دانشگاه سمنان

Semnan University
Faculty of Mechanical Engineering

دانشکده مهندسی مکانیک

دانشکده مهندسی مکانیک

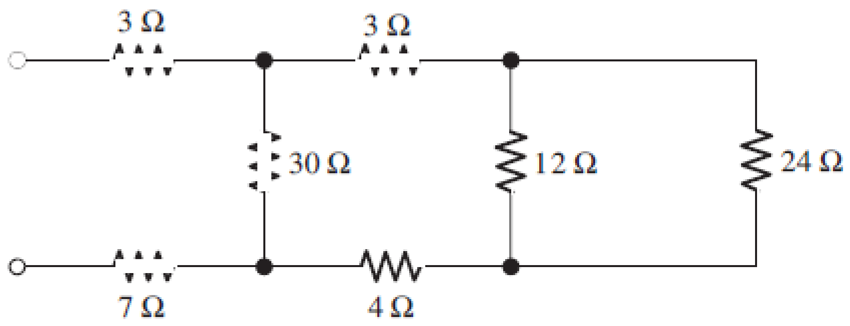
تمرین درس مبانی برق ۱

نام و شماره دانشجویی:

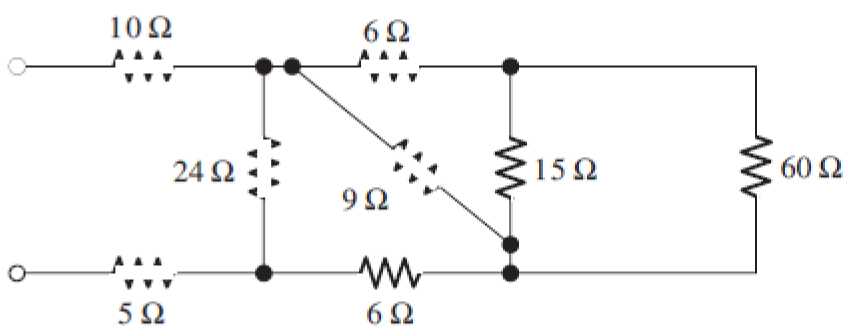
Introduction to Electrical Engineering Exercises

Chapter 2 – Resistive Circuits

*P2.1. Reduce each of the networks shown in Figure P2.1 to a single equivalent resistance by combining resistances in series and parallel.

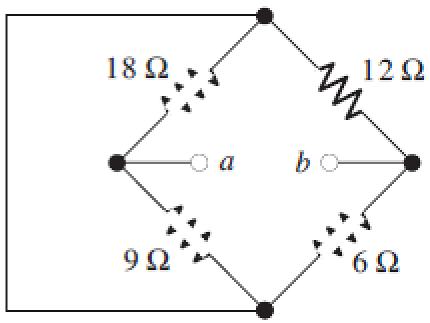


(a)

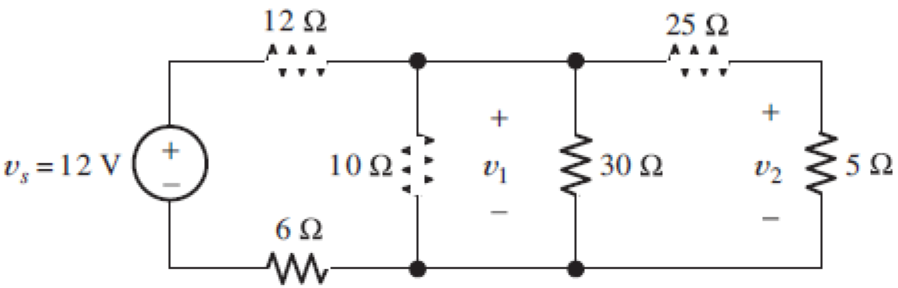


(b)

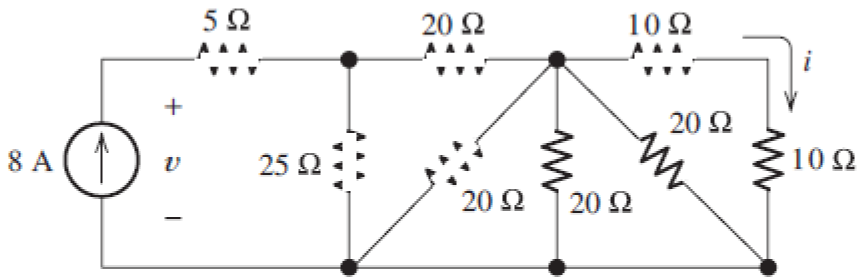
*P2.3. Find the equivalent resistance looking into terminals a and b in Figure P2.3.



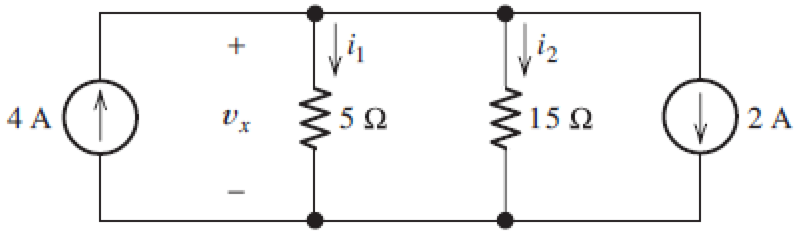
*__P2.24.__ Find the voltages v_1 and v_2 for the circuit shown in Figure P2.24 by combining resistances in series and parallel.



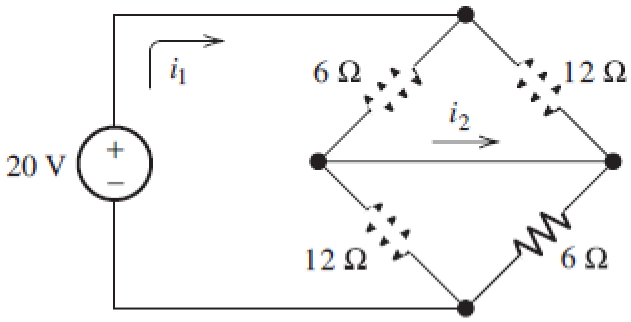
*__P2.25.__ Find the values of v and i in Figure P2.25.



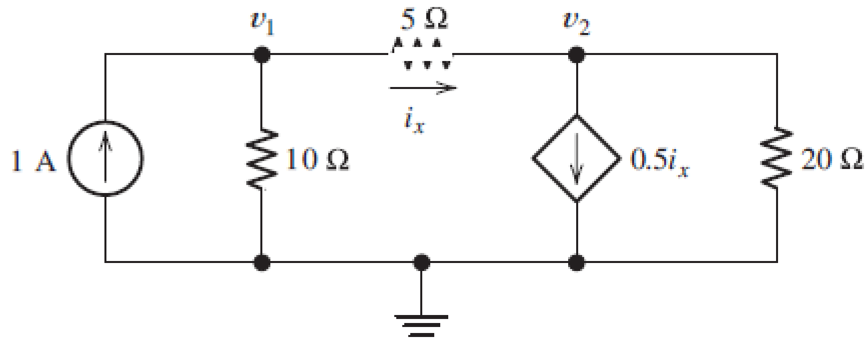
***P2.34.** Find the values of i_1 and i_2 in Figure P2.34. Find the power for each element in the circuit, and state whether each is absorbing or delivering energy. Verify that the total power absorbed equals the total power delivered.



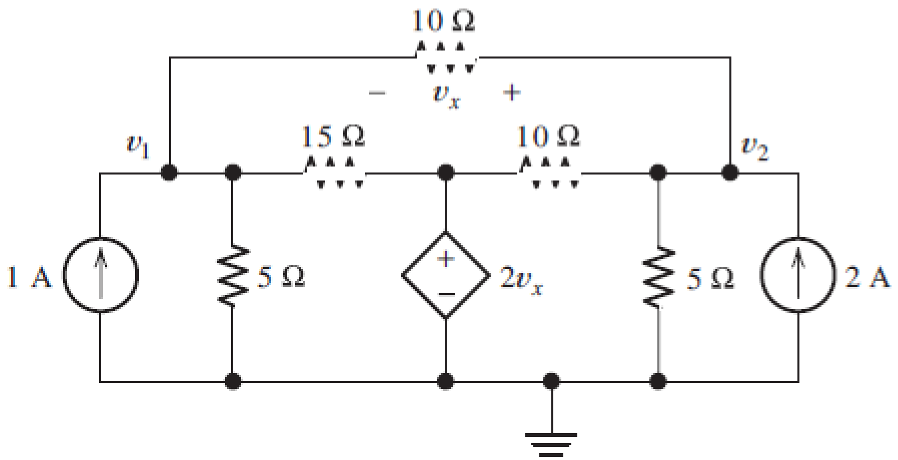
***P2.35.** Find the values of i_1 and i_2 in Figure P2.35.



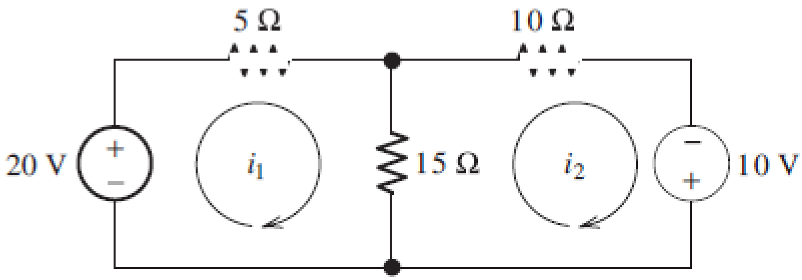
***P2.56.** Solve for the values of the node voltages shown in Figure P2.56. Then, find the value of i_x.



***P2.57.** Solve for the node voltages shown in Figure P2.57.



*P2.65. Solve for the power delivered to the 15-Ω resistor and for the mesh currents shown in Figure P2.65.



*__P2.66.__ Determine the value of v_2 and the power delivered by the source in the circuit of Figure P2.24 by using mesh-current analysis.

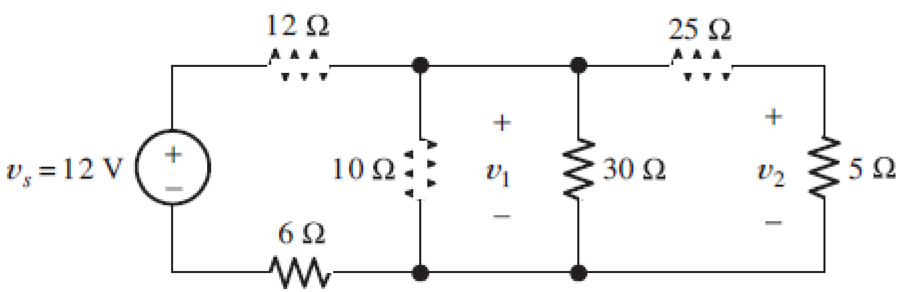
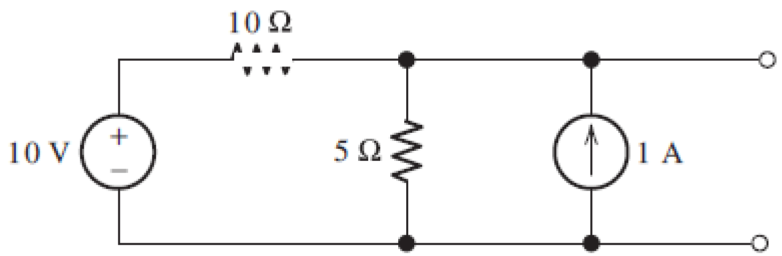
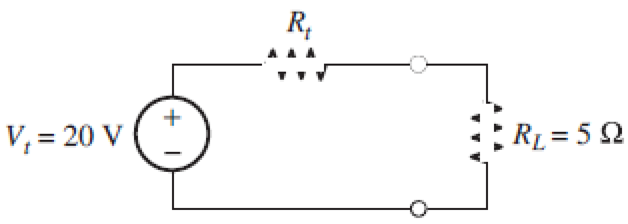


Figure P2.24

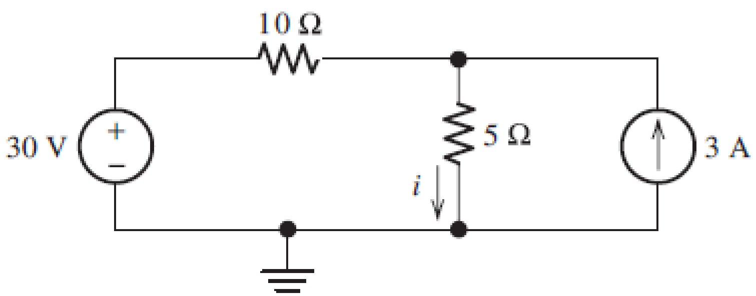
*P2.80. Find the Thévenin and Norton equivalent circuits for the two-terminal circuit shown in Figure P2.80.



*P2.91. Figure P2.91 shows a resistive load R_L connected to a Thévenin equivalent circuit. For what value of Thévenin resistance is the power delivered to the load maximized? Find the maximum power delivered to the load. (*Hint:* Be careful; this is a trick question if you don't stop to think about it.)



*__P2.94.__ Use superposition to find the current i in Figure P2.94. First, zero the current source and find the value i_v caused by the voltage source alone. Then, zero the voltage source and find the value i_c caused by the current source alone. Finally, add the results algebraically.



***P2.103.** The Wheatstone bridge shown in Figure 2.64 has $v_s = 10\,\text{V}$, $R_1 = 10\,\text{k}\Omega$, $R_2 = 10\,\text{k}\Omega$, and $R_x = 5932\ \Omega$. The detector can be modeled as a 5-kΩ resistance. **a.** What value of R_3 is required to balance the bridge? **b.** Suppose that R_3 is 1 Ω higher than the value found in part (a). Find the current through the detector. (*Hint:* Find the Thévenin equivalent for the circuit with the detector removed. Then, place the detector across the Thévenin equivalent and solve for the current.) Comment.

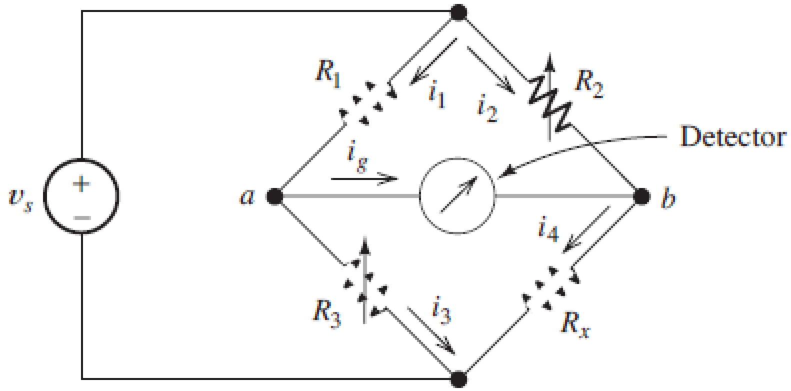
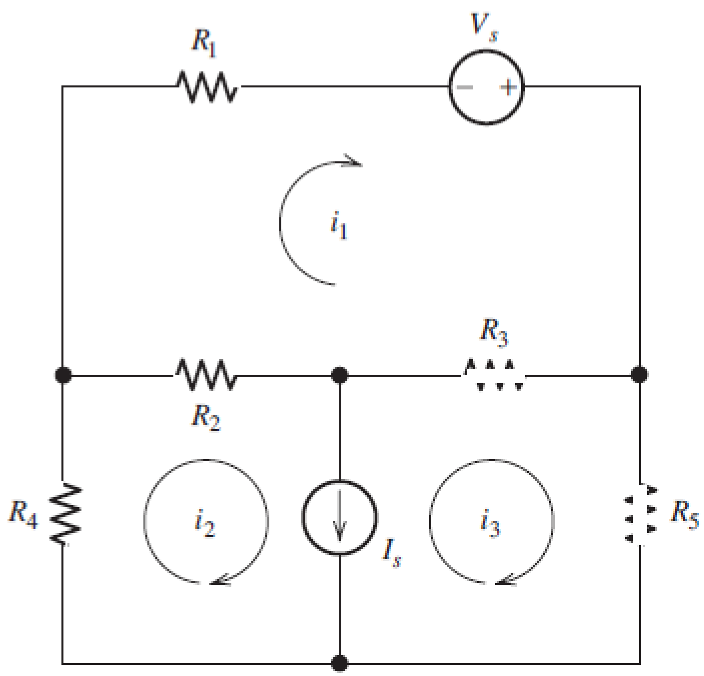
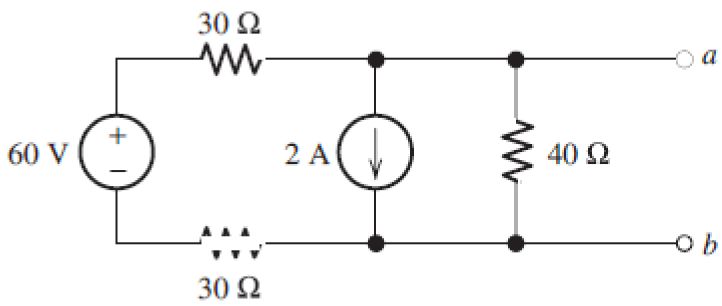


Figure 2.64 The Wheatstone bridge. When the Wheatstone bridge is balanced, $i_g = 0$ and $v_{ab} = 0$.

T2.4. Write a set of equations that can be used to solve for the mesh currents of Figure T2.4. Be sure to indicate which of the equations you write form the set.



T2.5. Determine the Thévenin and Norton equivalent circuits for the circuit of Figure T2.5. Draw the equivalent circuits labeling the terminals to correspond with the original circuit.



T2.6. According to the superposition principle, what percentage of the total current flowing through the 5-Ω resistance in the circuit of Figure T2.6 results from the 5-V source? What percentage of the power supplied to the 5-Ω resistance is supplied by the 5-V source? Assume that both sources are active when answering both questions.