Boise State University
Electrical Engineering Department

EE 210: Circuits I
Spring 2018 Due Date: Wed. 1/24/2018

Problem 1.

How many coulombs are represented by these amounts of electrons:

(a) 6.482×10^{17} (b) 1.24×10^{18}
(c) 2.46×10^{19} (d) 1.628×10^{20}

Problem 2.

The charge flowing in a wire is plotted in Fig. 1.24. Sketch the corresponding current.

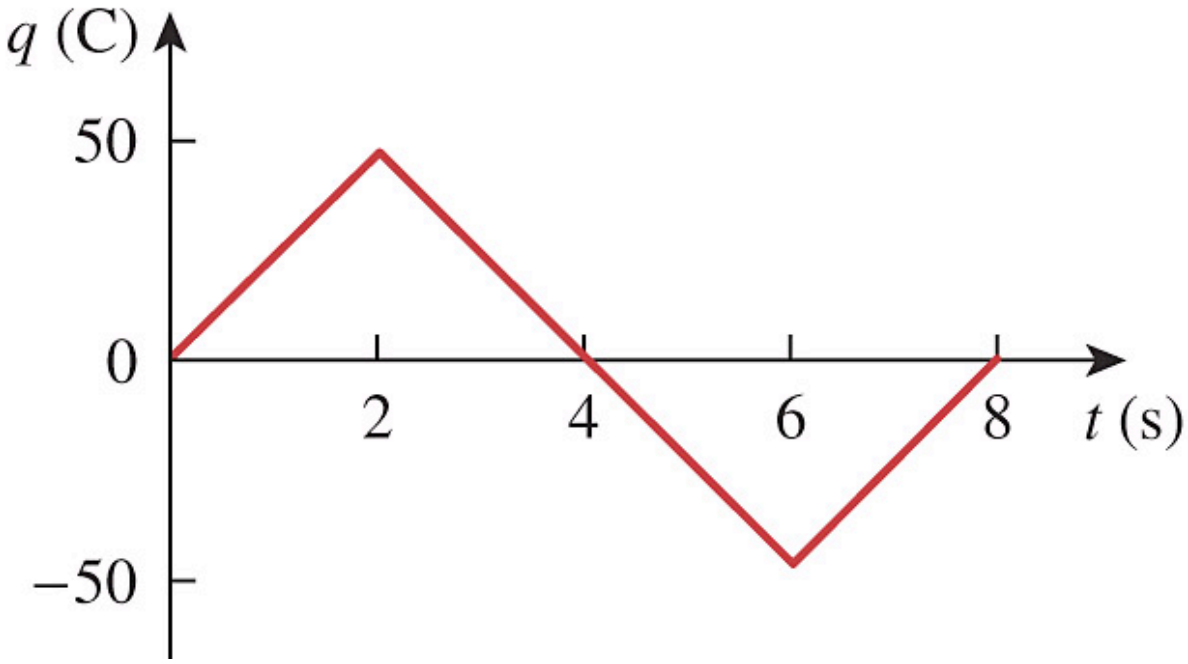

Figure 1.24

Problem 3.

The current through an element is shown in Fig. 1.26. Determine the total charge that passed through the element at:

(a) $t = 1$ s (b) $t = 3$ s (c) $t = 5$ s

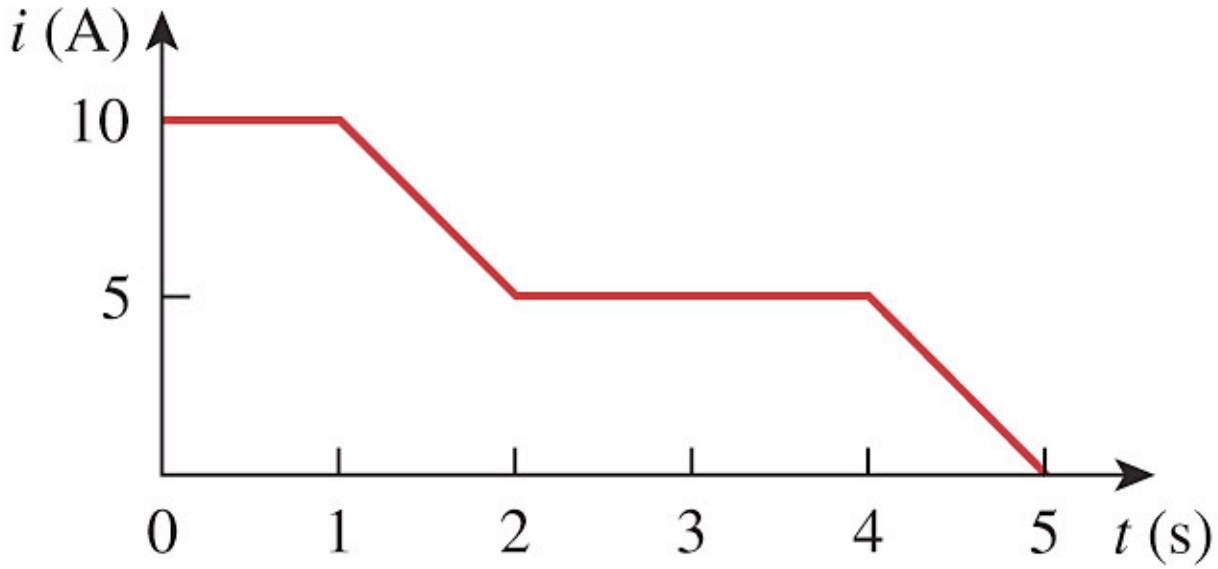

Figure 1.26

Problem 4.

A lightning bolt with 10 kA strikes an object for 15 μs. How much charge is deposited on the object?

Problem 5.

If the current flowing through an element is given by

$$i(t) = \begin{cases} 3t\text{A}, & 0 \leqq t < 6\text{ s} \\ 18\text{A}, & 6 \leqq t < 10\text{ s} \\ -12\text{A}, & 10 \leqq t < 15\text{ s} \\ 0, & t \geqq 15\text{ s} \end{cases}$$

Plot the charge stored in the element over $0 < t < 20$ s.

Problem 6.

The charge entering the positive terminal of an element is

$$q = 10\sin 4\pi t \text{ mC}$$

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

$$v = 2\cos 4\pi t \text{ V}$$

(a) Find the power delivered to the element at t = 0.3 s
(b) Calculate the energy delivered to the element between 0 and 0.6s.

Problem 7.

The current entering the positive terminal of a device is $i(t) = 3e^{-2t}$ A and the voltage across the device is $v(t) = 5\,di/dt$ V.

(a) Find the charge delivered to the device between $t = 0$ and $t = 2$ s.
(b) Calculate the power absorbed.
(c) Determine the energy absorbed in 3 s.

Problem 8.

Figure 1.28 shows a circuit with five elements. If

$$p_1 = -205 \text{ W}, p_2 = 60 \text{ W}, p_4 = 45 \text{ W}, p_5 = 30 \text{ W},$$

calculate the power p_3 received or delivered by element 3.

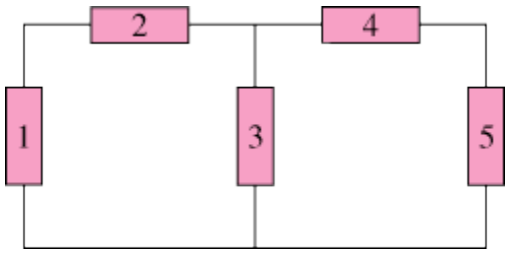

Figure 1.28

Problem 9.

Find I in the network of Fig. 1.30.

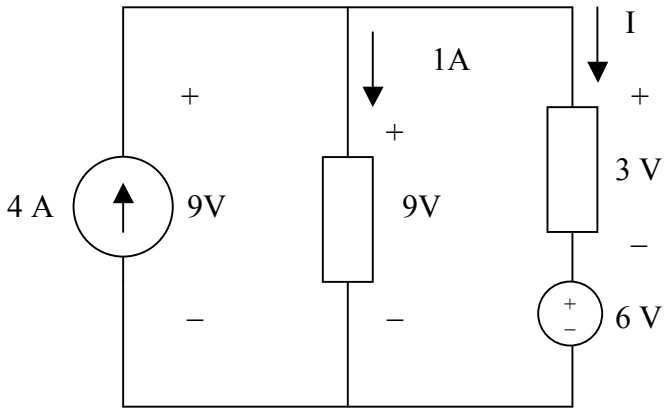

Figure 1.30

Problem 10.

A 600-W TV receiver is turned on for 4 hours with nobody watching it. If electricity costs 10 cents/kWh, how much money is wasted?