Chapter 30 - Inductance

Physics 207

1a. $I(t) = \dfrac{\mathcal{E}}{R} e^{-tR/L}$

1b. $I(t) = \dfrac{\mathcal{E}}{R}\left(1 - e^{-t_1 R/L}\right) e^{-(t_2 - t_1)R/L}$

2a. $i_1 = \dfrac{\mathcal{E}}{R_1}$

$i_2 = 0$

$i_3 = \dfrac{\mathcal{E}}{R_1}$

2b. $i_1 = \dfrac{\mathcal{E}}{R_1 + R_2}$

$i_2 = \dfrac{\mathcal{E}}{R_1 + R_2}$

$i_3 = 0$

2c. $i_3 = \dfrac{\mathcal{E}}{R_1}\left(1 - e^{\frac{-R_1 R_2 t}{L(R_1 + R_2)}}\right)$

3a. $i_0 = 0$

$v_{ac} = 0$

$v_{cb} = \mathcal{E}$

3b. $i_0 = \dfrac{\mathcal{E}}{R_0 + R}$

$v_{ac} = \dfrac{\mathcal{E} R_0}{R_0 + R}$

$v_{cb} = \dfrac{\mathcal{E} R}{R_0 + R}$

3c. $i_0(t) = \dfrac{\mathcal{E}}{R + R_0}\left(1 - e^{-(R+R_0)t/L}\right)$

$v_{ac}(t) = \dfrac{\mathcal{E} R0}{R + R_0}\left(1 - e^{-(R+R_0)t/L}\right)$

$v_{cb}(t) = \dfrac{\mathcal{E} R}{R + R_0}\left(1 - e^{-(R+R_0)t/L}\right)$

4. $0 = B\pi a^2 \omega \sin(\omega t) - \dfrac{q}{C} - \dfrac{dq}{dt} R$

5a. $K_m = 1.25$

$\chi_m = 0.25$

5b. $B_f = 1.25 B_0$

5c. $u_f = 1.25 u_0$

6a. At $t = 0$: Resistor $I = 24.0$ mA

30 mH Inductor $I = 0$

50 mH Inductor $I = 0$

At $t \to \infty$: Resistor $I = 0$ mA

30 mH Inductor $I = 20.0$ mA

50 mH Inductor $I = 0$

6b. At $t = 0$: Resistor $I = 24.0$ mA

30 mH Inductor $I = 0$

50 mH Inductor $I = 0$

At $t \to \infty$: Resistor $I = 0$ mA

30 mH Inductor $I = 0$

50 mH Inductor $I = 0$