Spring, 2007

EECS70A / CSE 70A Network Analysis I
Prof. Peter Burke

Homework # 1 solution

1. Problem 1.1

   (a) $Q = n \times q = 6.482 \times 10^{17} \times (-1.602 \times 10^{-19}) = -1.04 \times 10^{-1}$ C.

   (b) $Q = n \times q = 1.24 \times 10^{18} \times (-1.602 \times 10^{-19}) = -1.99 \times 10^{-1}$ C.

   (c) $Q = n \times q = 2.46 \times 10^{19} \times (-1.602 \times 10^{-19}) = -3.94$ C.

   (d) $Q = n \times q = 1.628 \times 10^{20} \times (-1.602 \times 10^{-19}) = -26.1$ C.

2. Problem 1.4

   Given: I = 3.2A

   $Q = I \times t = 3.2\ (A) \times 20\ (s) = 64$ C.

3. Problem 1.5

   Given: i(t) = 1/2 t A

   $Q = \int i(t)\, dt = (1/2) \int_{t=0s}^{t=10s} t\, dt = (1/2) \times (t^2/2) \Big|_{t=0s}^{t=10s} = (1/2) \times (10^2/2) = 25$ C

4. Problem 1.8

   Total charge, $Q = (1 + 2)\ (ms) \times 10 / 2\ (mA) = 15\ \mu C$

5. Problem 1.9

   (a) At t = 1s

   $Q = 10\ (A) \times 1(s) = 10$ C

   (b) At t = 3s

   $Q = 10\ (C) + (5 + 10)\ (A) \times 1 / 2\ (s) + 5\ (A) \times 1\ (s) = 22.5$ C

   (c) At t = 5s

   $Q = 22.5\ (C) + (1 + 2)\ (s) \times 5 / 2\ (A) = 30$ C

6. Problem 1.21

   Given: V = 120 V and P = 60W

   I = P/ V = 60 (W) / 120 (V) = 0.5 A

   $Q = I \times t = 0.5\ (A) \times 24\ (hr/day) \times 60\ (min/hr) \times 60(s/min) = 4.32 \times 10^4$ C.

   # of electrons = $Q / q = (4.32 \times 10^4 / 1.602 \times 10^{-19}) = 2.7 \times 10^{23}$ electrons

7. Problem 1.23

   Given: P = 1.8 kW, t = 15mins/ day, cost = 10 cents/kWh.

   Total hours = 15 (min/ day) / 60 (min/hr) $\times$ 30 days = 7.5 hrs.

   Cost for 30days = 1.8 (kW) $\times$ (7.5 hrs) $\times$ (10 cents/kWh) = 135 cents = $1.35