EE 210
chapter 1 - study Problems

1-9 The current entering the upper terminal of Fig-1.5 is $i = 20\cos 5000t\ A$. Assume the charge at the upper terminal is zero at the instant the current is passing through its maximum value. Find the expression for $q(t)$.

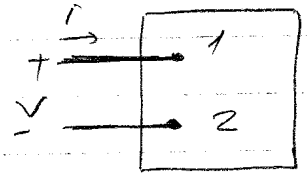
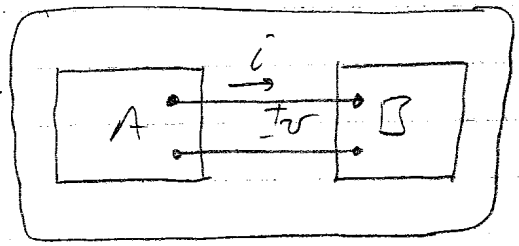


Fig. 1-5

1-12 Two electric circuits represented by boxes A and B are connected as shown in Figure 1-2. The reference direction for the current i in the interconnection and the reference polarity for the voltage v across the interconnection are as shown in figure. For each of the following sets of numerical values, calculate the power in the interconnection and state whether the power is flowing from A to B, or vice versa.

a) $i = 15A$, $v = 20V$
b) $i = -5A$, $v = 100V$
c) $i = 4A$, $v = -50V$
d) $i = -16A$, $v = -25V$



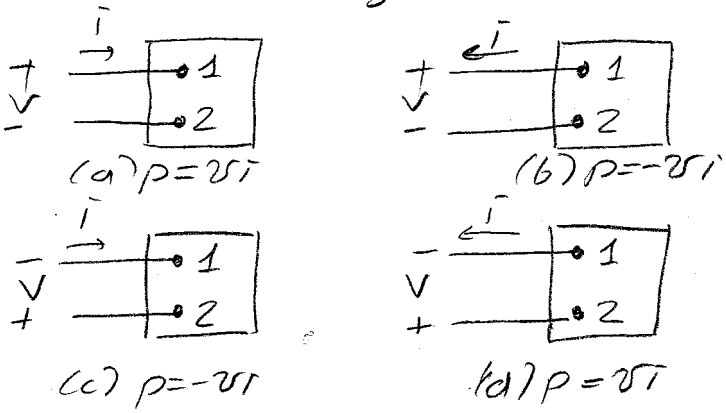
1-13 The references for the voltage and current at the terminal of a circuit element are as shown in Figure 1.6(d). The numerical values for v and i are $-20V$ and $5A$.

a) Calculate the power at the terminals and state whether the power is being absorbed or delivered by the element in the box.

b) Given that the current is due to electron flow, state whether the electrons are entering or leaving terminal 2.

c) Do the electrons gain or lose energy as they pass through the element in the box?

Figure 1.6d



Polarity references and the expression for power

1.16 The manufacturer of a 6V dry-cell flashlight battery says that the battery will deliver 15mA for 60 continuous hours. During that time the voltage will drop from 6V to 4V. Assume the drop in voltage is linear with time. How much energy does the battery deliver in this 60h interval?

1.18 The voltage and current at the terminals of the circuit element in Fig. 1.5 (Redraw in Problem 1.9),

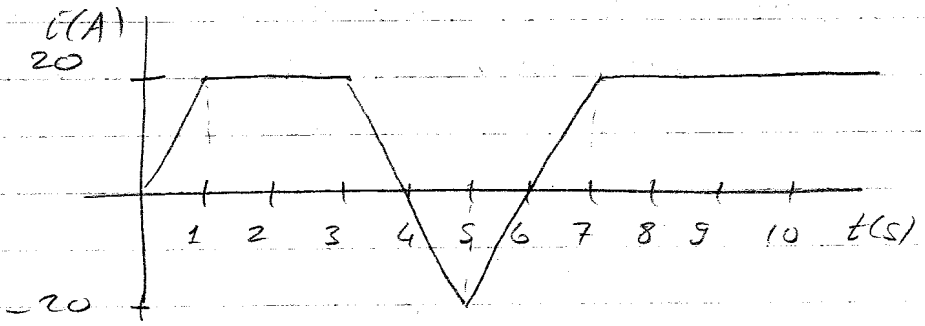
$$v = 100\,e^{-50t}\sin 150t\ \text{V}$$

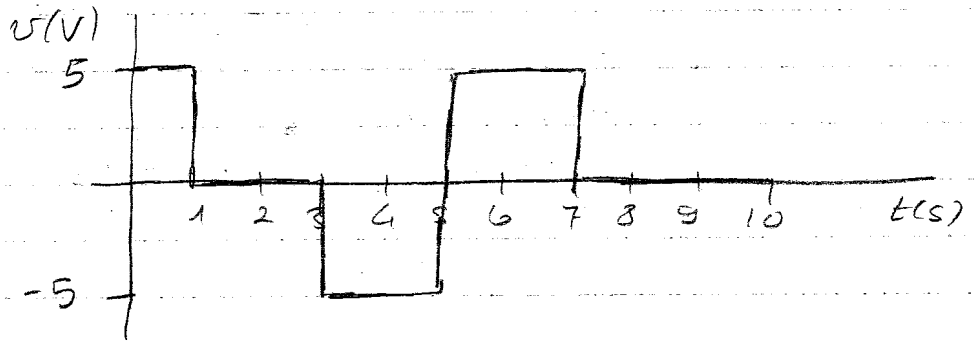
$$i = 20\,e^{-50t}\sin 150t\ \text{A}$$

a) Find the power absorbed by the element at $t = 20$ms.

b) Find the total energy absorbed by the element.

1.19 The voltage and current at the terminals of the circuit element in Fig 1-5 are shown in Fig P1.19, below a) Sketch the power versus t plot for $0 \le t \le 10s$ b) Calculate the energy delivered to the circuit element at t= 1-6 and 10s.





1.24 The voltage and current at the terminals of the circuit element in Fig 1-5 are zero for t<0 and t>40s. In the interval between 0 and 40s the expressions are

$$v = t(1 - 0.025t)\,V \qquad 0 < t < 40s$$
$$i = 4 - 0.2t\,A \qquad 0 < t < 40s$$

a) At what instant of time is the power being delivered to the circuit element is maximum?
b) What is the power at the time found in part (a).
(c) At what instant of time is the power being extracted from the circuit element is maximum?
(d) What is the power at the time found in part (c)?
(e) Calculate the net energy delivered to the circuit at 0, 10, 20, 30 and 40s.

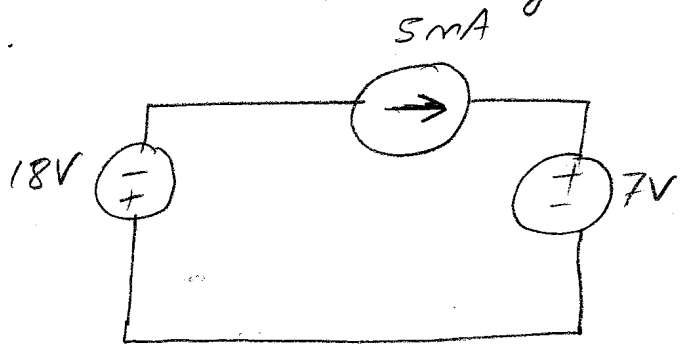
Chapter 2 – Study Problems

2-50 Is the interconnection of ideal sources in the circuit in Fig 2.5 valid? Explain.

b) Identify which sources are developing power and which sources are absorbing power.

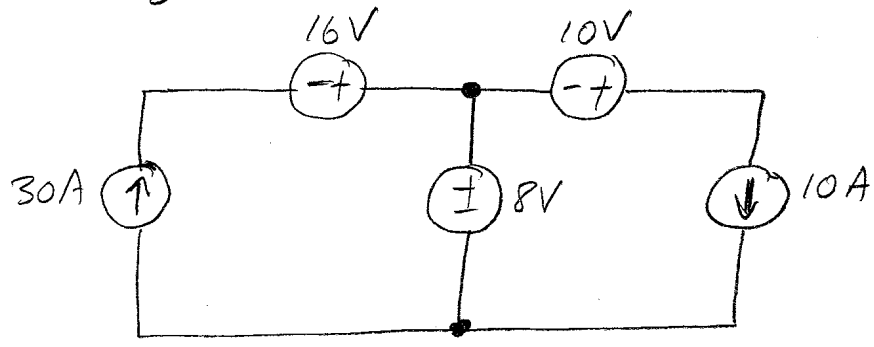
c) Verify that the total power developed in the circuit equals the total power absorbed.

d) Repeat (a)–(c), reversing the polarity of the 18V source.



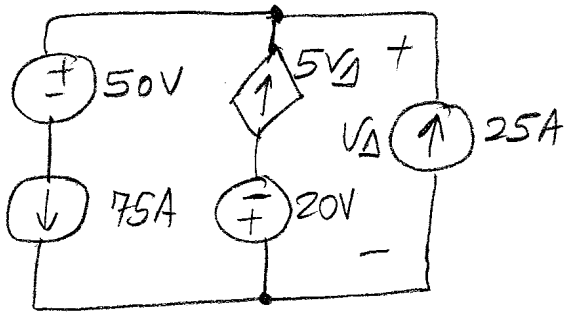
7 If the interconnection in Fig P.2.7 is valid, find the power developed by the current sources. If the interconnection is not valid, explain why.

Figure 2.7



11 If the interconnection in Fig P2.11 is valid, find the total power developed in the circuit. If the interconnection is not valid, explain why.

Figure P.2.11



2-14 Given the circuit shown in Fig. P2-14, find

a) The value of i_a,

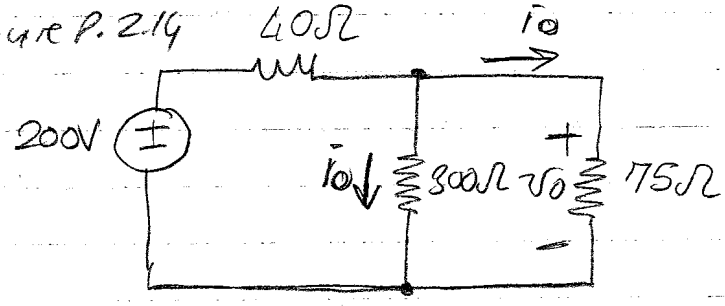
b) The value of i_b,

c) The value of v_o,

d) The power dissipated in each resistor

e) The power delivered by the 200V source

Figure P. 2.14



2-19 The currents i_a and i_b in the circuit in Fig P2-19 are 4A and -2A, respectively.

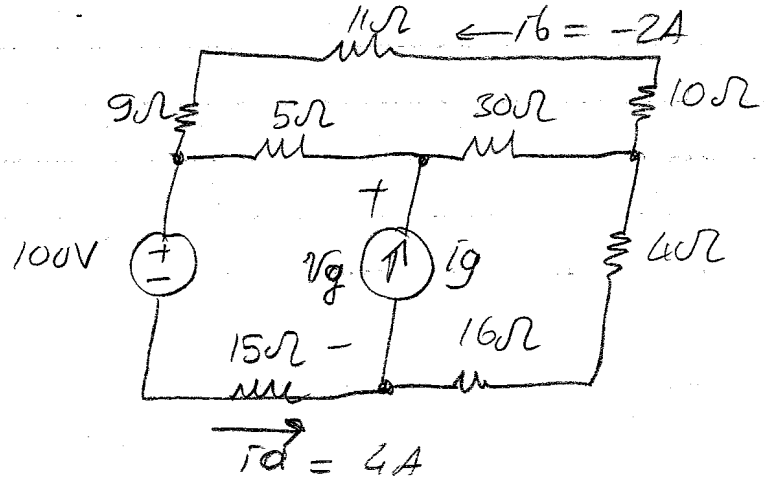
a) Find i_g.

b) Find the power dissipated in each resistor.

c) Find v_g.

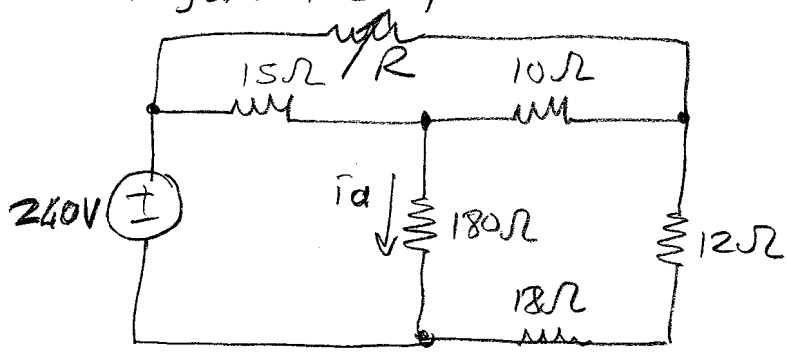
d) Show that the power delivered by the current source is equal to the power absorbed by all the other elements.

Figure P2-19



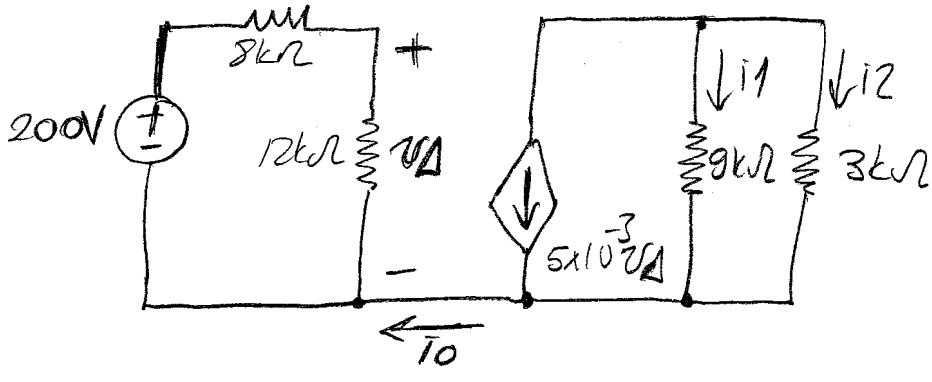
2.24 The variable resistor R in the circuit in Figure 2.24 is adjusted until i_a equals 1A. Find the value of R.

Figure P2.24



2.28 Find (a) i_0, (b) i_1, and (c) i_2 in the circuit in Figure P2.28

Figure P2.28



2.30 For the circuit shown in Figure P2.30, calculate (a) i_Δ and v_o and (b) show that the power developed equals the power absorbed.

Figure P2.30