Övning 8 – Lösningar

32.2 Vi behandlar telefonkabel som en spole:

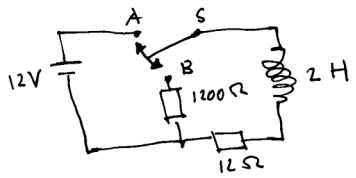
Då gäller:

$$L = \frac{\mu_0 N^2 A}{\ell} = \frac{4\pi\cdot 10^{-7}\cdot 70^2\cdot \pi\cdot (6.5\cdot 10^{-3})^2}{0.6} = 1.36\,\mu H$$

32.13 a) $L = \frac{\mu_0 N^2 A}{\ell} = \frac{\mu_0 (120)^2\cdot \pi\cdot (5\cdot 10^{-3})^2}{0.09} = 15.8\,\mu H$

b) $\Phi_B' = \frac{\mu_m}{\mu_0}\Phi_B \Rightarrow L = \frac{\mu_m N^2 A}{\ell} = 800\cdot 1.58\cdot 10^{-5} = 12.6\,mH$

32.26



a) $I = \frac{\mathcal{E}}{R} = \frac{12V}{12\Omega} = 1\,A$

b) $I_{initial} = 1\,A$:

$\Delta V_{12} = 1A\cdot 12\Omega = 12V$

$\Delta V_{1200} = 1A\cdot 1200\Omega = 1200V$

$\Delta V_L = \Delta V_{12} + \Delta V_{1200} = 1212V$

c) $I(t) = I_{max} e^{-Rt/L}$

$\frac{dI}{dt} = I_{max}\cdot\frac{R}{L} e^{-Rt/L}$ och $-L\frac{dI}{dt} = \Delta V_L = I_{max} R e^{-Rt/L}$

Vi löser då ekvationen

$$12V = (1212V)\cdot e^{-1212t/2} \Rightarrow t = 7.62\,ms$$

32.40 $\mathcal{E}_2 = -M\frac{dI_1}{dt} = -(1\cdot 10^{-4}H)(1\cdot 10^4 A/s)\cdot\cos 1000t$

$(\mathcal{E}_2)_{max} = 1\,V$

32.59 a) $Q = Q_{max} e^{-\frac{Rt}{2L}}\cos\omega_d t \Rightarrow I_{max} \propto e^{-Rt/2L}$

$0.500 = e^{-Rt/2L} \Rightarrow \frac{Rt}{2L} = -\ln 0.5 \Rightarrow t = -\frac{2L}{R}\ln(0.5) =$

$t = -0.693\cdot\frac{2L}{R}$

b) $U_0 \propto Q_{max}^2$ och $U = 0.5\, U_0$ ②

då får vi $Q = \sqrt{0.5}\; Q_{max} = 0.707\, Q_{max}$

$$t = -\frac{2L}{R} \ln(0.707) = 0.347 \cdot \frac{2L}{R}$$