18. In Fig. 6–17, assume that the standard resistor, R_S, has been adjusted so that the current in M_1 is exactly 0 μA. How much voltage exists at terminal C with respect to terminal B?
    a. 1.1 V.
    b. 0 V.
    c. 10.9 V.
    d. none of the above.

19. In Fig. 6–17, assume that the ratio arm resistors, R_1 and R_2, are interchanged. What is the value of the unknown resistor, R_x, if R_S equals 33,950 Ω when the bridge is balanced?
    a. 339.5 kΩ.
    b. 3.395 kΩ.
    c. 33,950 Ω.
    d. none of the above.

20. In Fig. 6–17, assume that the standard resistor, R_S, cannot be adjusted high enough to provide a balanced condition. What modification must be made to the circuit?
    a. Change the ratio arm fraction R_1/R_2 from 1/10 to 1/100 or something less.
    b. Change the ratio arm fraction, R_1/R_2 from 1/10 to 1/1, 10/1 or something greater.
    c. Reverse the polarity of the applied voltage, V_T.
    d. None of the above.

Essay Questions

1. In a series-parallel circuit, how can you tell which resistances are in series and which are in parallel?
2. Draw a schematic diagram showing two resistances in a parallel bank that is in series with one resistance.
3. Draw a diagram showing how to connect three resistances of equal value so that the combined resistance will be 1½ times the resistance of one unit.
4. Draw a diagram showing two strings in parallel across a voltage source, where each string has three series resistances.
5. Explain why components are connected in series-parallel, showing a circuit as an example of your explanation.
6. Give two differences between a short circuit and an open circuit.
7. Explain the difference between voltage division and current division.
8. In Fig. 6–12, assume that the thermistor has a positive temperature coefficient (PTC). Explain what happens to the voltage V_{CD} (a) if the ambient temperature decreases; (b) if the ambient temperature increases.
9. Draw a circuit with nine 40-V, 100-W bulbs connected to a 120-V source.
10. (a) Two 10-Ω resistors are in series with a 100-V source. If a third 10-Ω R is added in series, explain why I will decrease. (b) The same two 10-Ω resistors are in parallel with the 100-V source. If a third 10-Ω R is added in parallel, explain why I_T will increase.

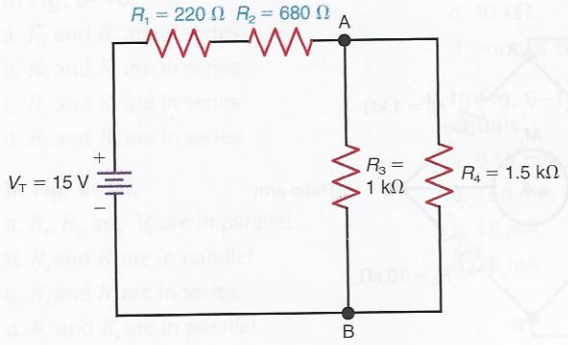
Problems

SECTION 6–1 FINDING R_T FOR SERIES-PARALLEL RESISTANCES

6–1 In Fig. 6–18, identify which components are in series and which ones are in parallel.

6–2 In Fig. 6–18,
    a. How much is the total resistance of just R_1 and R_2?
    b. What is the equivalent resistance of R_3 and R_4 across points A and B?
    c. How much is the total resistance, R_T, of the entire circuit?
    d. How much is the total current, I_T, in the circuit?
    e. How much current flows into point B?
    f. How much current flows away from point A?

Figure 6–18



6–3 MultiSim In Fig. 6–18, solve for the following: I_1, I_2, V_1, V_2, V_3, V_4, I_3, and I_4.

6–4 In Fig. 6–19, identify which components are in series and which ones are in parallel.

6–5 In Fig. 6–19,
    a. What is the equivalent resistance of R_2 and R_3 across points A and B?
    b. How much is the total resistance, R_T of the entire circuit?
    c. How much is the total current, I_T, in the circuit?
    d. How much current flows into point B and away from point A?