Answers Exam III 2011

1. a) $B_x = \frac{\mu_0 i}{2\pi\sqrt{d^2+H^2}}\cos\theta$ | $\cos\theta = \frac{H}{\sqrt{d^2+H^2}}$

$B_y = \frac{\mu_0 i}{2\pi\sqrt{d^2+H^2}}\sin\theta$ | $\sin\theta = \frac{d}{\sqrt{d^2+H^2}}$

b) $B_y = 0$; $B_x = \frac{\mu_0 i}{\pi}\frac{H}{d^2+H^2}$

c) $\vec{F} = q v_0 \frac{\mu_0 i}{\pi}\frac{H}{d^2+H^2}\vec{i}_y$

2. a) $i = \frac{B_0 H \beta a \cos\beta t}{2S}$

b) 

$i = -\frac{2\pi\beta B_0}{R}\frac{H^2}{3}\cos\beta t$

3. a) $i_2 = 0$; $i_1 = i = \frac{V}{R}$

b) $i(t) = \frac{V}{R_1} e^{\frac{R_2}{L}t}$

4. a) $Q(t) = Q_0 e^{-\frac{t}{RC}}$

b) $Q_1(t) = \frac{Q_0}{C_2\left(\frac{1}{C_1}+\frac{1}{C_2}\right)} + \alpha e^{-\left(\frac{1}{C_1}+\frac{1}{C_2}\right)\frac{t}{R}}$

$\alpha = Q_0\left(1 - \frac{1}{C_2\left(\frac{1}{C_1}+\frac{1}{C_2}\right)}\right)$

$Q_2(t) = Q_0 - Q_1$