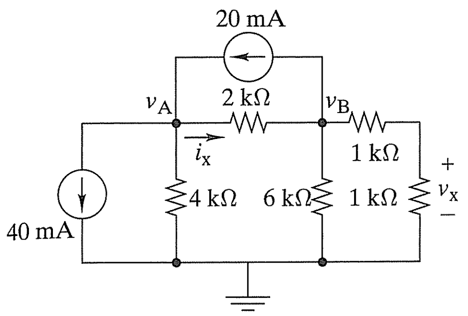
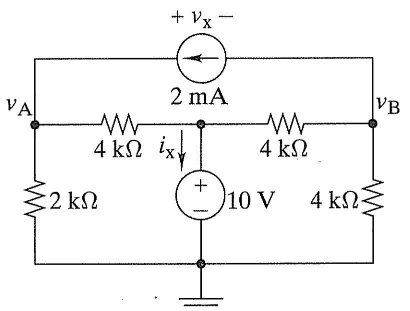


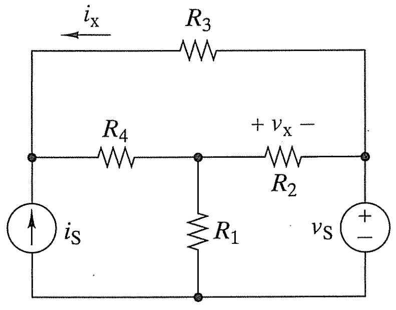
F I G U R E P 3 – 3

3–4 **(a)** Formulate node-voltage equations for the circuit in Figure P3–4.
(b) Use these equations to find v_x and i_x.



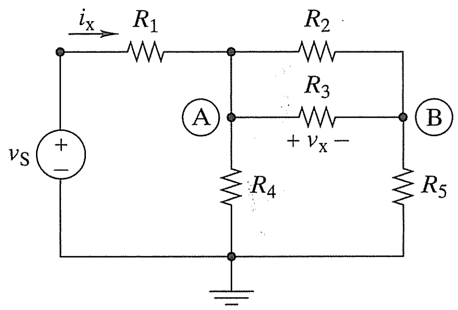
F I G U R E P 3 – 4

3–5 **(a)** Formulate node-voltage equations for the circuit in Figure P3–5.
(b) Solve for v_x and i_x when $R_1 = R_2 = R_3 = R_4 = 10\ \text{k}\Omega$, $v_S = 20$ V, and $i_S = 2$ mA.



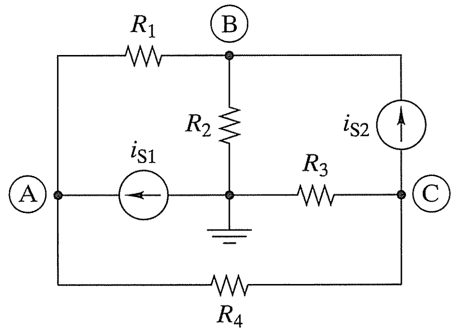
F I G U R E P 3 – 5

3–6 **(a)** Formulate node-voltage equations for the circuit in Figure P3–6.
(b) Solve for v_x and i_x when $R_1 = R_2 = R_3 = R_4 = R_5 = 10\ \text{k}\Omega$, and $v_S = 20$ V.



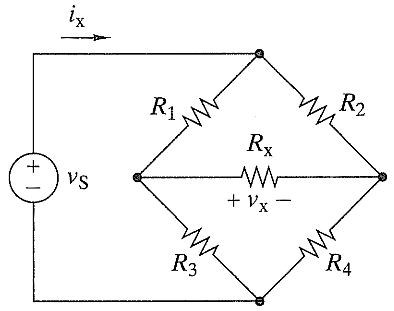
F I G U R E P 3 – 6

3–7 **(a)** Formulate node-voltage equations for the circuit in Figure P3–7.
(b) Solve for v_A, v_B, and v_C when $R_1 = 1\ \text{k}\Omega$, $R_2 = 2\ \text{k}\Omega$, $R_3 = 4\ \text{k}\Omega$, $R_4 = 2\ \text{k}\Omega$, and $i_{S1} = i_{S2} = 2$ mA.



F I G U R E P 3 – 7

3–8 **(a)** Formulate node-voltage equations for the circuit in Figure P3–8.
(b) Solve for v_x and i_x when $R_1 = R_4 = 1\ \text{k}\Omega$, $R_2 = R_3 = 250\ \Omega$, $R_x = 500\ \Omega$, and $v_S = 15$ V.



F I G U R E P 3 – 8

3–9 **(a)** Formulate mesh-current equations for the circuit in Figure P3–9.
(b) Use these equations to find v_x and i_x.

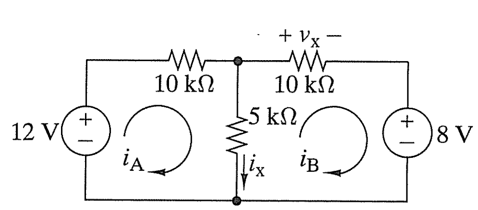


FIGURE P3–9

3–10 **(a)** Formulate mesh-current equations for the circuit in Figure P3–10.
(b) Use these equations to find v_x and i_x.

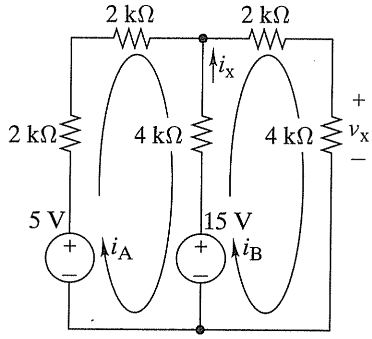


FIGURE P3–10

3–11 **(a)** Formulate mesh-current equations for the circuit in Figure P3–11.
(b) Use these equations to find v_x and i_x.

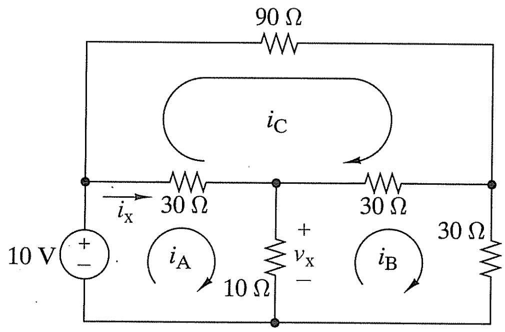


FIGURE P3–11

3–12 **(a)** Formulate mesh-current equations for the circuit in Figure P3–12.
(b) Solve for v_x and i_x when $R_1 = 200\ \Omega$, $R_2 = 300\ \Omega$, $R_3 = 50\ \Omega$, $R_4 = 250\ \Omega$, $R_5 = 200\ \Omega$, $i_S = 50$ mA, and $v_S = 15$ V.
(c) Find the total power dissipated in the circuit.

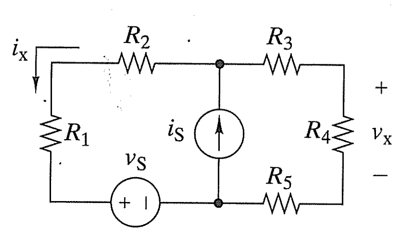


FIGURE P3–12

3–13 **(a)** Formulate mesh-current equations for the circu in Figure P3–13.
(b) Solve for v_x and i_x when $R_1 = R_2 = 10$ kΩ, $R_3 = 2$ k $R_4 = 1$ kΩ, $i_S = 2.5$ mA, $v_{S1} = 12$ V, and $v_{S2} = 0.5$ V
(c) Find the power supplied by v_{S1}.

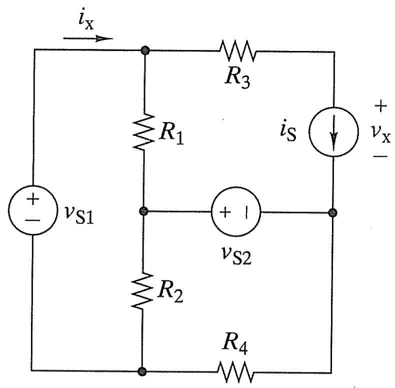


FIGURE P3–13

3–14 The circuit in Figure P3–14 seems to require two super meshes since both current sources appear in two meshes However, sometimes rearranging the circuit diagram wil eliminate the need for a supermesh.
(a) Show that supermeshes can be avoided in Figure P3–14 by rearranging the connection of resistor R_6.
(b) Formulate mesh-current equations for the modified circuit as redrawn in part (a).
(c) Solve for v_x when $R_1 = R_2 = R_3 = R_4 = 2$ kΩ, $R_5 = R_6 = 1$ kΩ, $i_{S1} = 40$ mA, and $i_{S2} = 20$ mA.

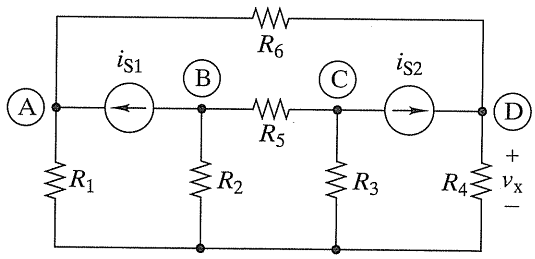


FIGURE P3–14

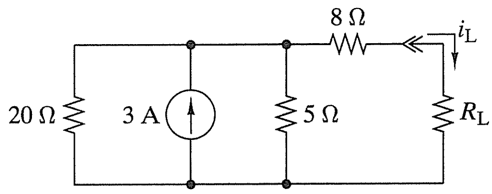


FIGURE P3–38

3–39 Find the Thévenin equivalent seen by R_L in Figure P3–39. Find the power delivered to the load when $R_L = 50$ kΩ and 200 kΩ.

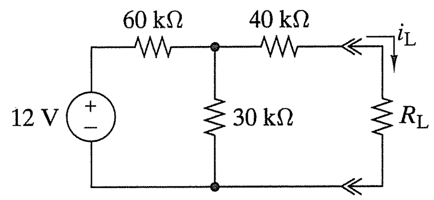


FIGURE P3–39

3–40 Find the Norton equivalent at terminals A and B in Figure P3–40.

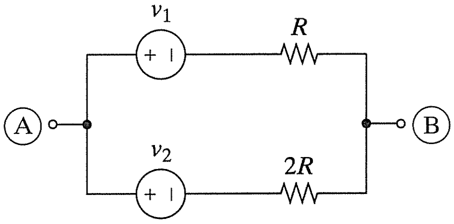


FIGURE P3–40

3–41 The purpose of this problem is to use Thévenin equivalent circuits to find the voltage v_X in Figure P3–41. Find the Thévenin equivalent circuit seen looking to the left of terminals A and B. Find the Thévenin equivalent circuit seen looking to the right of terminals A and B. Connect these equivalent circuits together and find the voltage v_X.

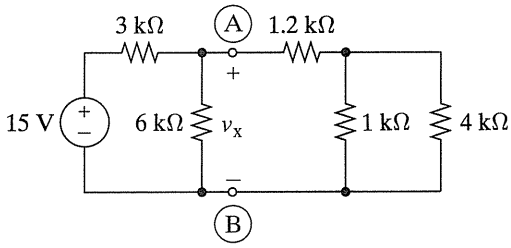


FIGURE P3–41

3–42 Figure P3–42 shows an active circuit with two acces ble terminals. The output current is $i = 10$ mA wh $v = 0$. The output voltage is $v = 6$ V when a 2.4-] resistor is connected between the terminals. How mu current would this source deliver to a 6-V battery?

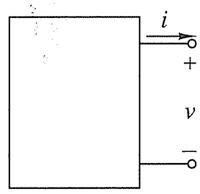


FIGURE P3–42

3–43 The i–v characteristic of the active circuit in P3–42 $5v + 500i = 60$. Find the output voltage when a 500 resistive load is connected across the two accessil terminals.

3–44 Figure P3–42 shows a source circuit with two accessil terminals. Some voltage and current measurements at t accessible terminals are

v(V)	−10	−5	0	+5	+10	12	13	14
i(mA)	+5	+4	+3	+2	+1	0	−1	−2

(a) Use these data to plot the source i–v characteristic.
(b) Develop a Thévenin equivalent circuit valid on t range $|v| < 10$ V.
(c) Use the equivalent circuit to predict the source v and i_{SC}.
(d) Compare your results in part (c) with the given me surements and explain any differences.

3–45 The Thévenin equivalent parameters of a practi voltage source are $v_T = 25$ V and $R_T = 150$ Ω. Find t smallest load resistance for which the load voltage excee 15 V.

3–46 Use a sequence of source transformations to find t Thévenin equivalent at terminals A and B in Figure P3–

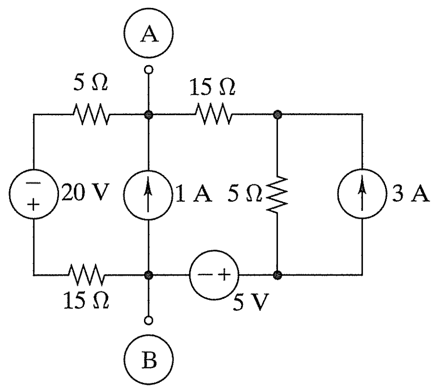


FIGURE P3–46

3–47 Select the value of R_L in Figure P3–47 so that $i_O = 80\ \mu A$.

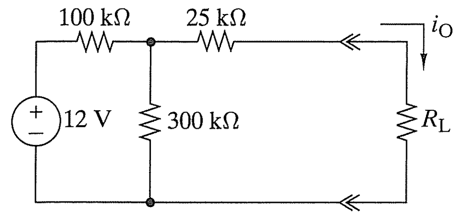


FIGURE P3–47

3–48 Find the Thévenin equivalent at terminals A and B in Figure P3–48.

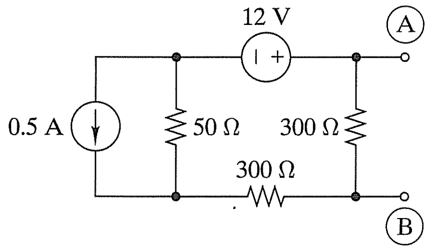


FIGURE P3–48

3–49 A nonlinear resistor is connected across a two-terminal source whose Thévenin equivalent is $v_T = 5$ V and $R_T = 500\ \Omega$. The i–v characteristic of the resistor is $i = 10^{-4}(v + 2\,v^{3.3})$. Plot the i–v characteristic of the source and the resistor and graphically determine the voltage across and current through the nonlinear resistor.

3–50 A nonlinear resistor is connected across a two-terminal source whose Thévenin equivalent is $v_T = 10$ V and $R_T = 200\ \Omega$. The i–v characteristic of the resistor is $v = 4000\,i^2$. Plot the i–v characteristic of the source and the resistor and graphically determine the voltage across and current through the nonlinear resistor.

3–51 Find the Norton equivalent seen by R_L in Figure P3–51. Select the value of R_L so that 100 mW is delivered to the load.

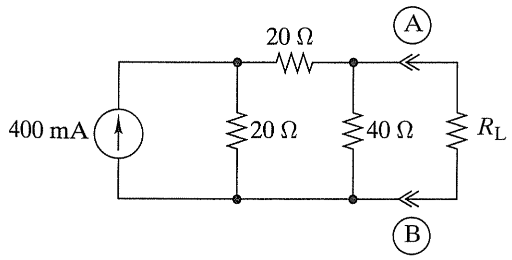


FIGURE P3–51

3–52 Find the Norton equivalent seen by R_L in Figure P3–52.

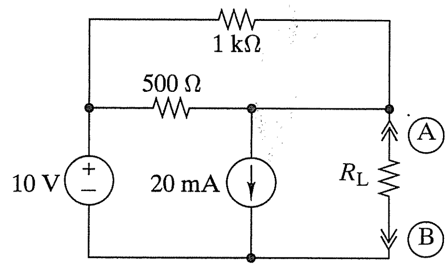


FIGURE P3–52

3–53 Find the Thévenin equivalent seen by R_L in Figure P3–53.

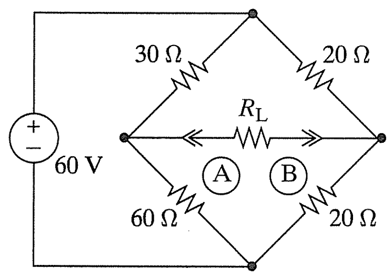


FIGURE P3–53

OBJECTIVE 3–4 MAXIMUM SIGNAL TRANSFER (SECT. 3–5)

Given a circuit containing linear resistors and independent sources:

(a) Find the maximum voltage, current, and power available at a specified pair of terminals.

(b) Find the resistive loads required to obtain the maximum available signal levels.

See Example 3–17 and Exercise 3–19

3–54 The resistance R in Figure P3–54 is adjusted until maximum power is delivered to the load consisting of R and the 6-kΩ resistor in parallel. Find the required value of R.

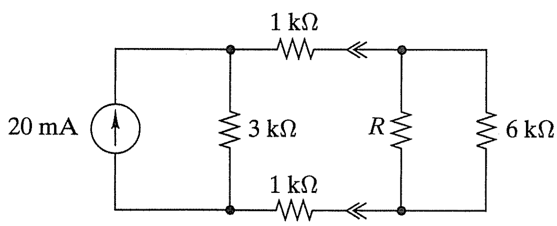


FIGURE P3–54