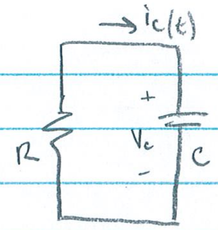
8.3



$R = 25K\Omega$
$V_c(0) = 20v$

Want $V_c(0.25) = 2.7067$ v.

a) $\tau = RC$, $\quad V_c = V_c(0)\, e^{-(t-t_0)/\tau}$ general solution.

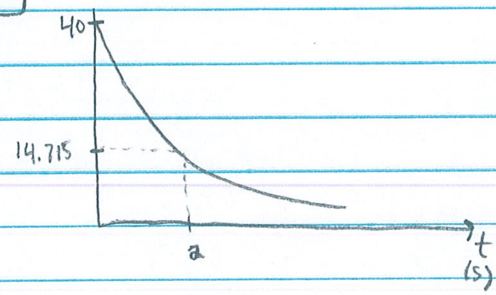
$$V_c(0.25) = 2.7067 = 20\, e^{-.25/\tau}$$

$$\rightarrow \tau = 1/8 = \overset{R}{(25000)}\overset{C}{C}$$

$$\boxed{C = 5\mu F}$$

b) $\boxed{V_c(t) = 20e^{-8t} \text{ volts.}}$

$\boxed{8,5}$



Time constant τ is time required to drop to 37% (e^{-1}) of original value.

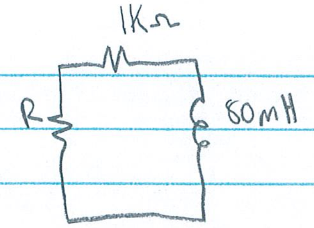
$40(.37) \simeq 14.8$

so $\boxed{\tau \simeq 2 \text{ sec}}$

if $C = 0.25\text{ mF}$, $\tau = RC = 2$

so $\boxed{R = 8\text{ K}\Omega}$

$\boxed{8.8}$



Want $i_L(0.05\text{ msec}) = 9.197\text{ mA}$

$i_L(0.15\text{ msec}) = 1.2447\text{ mA}$

find R and $i_L(0)$.

a) General solution: $i_L(t) = i_L(0)\, e^{-t/\tau}$ $\qquad \tau = L/R$.

plug in given values: $i_L(.05) = 9.197\text{ mA} = i_L(0)\, e^{-.05\text{ms}/\tau}$

$i_L(.15) = 1.2447\text{ mA} = i_L(0)\, e^{-.15\text{ms}/\tau}$

divide the two: $\dfrac{9.197}{1.2447} = e^{(-.05\text{ms}/\tau)-(-.15\text{ms}/\tau)}$

$$\ln(7.3889) = -\frac{0.05\text{ms}}{\tau} + \frac{0.15\text{ ms}}{\tau} = \frac{0.1\text{ ms}}{\tau}$$

$$\tau = \frac{.1\times10^{-3}}{\ln(7.3889)} = 5\times10^{-5} = L/R_{tot} = \frac{80\text{ mH}}{R_{tot}}$$

$R_{tot} = 1600\,\Omega$.

$R_{tot} = R + 1K\Omega \rightarrow \boxed{R = 600\,\Omega}$

Now find $i_L(0)$: $\quad 9.197\text{mA} = i_L(0)\, e^{-.05\text{ms}/5\times10^{-5}}$

$$i_L(0) = 9.197\text{ mA}/.3678 = \boxed{25\text{ mA}}$$

b) $\boxed{i_L(t) = 25\, e^{-20000t}\text{ mA}}$