Laboratory Application Assignment

In this lab application assignment you will examine the characteristics of a simple parallel circuit. You will also calculate and measure the equivalent resistance, R_{EQ}, of parallel connected resistors.

Equipment: Obtain the following items from your instructor.

- Variable DC power supply
- Assortment of carbon-film resistors
- DMM

Parallel Circuit Characteristics

Examine the parallel circuit in Fig. 5–40. Calculate and record the following values:

I_1 = ______, I_2 = ______, I_3 = ______, I_T = ______, R_{EQ} = ______

Construct the parallel circuit in Fig. 5–40. Measure and record the following values. (Note that the power supply connections must be removed to measure R_{EQ}.)

Figure 5–40

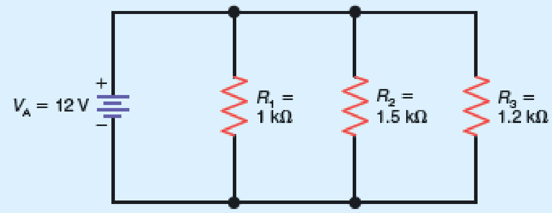
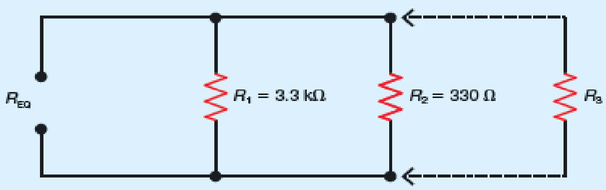


Figure 5–41



I_1 = ______, I_2 = ______, I_3 = ______, I_T = ______, R_{EQ} = ______

How does the ratio I_1/I_2 compare to the ratio R_2/R_1? ______

What is unique about comparing these ratios? ______

Add the measured branch currents I_1, I_2, and I_3. Record your answer. ______

How does this value compare to the measured value of I_T? ______

______

Does the sum of these individual branch currents satisfy KCL? ______

______

In Fig. 5–40, which branch resistance dissipates the most power?

______

Which branch resistance dissipates the least amount of power?

______

Parallel Circuit Analysis

In Fig. 5–40, add another 1.2 kΩ resistor, R_4, to the right of resistor R_3. Measure and record the total current, I_T. I_T = ______ Next, calculate the equivalent resistance, R_{EQ}, using the equation $R_{EQ} = V_A/I_T$. R_{EQ} = ______ Did the value of R_{EQ} increase or decrease from its original value? ______ Explain why. ______

______

Now remove both R_3 and R_4 from the circuit. Measure and record the total current, I_T. Recalculate the equivalent resistance, R_{EQ} as V_A/I_T. R_{EQ} = ______ Did R_{EQ} increase or decrease from its original value? ______ Explain why. ______

______

______

Connect a 3.3 kΩ resistor, R_1, and a 330 Ω resistor, R_2, in parallel as shown in Fig. 5-41. Calculate and record the equivalent resistance, R_{EQ}, using equation 5-4 (product over the sum). R_{EQ} = ______ Using a digital multimeter (DMM), measure and record the value of R_{EQ}. R_{EQ} = ______

Connect another 150 Ω resistor, R_3, in parallel with R_1 and R_2 in Fig. 5–41. Calculate and record the equivalent resistance, R_{EQ}, using equation 5-3 (the reciprocal formula). R_{EQ} = ______ Using a DMM, measure and record the value of R_{EQ}. R_{EQ} = ______

Connect four 1 kΩ resistors in parallel as shown Fig. 5–42. Calculate and record the equivalent resistance, R_{EQ}. R_{EQ} = ______ Using a DMM, measure and record the value of R_{EQ}. R_{EQ} = ______

When calculating the value of R_{EQ} for equal resistances in parallel, which formula is the easiest to use? ______

Examine the circuit in Fig. 5–43. Determine what value of resistance, R_X, in parallel with a 1.2 kΩ R will provide an R_{EQ} of 720 Ω. (Use equation 5-5) R_X = ______ Connect your calculated value of R_X across the 1.2 kΩ R in Fig. 5-43. Using a DMM, measure and record the value of R_{EQ}. R_{EQ} = ______

Connect a 1 kΩ resistor, R_1, and a 10 Ω resistor, R_2, in parallel as in Fig. 5–44. Measure and record the value of R_{EQ}. R_{EQ} = ______ Remove the 10 Ω R_2 from the circuit and replace it with a 100 kΩ resistor. Re-measure R_{EQ}. R_{EQ} = ______. Explain the significance of the measurements in Fig. 5–44. ______

______

______

Figure 5–42

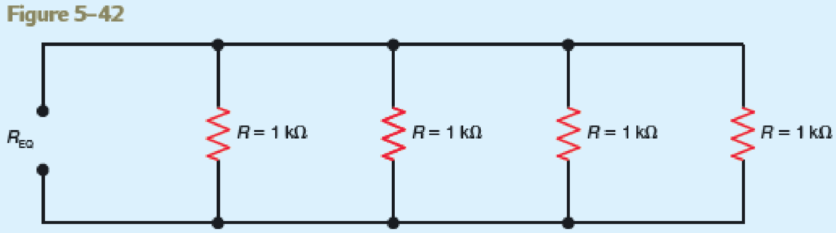


Figure 5–43

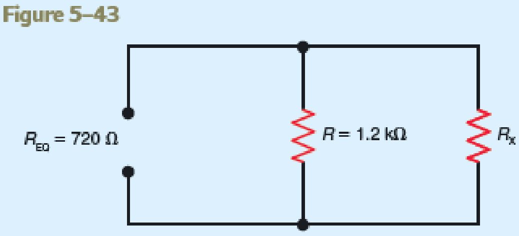


Figure 5–44