

Chapter 30.1-30.3 - Inductance

Physics 207

Problem 1

$$M = 1.18 \times 10^{-5} \text{ H}$$
$$\mathcal{E}_2 = -0.0207 \text{ V}$$

Problem 2

$$U_B = 1.50 \text{ J}$$
$$P_R = 45.0 \text{ W or J/s}$$

Problem 3

$$\left| \frac{dI}{dt} \right| = 6.92 \text{ mA/s}$$

Problem 4

$$\frac{E}{B} = \frac{1}{\sqrt{\epsilon_0 \mu_0}} = c = 3 \times 10^8 \text{ m/s}$$
$$B = 1.67 \text{ } \mu\text{T}$$

Problem 5

$$\mathcal{E}_{max} = 0.641 \text{ V}$$
$$\Phi_{max} = 12.8 \text{ } \mu\text{Wb}$$
$$\mathcal{E} = 0.494 \text{ V}$$

Problem 6

Inside ($r < R$):

Outside ($r > R$):

$$E = \frac{\rho_0 r^2}{4\epsilon_0}$$
$$B = \frac{\mu_0 j_0 r^2}{3}$$
$$B = \frac{\mu_0 \epsilon_0 E_0 r^2}{3}$$
$$E = \frac{B_0 r^2}{3}$$
$$E = \frac{\rho_0 R^4}{4\epsilon_0 r^2}$$
$$B = \frac{\mu_0 j_0 R^3}{3r}$$
$$B = \frac{\mu_0 \epsilon_0 E_0 R^3}{3r}$$
$$E = \frac{B_0 R^3}{3r}$$