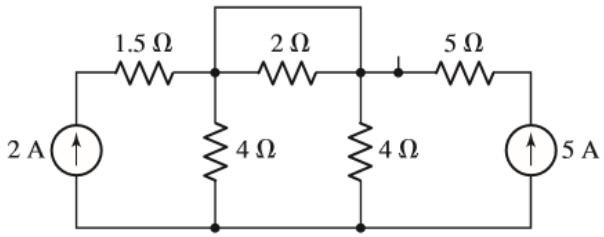
تاریخ تحویل: 20 مهر 1398

توجه: از همه سوالات کافیست 10 سوال را حل کنید، اما از هر دسته سوال (با شماره اصلی یکسان) نمی‌توانید بیش از یکی را انتخاب کنید.

1- a. Plot the I-V characteristics of a 2kΩ, 1 MΩ, and a 100Ω resistor on the same graph. Use a horizontal axis of 0 to 20 V and a vertical axis of 0 to 10 mA.
b. Comment on the steepness of the curve with decreasing levels of resistance.
c. Are the curves linear or nonlinear? Why?

2- Find the power, $p(t)$, supplied by the element shown in Figure below when $v(t) = 4cos3t$ V and $i(t) = \frac{sin3t}{12}$ A. Evaluate $p(t)$ at $t = 0.5$ and $t = 1$ s. observe that the power applied by this element has a positive value at some times and a negative value at other times.
(Answer: $p(0.5) = 0.0235, p(1) = -0.0466$)

3- Referring to the circuit depicted in Fig. 3.45, count the number of (a) nodes; (b) elements; (c) branches.



4-1. A CD player draws 125 mA when 4.5 V is applied. What is the internal resistance?

4-2. a. If an electric heater draws 9.5A when connected to a 120 V supply, what is the internal resistance of the heater?
b. Using the basic relationships, determine how much energy in joules (J) is converted if the heater is used for 2 h during the day.

4-3. The average plasma screen TV draws 339 W of power, whereas the average LCD TV draws 213 W. If each set was used 5 h/day for 365 days, what would be the cost savings for the LCD unit over the year if the cost is 11¢/kWh?

5-1. The current in a circuit element is:

$$i(t) = \begin{cases} 0 & t < 2 \\ 2 & 2 < t < 4 \\ -1 & 4 < t < 8 \\ 0 & 8 < t \end{cases}$$

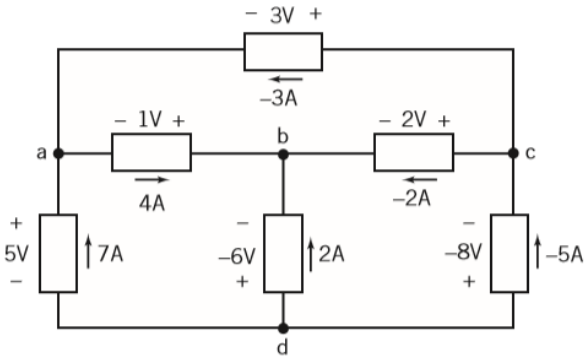
where the units of current are A and the units of time are s. Determine the total charge that has entered a circuit element for $t \geq 0$.

5-2. The total charge $q(t)$, in coulombs, that enters the terminal of an electrode is:

$$q(t) = \begin{cases} 0 & t < 0 \\ 2t & 0 \le t \le 2 \\ 3 + e^{-2(t-2)} & t > 2 \end{cases}$$

Obtain the current passing that electrode.

6-1. The element currents and voltages shown in Figure P 1.7-3 are correct with one exception: the reference direction of exactly one of the element currents is reversed. Determine which reference direction has been reversed.



gure P 1.7-3

6-2. Computer analysis of the circuit in Figure P 3.8-6 shows that ia¼0.5 mA and ib¼4.5 mA. Was the computer analysis done correctly?

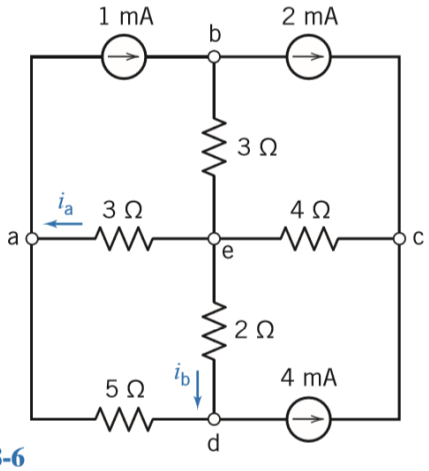
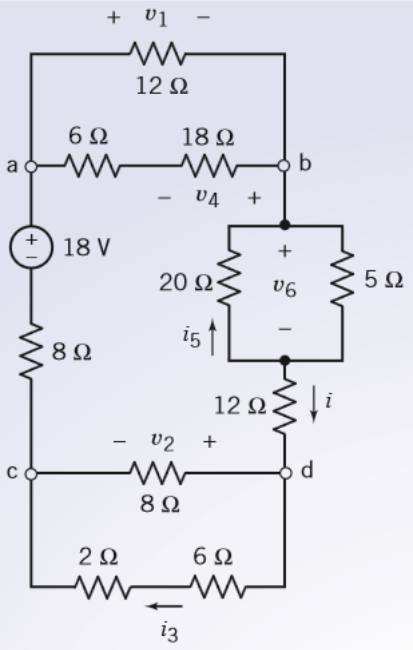
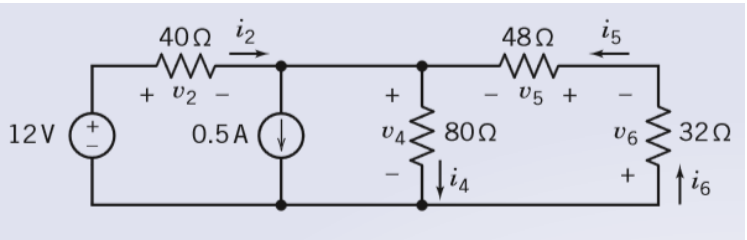


Figure P 3.8-6

7-1. با استفاده از مقاومت‌های سری و موازی و قانون تقسیم جریان و ولتاژ، ولتاژ و جریانهای مشخص‌شده در مدار زیر را به دست آورید. (جواب: $i_3 = 0.25A, v_4 = -3V, i_5 = -0.1A, v_6 = 2V$)

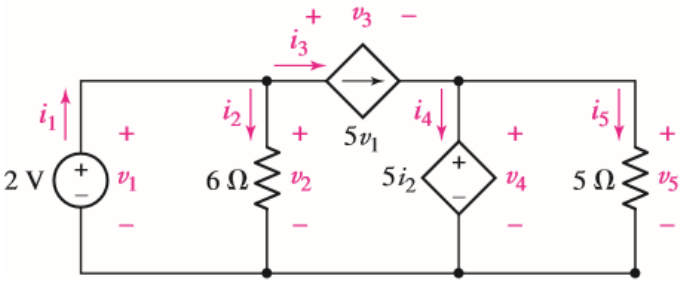


7-2. Determine the values of the resistor voltages and currents for the circuit shown in Figure 3.7-1. (Answer: $i_4 = -0.05A, i_6 = 0.05A, v_2 = 16V, v_4 = -4V, v_5 = 2.4V, v_6 = 1.6V$)



7-3. (a) Determine a numerical value for each current and voltage (i1, v1, etc.) in the circuit of figure below.

(b) Calculate the power absorbed by each element and verify that they sum to zero



8-1. Determine the value of the voltage v_6 for the circuit shown in Figure P 3.2-20

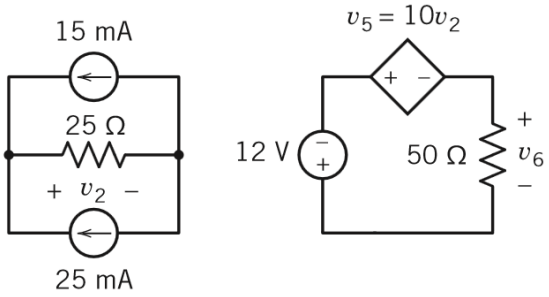
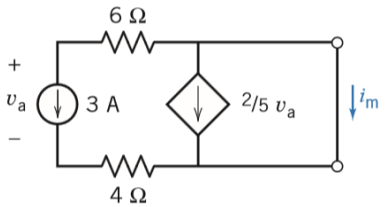


Figure P 3.2-20

8-2. Determine the value of the current i_m in Figure P 3.2-18a.

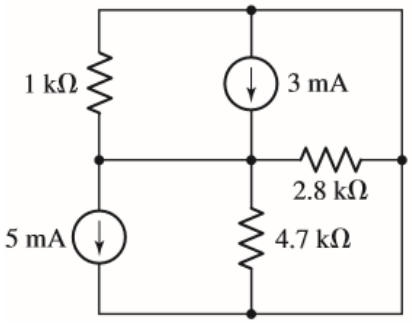


8-3. Although drawn so that it may not appear obvious at first glance, the circuit of Fig. 3.73 is in fact a single-node-pair circuit.

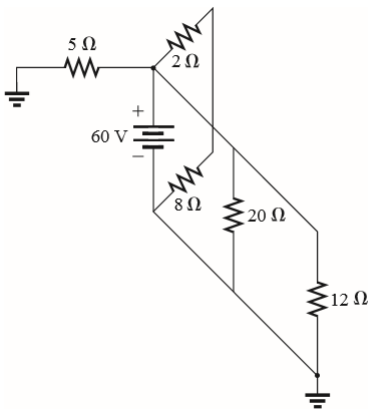
(a) Determine the power absorbed by each resistor.

(b) Determine the power supplied by each current source.

(c) Show that the sum of the absorbed power calculated in (a) is equal to the sum of the supplied power calculated in (c).

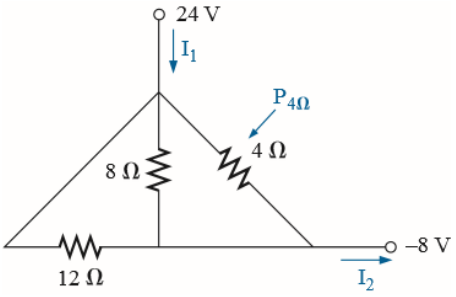


8-4. Determine the power delivered by the dc battery in figure below.



8-5. For the network in figure below:

a. Find the current I_1.
b. Calculate the power dissipated by the 4 Ω resistor.
c. Find the current I_2.



9-1. The voltage source in the circuit shown in Figure P 3.2-25 supplies $2W$ of power. The value of the voltage across the 25-V resistor is $v_2 = 4V$. Determine the values of the resistance R1 and of the gain G of the VCCS

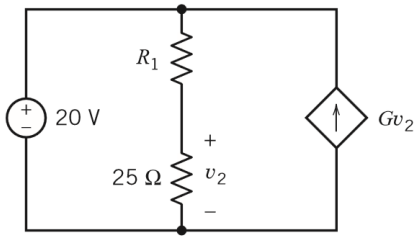


Figure P 3.2-25

9-2. Consider the circuit shown in Figure P 3.2-28. (a) Determine the value of the power supplied by each independent source. (b) Determine the value of the power received by each resistor. (c) Is power conserved?

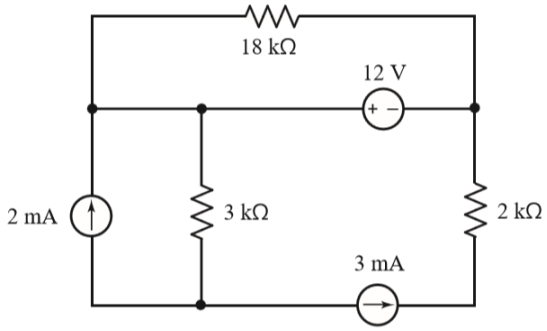


Figure P 3.2-28

9-3. Determine the power supplied by each source in the circuit shown in Figure P 3.5-2.

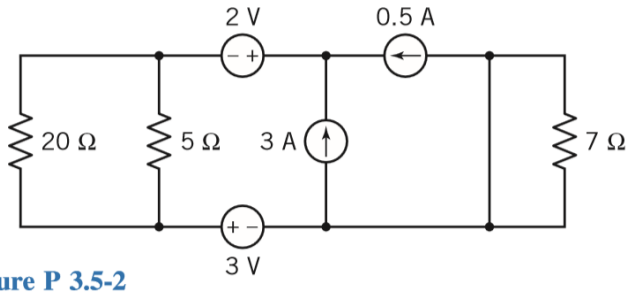
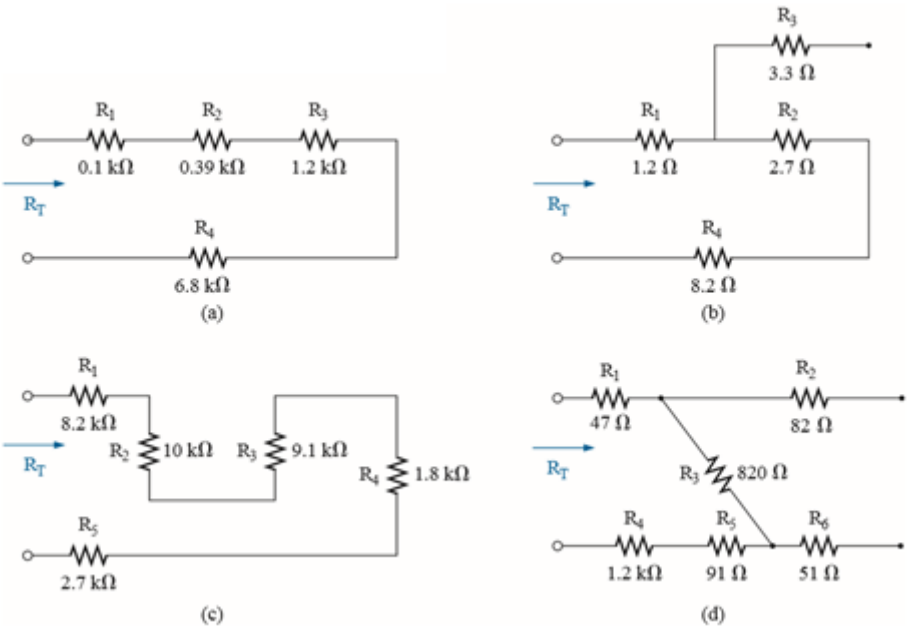
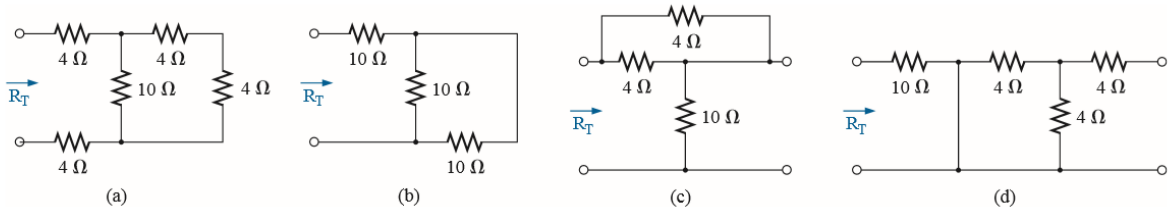


Figure P 3.5-2

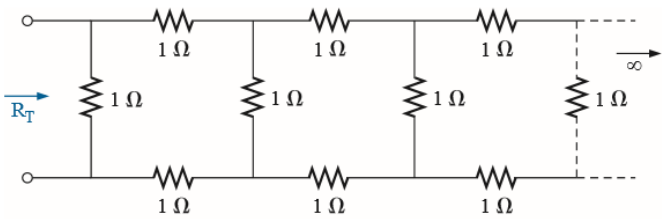
10-1. Find the total resistance R_T for each configuration in figure below. Note that only standard resistor values were used.



10-2. Determine R_T for the networks in figure below:



10-3. Find the resistance for the network of figure below. **Hint! If it was infinite in length, how would the resistance looking into the next vertical 1Ω resistor compare to the desired resistance R_T?**



10-4. Determine the value of the voltage v inFigureP3.4-8

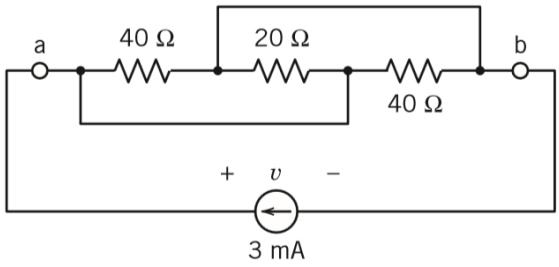


Figure P 3.4-8

10-5. The input to the circuit shown in Figure P 3.4-20 is the voltage source voltage Vs. The output is the voltage v_o. The output of this circuit is proportion to the input, that is $v_o = kVs$ Determine the value of the constant of proportionality k.

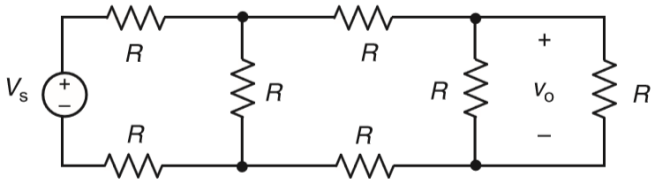


Figure P 3.4-20

10-6. All of the resistances in the circuit shown in Figure P 3.6-14 are multiples of R. Determine the value of R.

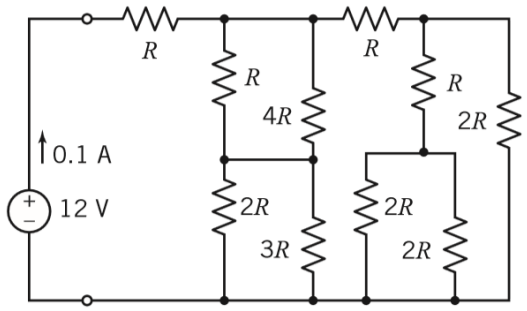
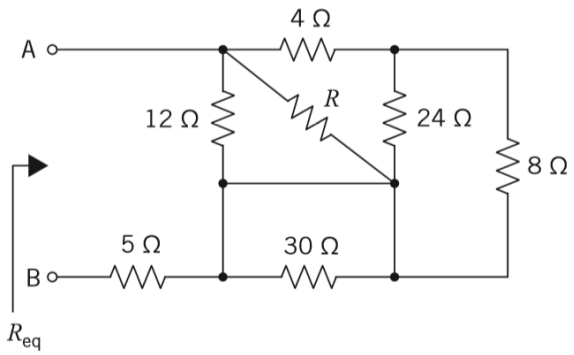


Figure P 3.6-14

10-7. Determine the value of the resistance R in the circuit shown in Figure P 3.6-21, given that $R_{eq} = 9\Omega$. (Answer: $R_{eq} = 15\Omega$)



10-8. Determine the value of the resistance R in the circuit shown in Figure P 3.6-22, given that $R_{eq} = 40\Omega$.

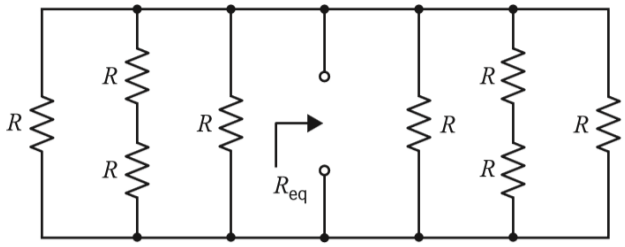


Figure P 3.6-22

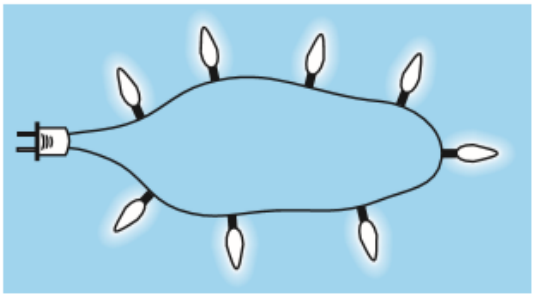
11-1. Eight holiday lights are connected in series as shown in figure below.

a. If the set is connected to a 120 V source, what is the current through the bulbs if each bulb has an internal resistance of 8Ω?

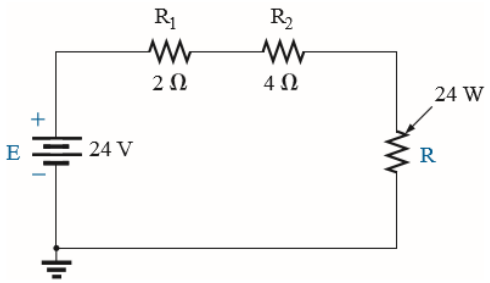
b. Determine the power delivered to each bulb.

c. Calculate the voltage drop across each bulb.

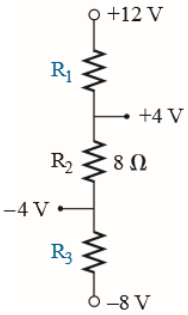
d. If one bulb burns out (that is, the filament opens), what is the effect on the remaining bulbs? Why?



11-2. For the conditions specified in figure below, determine the unknown resistance.



11-3. Given the information appearing in figure below, find the level of resistance for R_1 and R_3.



12-1. Determine the current i in the circuit shown in Figure P 3.4-4.

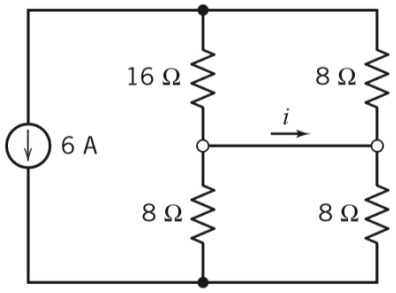


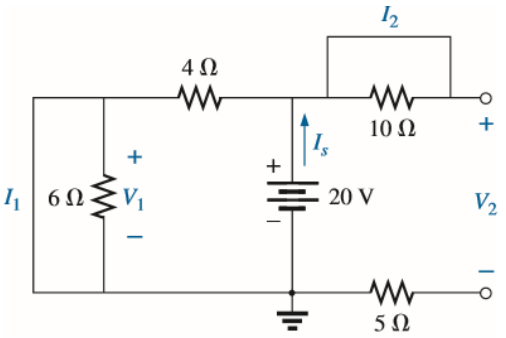
Figure P 3.4-4

12-2. For the network in below, determine:

a. The short-circuit currents I_1 and I_2.

b. The voltages V_1 and V_2.

c. The source current I_s.



13-1. The circuit shown in Figure P 3.6-2a has been divided into three parts. In Figure P 3.6-2b, the rightmost part has been replaced with an equivalent circuit. The rest of the circuit has not been changed. The circuit is simplified further in Figure 3.6-2c. Now the middle and rightmost parts have been replaced by a single equivalent resistance. The leftmost part of the circuit is still unchanged.

(a) Determine the value of the resistance R_1 in Figure P 3.6-2b that makes the circuit in Figure P 3.6-2b equivalent to the circuit in Figure P 3.6-2a.

(b) Determine the value of the resistance R_2 in Figure P 3.6-2c that makes the circuit in Figure P 3.6-2c equivalent to the circuit in Figure P 3.6-2b.

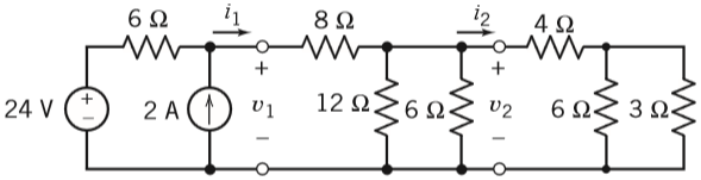
(c) Find the current i_1 and the voltage v_1 shown in Figure P3.6-2c. Because of the equivalence, the current i1 and the voltagev1 showninFigureP3.6-2b are equal to current i_1 and the voltage v_1 shown in Figure P 3.6-2c.

Hint: $\boldsymbol{24 = 6(i_1 - 2) + i_1 R_2}$

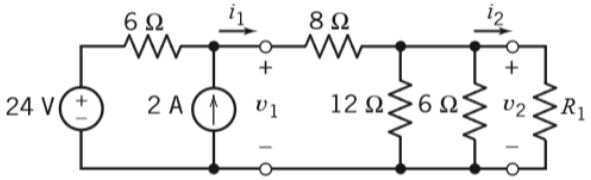
(d) Find the current i2 and the voltage v2 shown in Figure P 3.6-2b. Because of the equivalence, the current i_2 and the voltage v_2 shown in Figure P 3.6-2a are equal to the current i_2 and the voltage v_2 shown in Figure P 3.6-2b.

Hint: Use current division to calculate i_2 from i_1.

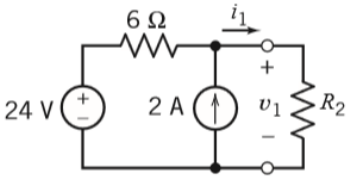
(e) Determine the power absorbed by the 3-V resistance shown at the right of Figure P 3.6-2a.



(a)



(b)

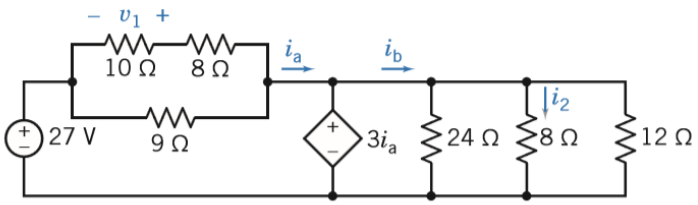


(c)

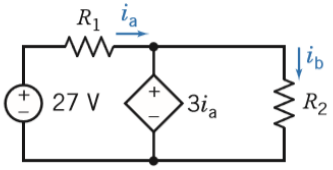
13-2. (a) Determine values of R1 and R2 in FigureP3.6-4b that make the circuit in Figure P 3.6-4b equivalent to the circuit in Figure P 3.6-4a.

(b) Analyze the circuit in Figure P 3.6-4b to determine the values of the currents i_a and i_b.

(c) Because the circuits are equivalent, the currents i_a and i_b shown in Figure P 3.6-4b are equal to the currents i_a and i_b shown in Figure P 3.6-4a. Use this fact to determine values of the voltage v_1 and current i_2 shownin Figure P 3.6-4a.



(a)



(b)

Figure P 3.6-4