

**Problem 1.**

Determine the current flowing through an element if the charge flow is given by

- (a)  $q(t) = (2e^{-3t} - 4e^{-t})$  nC
- (b)  $q(t) = 20\sin 50\pi t$  pC
- (c)  $q(t) = 30e^{-2t} \cos 60t$   $\mu$ C

**Problem 2.**

Find the charge  $q(t)$  flowing through a device if the current is:

- (a)  $i(t) = (6t+4)$  mA,  $q(0)=0$
- (b)  $i(t) = 40\cos(20t+\pi/6)$   $\mu$ A,  $q(0)=2\mu$ C

**Problem 3.**

The charge entering a certain element is shown in Fig.1.1. Find the current at:

- (a)  $t = 4$  ms
- (b)  $t = 12$  ms
- (c)  $t = 20$  ms

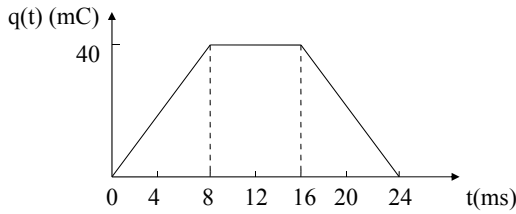


Figure 1.1

**Problem 4.**

The current flowing past a point in a device is shown in Fig.1.2. Calculate the total charge through the point over the time period  $[0,5]$ .

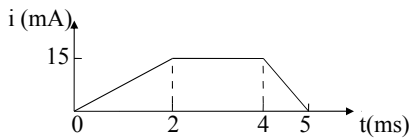


Figure 1.2

**Problem 5.**

The current through an element is shown in Fig.1.3 Determine the total charge that passed through the element at:

- (a)  $t = 2$  s
- (b)  $t = 4$  s
- (c)  $t = 5$  s. Assume  $q(0)=0$ .

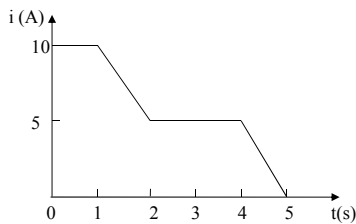


Figure 1.3

**Problem 6.**

The charge entering the positive terminal of an element is

$$q = 5 \sin 6\pi t \text{ mC}$$

while the voltage across the element (plus to minus) is

$$v = \cos 6\pi t \text{ V}$$

- (a) Find the power delivered to the element at  $t = 0.3 \text{ s}$
- (b) Calculate the energy delivered to the element between 0 and 0.6s.

**Problem 7.**

The voltage  $v$  across a device and the current  $I$  through it are

$$v(t) = 2 \cos 2t \text{ V}, \quad i(t) = 8(1 - e^{-0.5t}) \text{ A}$$

Calculate:

- (a) the total charge in the device at  $t = 1 \text{ s}$ , assume  $q(0) = 0$ .
- (b) the power consumed by the device at  $t = 1 \text{ s}$ .

**Problem 8.**

Find the power absorbed by each element in Fig.1.4.

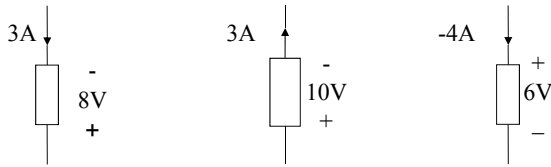


Figure 1.4

**Problem 9.**

Figure 1.5 shows a circuit with five elements. If

$$p_1 = 105 \text{ W}, \quad p_2 = -70 \text{ W}, \quad p_4 = 60 \text{ W}, \quad p_5 = -30 \text{ W},$$

calculate the power  $p_3$  received or delivered by element 3.

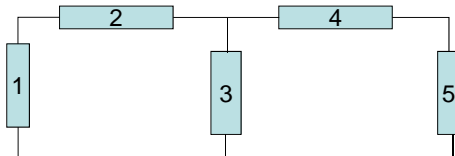


Figure 1.5

**Problem 10.**

Calculate the power absorbed or supplied by each element (including the sources) in Fig.1.6

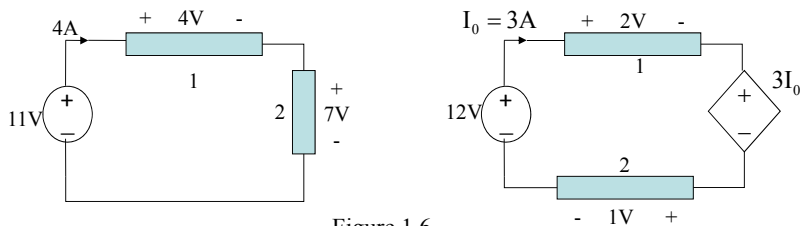


Figure 1.6

Problem 11.

Find  $I$  in the network of Fig. 1.7 (Answer:  $I=2.5A$ )

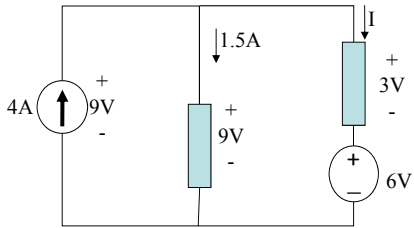


Figure 1.7

Problem 12.

Find  $v_0$  in the circuit of Fig. 1.8 ( $V_0=18V$ )

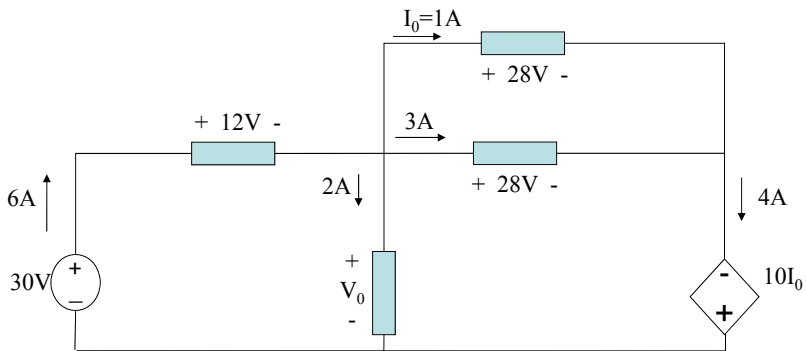


Figure 1.8