Monday, February 1, 2011

CHAPTER 1

P.P.1.1 A proton has 1.602×10^{-19} C. Hence, 6 million protons have

$+1.602 \times 10^{-19} \times 6 \times 10^{6} =$ **9.612×10^{-13} C**

P.P.1.2 $i = dq/dt = -10(-2)e^{-2t}$ mA

At $t = 1.0$ sec, $i = 20e^{-2} =$ **2.707 mA**

P.P.1.3 $q = \int i dt = \int_0^1 4dt + \int_1^2 4t^2 dt = 4t \Big|_0^1 + (4/3)t^3 \Big|_1^2$

$= 4 + 28/3 =$ **13.333 C**

P.P.1.4 (a) $V_{ab} = w/q = -30/6 =$ **–5 V**

The negative sign indicates that point a is at a higher potential than point b.

(b) $V_{ab} = w/q = -30/-3 =$ **10 V**

P.P.1.5 (a) $v = 2i = 10 \cos(60\pi t)$

$p = vi = 50 \cos^2(60\pi t)$

At $t = 5$ ms, $p = 50 \cos^2(60\pi\, 5\text{x}10^{-3}) = 50 \cos^2(0.3\pi)$

$=$ **17.27 watts**

(b) $v = 10 + 5\int_0^t i dt = 10 + \int_0^t 25 \cos 60\pi t\, dt = 10 + \frac{25}{60\pi} \sin 60\pi t$

$p = vi = 5 \cos(60\pi t)[10 + (25/(60\pi)) \sin(60\pi t)]$

At $t = 5$ ms, $p = 5 \cos(0.3\pi)\{10 + (25/(60\pi)) \sin(0.3\pi)\}$

$=$ **29.7 watts**

P.P.1.6 $p = vi = 15 \times 240 = 3600$ watts; $w = p \times t$

therefore, $t = w/p = (180 \times 10^3)/3600 =$ **<u>50 seconds</u>**

P.P.1.7 $p_1 = 5(-9) =$ **<u>–45w</u>**

$p_2 = 2(9) =$ **<u>18w</u>**

$p_3 = 0.6xI(4) = 0.6(5)(4) =$ **<u>12w</u>**

$p_4 = 3(5) =$ **<u>15w</u>**

Note that all the absorbed power adds up to zero as expected.

P.P.1.8 $i = dq/dt = e\frac{dn}{dt} = -1.6 \times 10^{-19} \times 10^{13} = -1.6 \times 10^{-6}$ A

$p = v_0\, i = 30 \times 10^3 \times (1.6 \times 10^{-6}) =$ **<u>48mW</u>**

P.P.1.9

Minimum monthly charge	= \$12.00
First 100 kWh @ \$0.16/kWh	= \$16.00
Next 200 kWh @ \$0.10/kWh	= \$20.00
Remaining 50 kWh @ \$0.06/kWh	= <u>\$3.00</u>
Total Charge	= \$51.00

Average cost = \$51/[100+200+50] = **<u>14.571 cents/kWh</u>**

P.P.1.10 This assigned practice problem is to apply the detailed problem solving technique to some of the more difficult problems of Chapter 1.