ECE-UY 2004-Fundamentals of Electric Circuits-Spring 2023
Homework #1: General Concepts
Due Date: Feb 2, 2023

1. Convert the followings to engineering notation using SI prefixes:

(a) 1230 fs $= 1.230 \times 10^{-12}$ s
(b) 0.0001 decimeter $= 0.001$ m
(c) 1400 mK $= 1.4$ K
(d) 32 nm $= 3.2 \times 10^{-8}$ m
(e) 13,560 kHz $= 13.560$ Hz

2. A conductor has a DC current of 5 amperes. How many electrons pass a fixed point on the conductor in one minute?

$I = 5$ A, $t = 60$ s, $I = \frac{Q}{t}$

$Q = It = 5 \times 60 = 300$ C

3. How many electrons pass through a fixed point in a 100-watt light bulb in 1 hour if the applied constant voltage is 120 V?

$P = 100$ W, $t = 3600$ s, $V = 120$ V

$P = VI$, $I = \frac{P}{V} = \frac{100}{120}$

$Q = It = \frac{100}{120} \times 3600 = 3000$ C $= 3$ kC

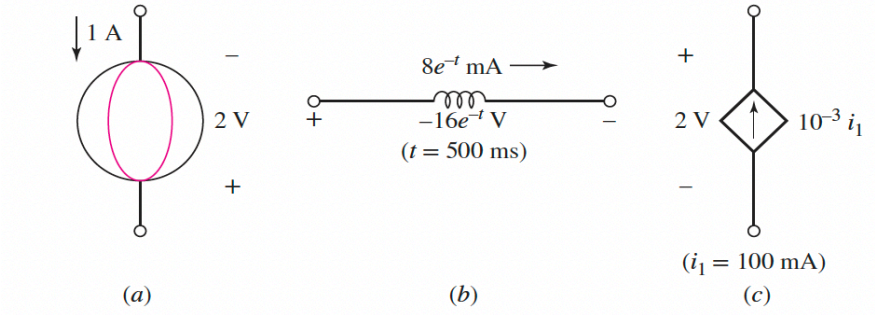
4. A new type of device appears to accumulate charge according to the expression $q(t) = 10t^2 - 22t\ (mC)$ where t is in sec. (a) Over the interval $0 \le t < 5$ sec., at what time does the current flowing into the device equal zero? (b) Sketch $q(t)$ and $i(t)$ over the interval $0 \le t < 5$ sec.

(a) $20t - 22 = 0$

$t = \frac{22}{20} = 1.1$ s

#6 is done below

5. Determined the power absorbed by each of the elements in the figure provided below.



(a) $P = VI = 1 \times 2 = 2$ W

(b) $P = VI = -16e^{-0.5} \times 8e^{-0.5} = -\frac{16}{e^{0.5}} \times \frac{8}{e^{0.5}} = -\frac{128}{e} = -128e^{-1}$ W

(c) $P = VI = 2 \times 10^{-3} \times 100 \times 10^{-3} = 2 \times 100 = 200$ W

(4b) $q(t) = 10t^2 - 22t$ $\quad i(t) = 20t^2 - 22$

t	$q(t)$
0	$= 0$
1	$= 10 - 22 = -12$
2	$= 40 - 44 = -4$
3	$= 90 - 66 = 24$
4	$= 160 - 88 = 72$

t	$i(t)$
0	$= -22$
1	$= -2$
2	$= 80 - 22 = 58$
3	$= 180 - 22 = 158$
4	$= 320 - 22 = 298$