

LAB 1: Measurements & Theorems

OBJECTIVE:

The objectives of this lab are

- To learn how to use equipment such as a) power supply, b) multi-meter, c) function generator, and d) oscilloscope
- To learn how to construct circuits using breadboard.
- To learn how to measure resistance, voltage and current using multi-meter.
- To verify the results using the constructed circuit in the lab.

PRELAB

1. Find the voltage V_{out} in Fig. L1.1, where $R_1 = 4.7\text{ K}\Omega$, $R_2 = 6.8\text{ K}\Omega$. If a load with resistance of $5.6\text{ K}\Omega$ is attached to the output terminal, what is the voltage of V_{out} ?
2. Find the voltage across each resistor (V_{RX}) and the current in each resistor (I_{RX}) in Fig L1.2. Assume the following values for the resistors: $R_1 = 1\text{ K}\Omega$, $R_2 = 4.7\text{ K}\Omega$, $R_3 = 10\text{ K}\Omega$, $R_4 = 4.7\text{ K}\Omega$, $R_5 = 1\text{ K}\Omega$, $V_1 = 5\text{ V}$, $V_2 = 7\text{ V}$.

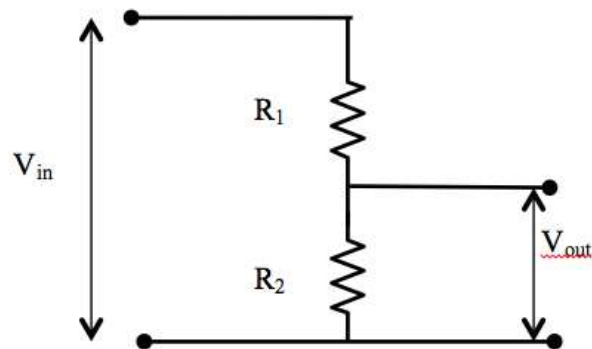


Fig.L1.1 Voltage Divider

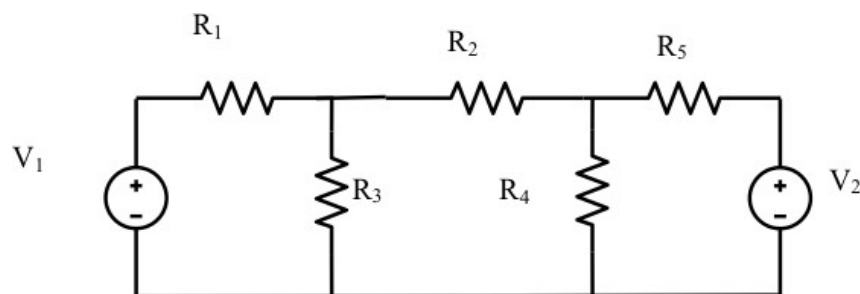


Fig. L1.2 Series parallel circuit

LAB**Part I: Voltage Dividers**

In this part, you will construct a voltage divider based on Fig. L1.1 and measure the output voltage V_{out} . Please follow the steps below.

1. Choose two resistors $R_1 = 4.7\text{ K}\Omega$, $R_2 = 6.8\text{ K}\Omega$. Measure the actual values of R_1 and R_2 , and record the values.
2. Calculate V_{out} using the measured resistances instead of the nominal values.
3. Connect the resistors and voltage source as shown in Fig.L1.1.
4. Set V_{in} to 10V. Measure V_{out} and record it. What is the ratio of V_{out}/V_{in} ?
5. Is the measured V_{out} the same as you calculated in Step 2? If not, why?
6. Is the measured V_{out} the same as you calculated in prelab? If not, why?
7. Choose a resistor $R_L = 5.6\text{ K}\Omega$, measure and record its value. Calculate the V_{out} based on measured R_L .
8. Load the output with the R_L . Is the measured V_{out} the same as you calculated in Step 7? If not, why? Is the measured V_{out} the same as you calculated in prelab? If not, why? (In your report, discuss the effect of load.)

Part II: DC Measurements

In this part, you will construct a circuit based on Fig. L1.2 and measure the output voltage V_{out} . Please follow the steps below.

1. Choose resistors: $R_1 = 1\text{ K}\Omega$, $R_2 = 4.7\text{ K}\Omega$, $R_3 = 10\text{ K}\Omega$, $R_4 = 4.7\text{ K}\Omega$, $R_5 = 1\text{ K}\Omega$. Measure their values and record them.
2. Construct the circuit in Fig. L1.2 using a breadboard.
3. Set V_1 to 5 V (always measure it with a voltmeter, do not depend on the displayed value). Set V_2 to 7V.
4. Measure the voltages across the resistors. Show the values you measured in a table like the following. Comments on the measured and calculated results.

	Prelab	Measured
VR1		
VR2		
VR3		
VR4		
VR5		

5. Measure the currents flowing through R_3 and R_4 by inserting multi-meter as shown in Fig. L1.3. Comments on the measured and calculated results.

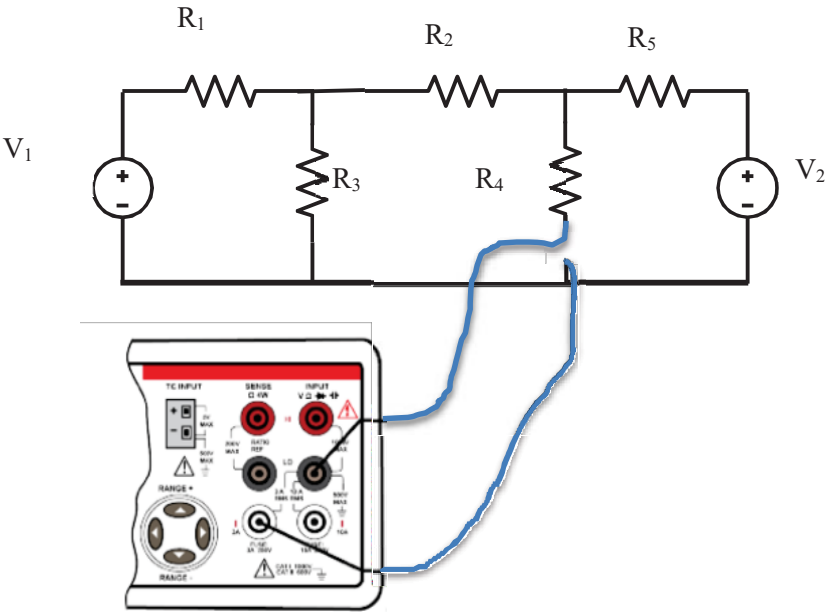


Fig. L1.3 Current measurement