**ENGR 212 Laboratory Experiment 2**

**Group Lab Report**

**Objectives:**

1. Build and test a voltage divider circuit.
2. Investigate the effects of loading on the voltage divider circuit.
3. Characterize the current-voltage relationships of an LED.

**Materials**:

1. One breadboard
2. One Agilent 34410A or 34401A digital multi-meter (DMM)
3. Resistors (100 Ω, 1 kΩ, 2.2 kΩ, 3.9 kΩ, 4.7 kΩ, 10 kΩ, 20 kΩ, 33 kΩ, 100 kΩ), LED, cables.

**Construction of a Voltage Divider Circuit**:

1. We will build the circuit diagram shown in Figure 1(a).

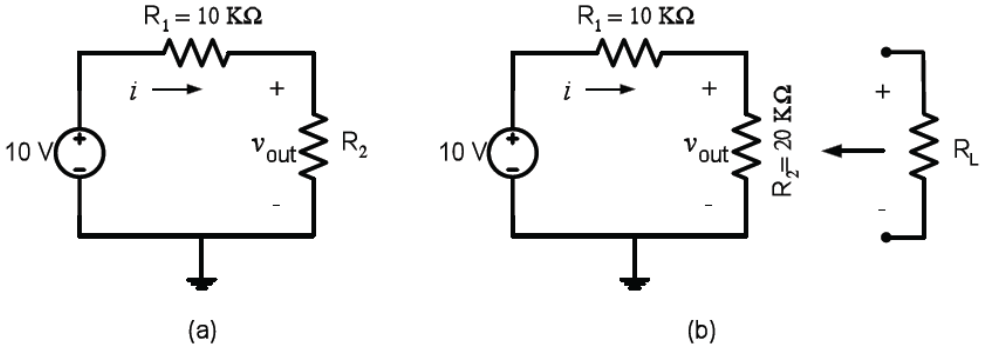


Figure 1

2. Calculate $v_{out}$, $i$, and $P_{R_2}$ when $R_2$ is 2.2 kΩ, 4.7 kΩ, 10 kΩ, 20 kΩ, and 33 kΩ.
3. Construct the circuit in Figure 1(a) with the $R_2$ provided in step 2. Measure $v_{out}$ and $i$ using the DMMs as shown in Fig. 2; and then calculate $P_{R_2}$. Repeat for all $R_2$ values.
4. Tabulate your results from steps 2 (in the Calculation column) & 3 (in the Reading column) in the format shown in Table 1 for comparison.

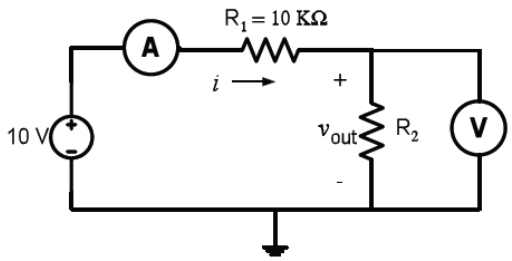


Fig. 2

Table 1

| $R_2$ | $v_{out}$ | | | $i$ | | | $P_{R_2}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | Calculation | Reading | Error (%) | Calculation | Reading | Error (%) | Calculation | Reading | Error (%) |
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Error = (Calculation - Reading) / Calculation * 100%

**A Simple LED Circuit**:

In this part of the experiment we will experiment with a light emitting diode (LED). Construct the circuit shown in Figure 3. The longer leg of the LED represents a positive terminal. Be sure to connect the LED such that it is forward biased.

*Measurements & Questions*:

a. Set the resistor $R_1$ in Figure 3 to 0 Ω.
b. Change the dc voltage from 1 to 5 volts with an increment of 1 volt. If you connected the circuit correctly, your LED should gradually turn on, ending with a bright red light.
c. Measure and record the voltage across the LED and the current flowing through it using your multimeters for each value of voltage.
d. Change $R_1$ to 100 Ω, 1 kΩ, and 100 kΩ. With each setting of $R_1$, repeat step b and c.
e. Plot the measured current through the LED versus the measured voltage drop across the LED for a given value of $R_1$.
f. Estimate the turn-on voltage of the LED. (This will be the voltage at which the current is no longer zero.)

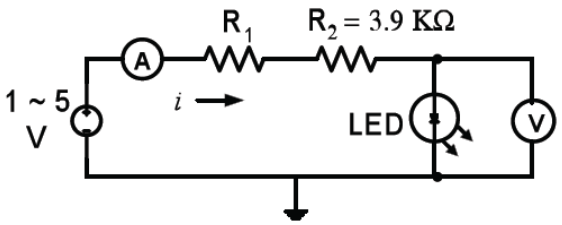

Fig. 3