Solution PHCS 102 – TEST-2   1/6/2004
MC – Solutions

1. $R_{tot} = 2 + 3 + \dfrac{(10)(10)}{10+10} = 10\Omega$, $\quad P = I^2 R = \left(\dfrac{\varepsilon}{10}\right)^2 x\, 2 = 2\ W$, $(for\ \varepsilon = 10\ V)$

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2. $R = \dfrac{(10)(10)}{10+10} = 5M\Omega$, $\tau = RC$, $Q = Q_0\left(1 - e^{-t/\tau}\right) = 0.64\,Q_0$

$\therefore t = 1.0216\,\tau = 1.0216\ RC = 5.108$

$C(\mu F) = 10.25$, $(for\ C = 2\ \mu F)$

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3. $A = \pi r^2 = 7.85x10^{-7}\ m^2$, $R = \dfrac{\rho L}{A} = 0.252$, $I = 0.5A$, $(for\ 0.1\ V)$

$I = A\,n\,e\,v_d \quad \therefore v_d = 4.6\ \mu m/s$

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4. $T = \dfrac{2\pi m}{qB} = \dfrac{6.558\ x\ 10^{-8}}{B} = 0.65\ \mu s$, $(for\ B = 0.1\ T)$

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5. $R = 20\left[1 + 0.0045\left(1500 - 20\right)\right] = 153.2\ \Omega$

$I = V/R = 120/153.2 = 0.78\ A$

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6. $\mu = \pi r^2 I = 0.785I = 0.785\ A\ m^2$, $\tau = \mu\,B = 0.157\ N\,.m$

Problem 1:

Loop1: $-3I_3 + 6I_2 = 0$ $I_1 = 1.42A$

Loop2: $6I_2 + 5I_1 = 10$ $\}$ $I_2 = 0.47A$

Currents: $I_1 = I_2 + I_3$ $I_3 = 0.95A$

$V_{ab} = -5I_1 - (-20) = +12.9\ V$

Problem 2:

$F = \int_0^2 I\,(0.2x)\,dx = 0.8\ N$