1.7 The current entering the upper terminal of Fig. 1.5 is

$$i = 24 \cos 4000t \text{ A}$$

Assume the charge at the upper terminal is zero at the instant the current is passing through its maximum value. Find the expression for $q(t)$.

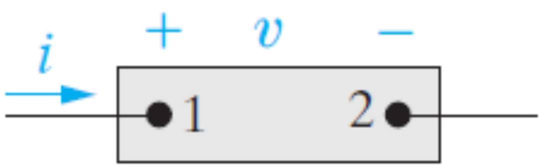


Fig 1.5

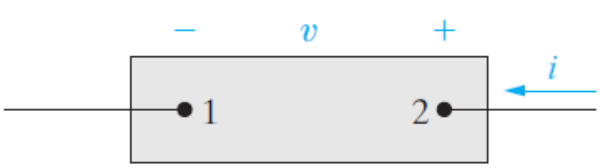
1.15 The references for the voltage and current at the terminals of a circuit element are as shown in Fig. 1.6(d). The numerical values for v and i are -20 V and 5 A.

HW

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?



(d) $p = vi$

Fig 1.6 (d)

1.18 The voltage and current at the terminals of the circuit element in Fig. 1.5 are zero for $t < 0$. For $t \geq 0$ they are

PSPICE
MULTISIM

hw

$$v = 75 - 75e^{-1000t}\ \text{V},$$

$$i = 50e^{-1000t}\ \text{mA}.$$

a) Find the maximum value of the power delivered to the circuit.

b) Find the total energy delivered to the element.

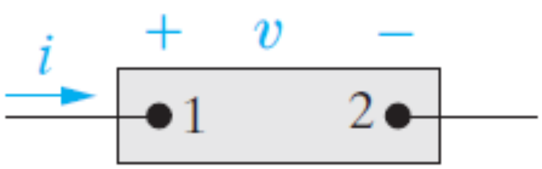


Fig 1.5

1.25 The voltage and current at the terminals of the circuit element in Fig. 1.5 are zero for $t < 0$. For $t \geq 0$ they are

PSPICE
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HW

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

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

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

b) Find the total energy absorbed by the element.

b) $W = \int_0^\infty p\,dt$

20 points

$$W = \int_0^\infty (2000 e^{-100t} \sin^2 150t)\,dt$$

We can eliminate the $\sin^2$ term by using:

$$\sin^2\alpha = \frac{1 - \cos 2\alpha}{2}.$$

So, $$W = 2000 \int_0^\infty e^{-100t} * \left(\frac{1}{2} - \frac{\cos 300t}{2}\right) dt$$

$$= 1000 \int_0^\infty e^{-100t}\,dt - 1000 \int e^{-100t} \cos 300t\,dt$$

$$A - B$$

to solve B : $\int_0^\infty e^{-100t} \cos 300t\,dt.$

Use the formula

$$\int e^{ax} \cos bx\,dx = \frac{1}{a^2+b^2} \cdot e^{ax}(a\cos bx + b\sin bx)$$