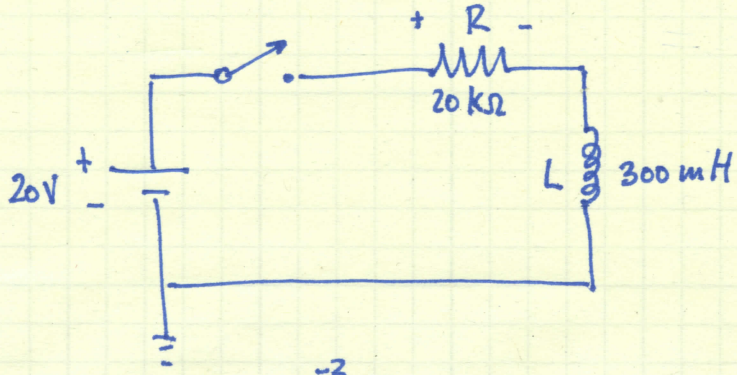
HW #16

11-11



a.) $\tau = \frac{L}{R} = \frac{300 \cdot 10^{-3}\ H}{20 \cdot 10^{3}\ \Omega} = 15\ \mu s$

b.) $i_L = \frac{E}{R}\left(1 - e^{-t/\tau}\right) = \frac{20\ mV}{20\ k\Omega}\left(1 - e^{-t/\tau}\right) = 1mA\left(1 - e^{\frac{-t}{15\mu s}}\right)$

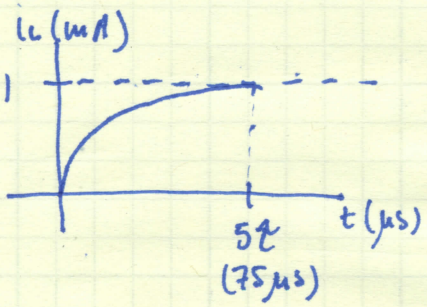
c.) $V_L = E \cdot e^{\frac{-t}{\tau}} = 20\ V\ e^{-t/15\mu s}$

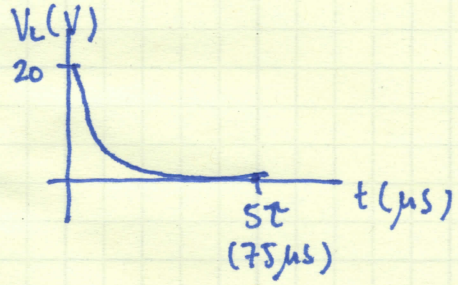
$V_R = i_R \cdot R = i_L R = E\left(1 - e^{-t/\tau}\right) = 20\ V\left(1 - e^{-t/15\mu s}\right)$

d.) i_L: $1\tau = 0{,}632\ mA$ $3\tau = 0{,}951\ mA$ $5\tau = 0{,}993\ mA$

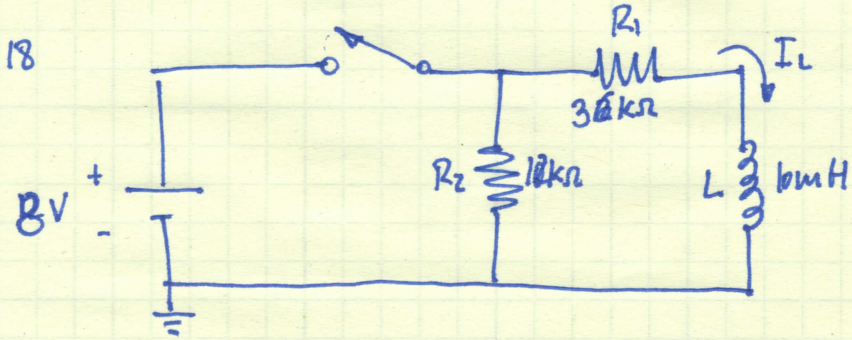
V_L: $1\tau = 7{,}36\ V$ $3\tau = 0{,}98\ V$ $5\tau = 140\ mV$

e.)





11-18

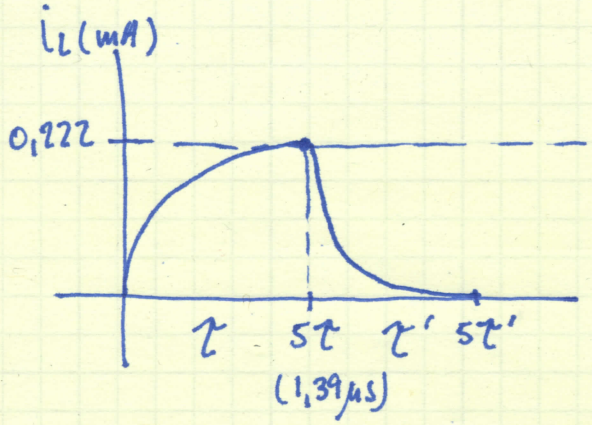
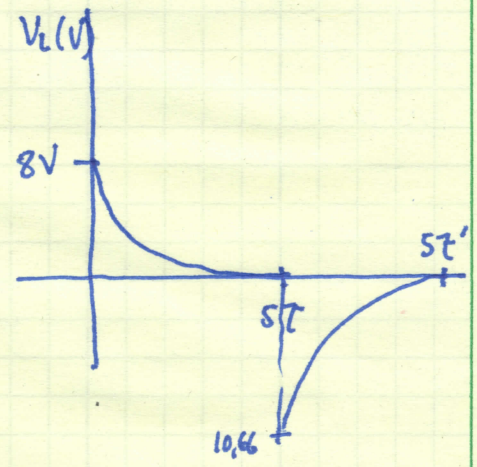


$\tau = \frac{L}{R} = \frac{10\ mH}{36\ k\Omega} = 0{,}278\ \mu s$

$V_L = 8V \cdot e^{\frac{-t}{0{,}278\mu s}}$ $i_L = \frac{E}{R}\left(1 - e^{-t/\tau}\right) = 0{,}222\ mA\left(1 - e^{\frac{-t}{0{,}278\mu s}}\right)$

b.) Steady State $\Rightarrow 5 \cdot \tau$

$$\tau' = \frac{L}{R} = \frac{10\,mH}{12\,k\Omega + 36\,k\Omega} = 0{,}208\,\mu s$$

$$i_L = I\, e^{-t/\tau} = 0{,}222\,mA \cdot e^{\frac{-t}{0{,}208\,\mu s}}$$

$$V_L = -(0{,}222\,mA)\cdot(48\,k\Omega)\, e^{-t/\tau} = -10{,}66\,V \cdot e^{-t/0{,}208\,\mu s}$$