

# HOMEWORK SET #1

Chapter 1: 1, 2, 5, 6, 8, 10, 11, 14, 15, 17, 19, 23, 24, 20

Chapter 2: 3, 5, 10, 14, 15, 19, 20, 21, 22, 23, 24, 26, 28

## Solutions:

- 1.1) A lightning bolt carrying 10,000 amperes lasts for 50 microseconds. If the lightning strikes a tractor, determine the charge deposited on the tractor if the tires are assumed to be perfect.

Solution:  $i = \frac{dq}{dt} = I = \text{const}$

$$dq = I dt \Rightarrow \int_0^t dq = q(t) - q(0) = I \int_0^t dt = It$$

Since  $q(0) = 0$ , we have that:

$$q(t) = I \cdot t = 10^4 \times 50 \times 10^{-6} = 50 \times 10^{-2} = 0.5 \text{ C}$$

- 1.2) Determine the time required for a 24 A battery charger to deliver a charge of 1200 C.

Solution: From problem 1.1, it follows that:

$$q(t) = It \Rightarrow t = \frac{q(t)}{I} = \frac{1200}{24} = 50 \text{ s}$$

- 1.5) The charge entering an element is shown in Fig. P1.5. Find the current in the element in the time interval  $0 \leq t \leq 0.5$  sec.

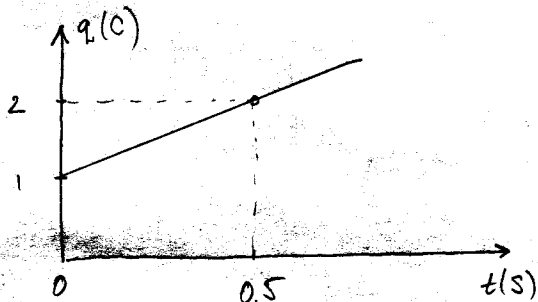


Figure P1.5

Solution: From the figure, it follows immediately that:

$$q(t) = 1 + \frac{1}{0.5} t = 1 + 2t$$

Thus:

$$i(t) = \frac{dq}{dt} = \frac{d}{dt}(1 + 2t) = 2 \text{ A} = \text{const}$$