Question 1.

$$\int_0^l B_0 \cdot dl \Rightarrow B_0 = \frac{I_0}{l} \cdot \mu_0 n$$

We assume. rod length = L $\mu_{total} = M v = M \pi R^2 L$

$$dB_f = \frac{\mu_0 \cdot M_{total}}{2\pi (x^2 + a^2)^{\frac{3}{2}}} = \frac{\mu_0 \cdot M \cdot \pi R^2 L}{2\pi (x^2 + R^2)^{\frac{3}{2}}} \qquad B_f = \int_z^{z+L} \frac{\mu_0 \cdot M \cdot \pi R^2 L}{2\pi (x^2 + R^2)^{\frac{3}{2}}} dt$$

$$= 5000 \mu_0 L \left(\frac{z+L}{\sqrt{R^2 + (z+L)^2}} - \frac{z}{\sqrt{R^2 + z^2}} \right)$$

$$-B = B + B_f = I \mu_0 n + 5000 \mu_0 L \left(\frac{z+L}{\sqrt{R^2 + (z+L)^2}} - \frac{z}{\sqrt{R^2 + z^2}} \right)$$

Question 2.

A). $V = 10 \frac{\cos(1000t)}{1000}$
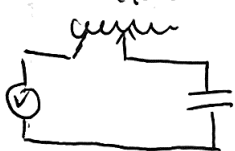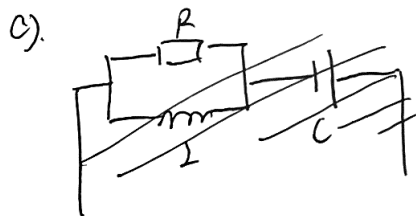

$$L = \frac{\mu n^2 \cdot A}{l} = \frac{4\pi \times 10^{-7} \times 5000^2 \cdot A}{l} = 10\pi A \cdot 10\pi^2 R^2$$

$l = 0.134 m$

B] $l = 0.134 m$

$$f = \frac{1}{2\pi \sqrt{LC}}, \quad \Rightarrow C = \frac{1}{(2\pi f)^2 L} = \frac{1.915}{R^2} nF$$
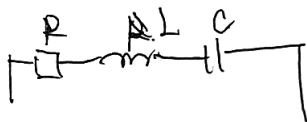
$$L = 50 \Omega t$$

C).

let's assume.

$R = 50 \Omega$

$L = 10\pi^2 R^2 j.$

$$C = \frac{1}{522112728 R^2}$$

$50 \Omega + 10\pi R^2 j$

$R + L$

$50 \Omega + 10\pi R^2 j$

$$|Z| = \sqrt{R^2 + (wL - \frac{1}{wC})^2}$$

$$= \sqrt{50 \Omega^2 + [(2000\pi^3 d R^2) - (83096.82 R^2)]^2} = 4.13\Omega$$

$$\Rightarrow Q = \frac{\sqrt{L}}{R\sqrt{C}} = \frac{0.0113}{\sqrt{d}} = 8.87 \times 10^3$$

$$= \frac{1}{\frac{1}{Q_L} + \frac{1}{Q_C}} = \frac{1}{\frac{R_L}{wL}} + th \ C \cdot R. \quad (using \ the \ capacitor$$

Question 3.

A). $\lambda = \frac{\lambda_0}{n}$ $n_{air} = 1$ $\Rightarrow$ $1 \cdot \sin 88° = 3.8816 \cdot \sin\theta$ $\Rightarrow \theta = 14.82°$

$\Rightarrow \lambda_{new} = \frac{632.8\,nm}{3.8816} = 163.03\,nm.$

B) $1 \cdot \sin 10° = 1.544 \cdot \sin\theta \Rightarrow \theta = 6.46°$ $\lambda_{new} = \frac{589\,nm}{1.544} = 381.48\,nm.$

C). $\sin\theta_{crt} = \frac{n_b}{n_a} = \frac{3.8816}{4}$ $\frac{1}{3.8816} = 14.93°$