R_1 = 2.4$ KΩ, $R_2 = 5.6$ KΩ and R_s=1 KΩ . Set the variable power supply voltage at V_s=10 V. Repeat this step by using R_1=R_2 =2.4 KΩ and note down the measurements.

   b) Calculate the currents I_1 and I_2 by using the formulas (3) and (4).

c) Compare the results from steps 2a and 2b.

Questions for Lab Report:

1. How well did the measured outputs and calculated outputs compare? Explain any difference.

2. Can you apply current division to obtain I_1 and I_2 for the circuit shown in the figure below? Explain briefly.

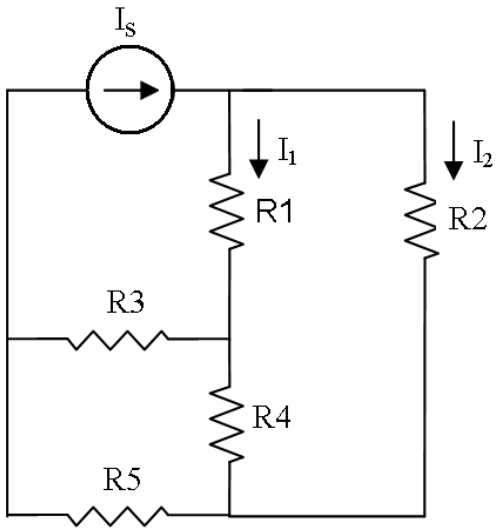
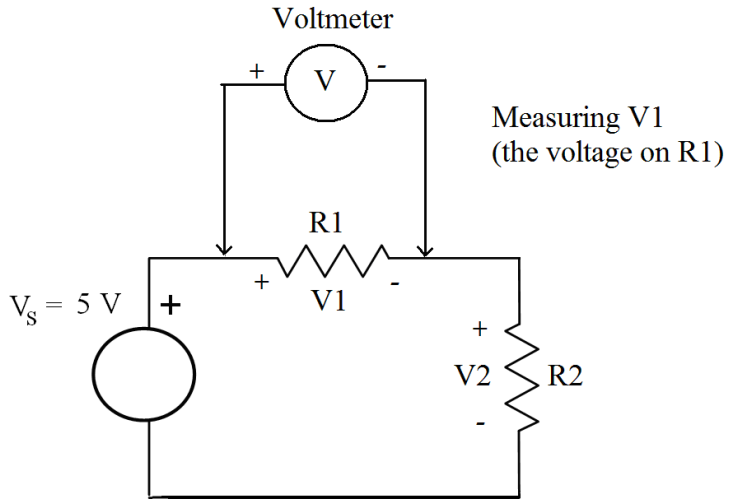
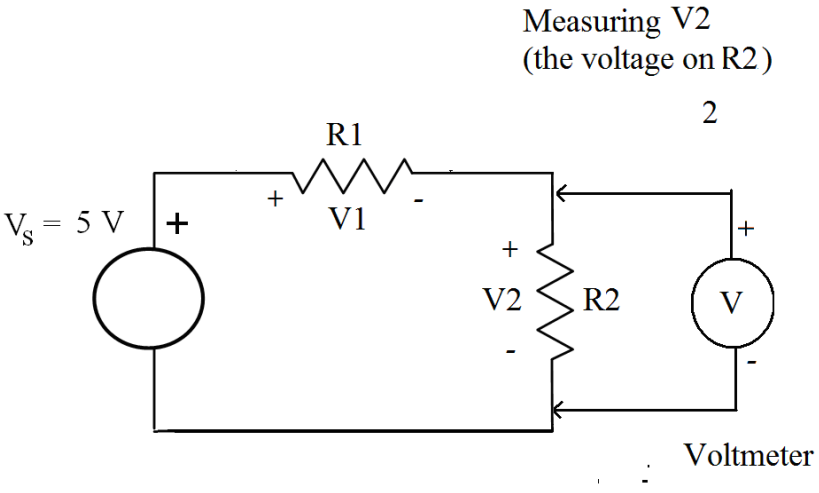


Figure 3.

SOME EXAMPLES

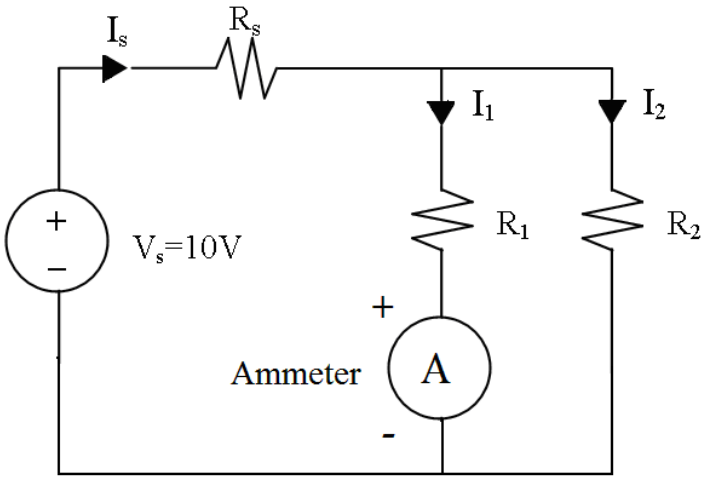
VOLTAGE MEASUREMENT DETAILS OF FIG.1





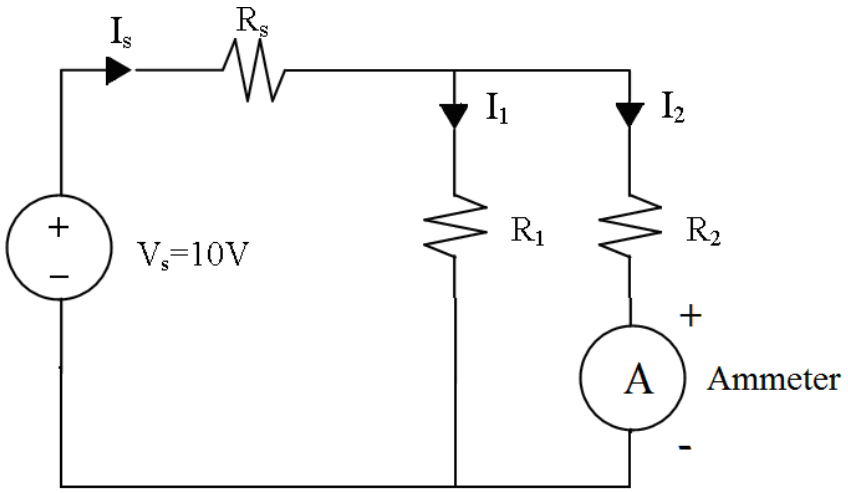
CURRENT MEASUREMENT DETAILS ON FIG.2

Measuring I_1 (the current thru R1) using an Ammeter
(Digital Multimeter running in Ammeter Position)



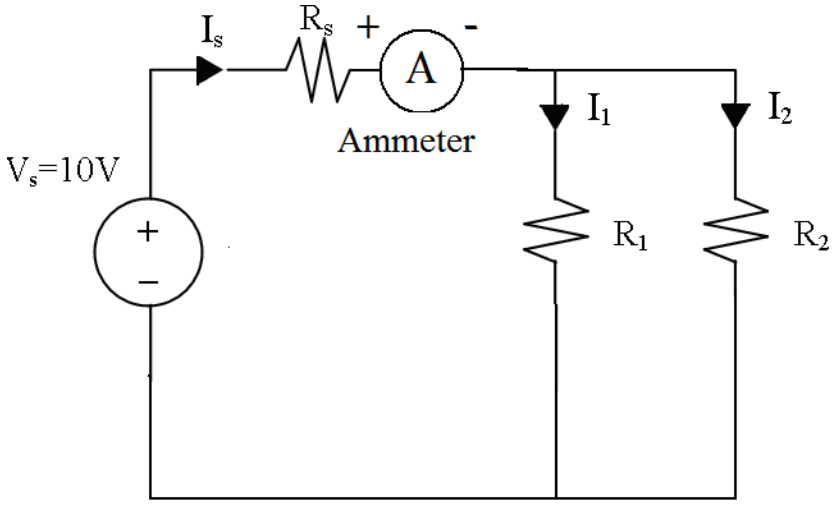
Note: The ammeter above can also be placed before the resistor R1

Measuring I_2 (the current thru R1) using an Ammeter



Note: The ammeter above can also be placed before the resistor R2

Measuring the total current I_S (or the supply current)



Note: The following is another alternative when measuring I_S