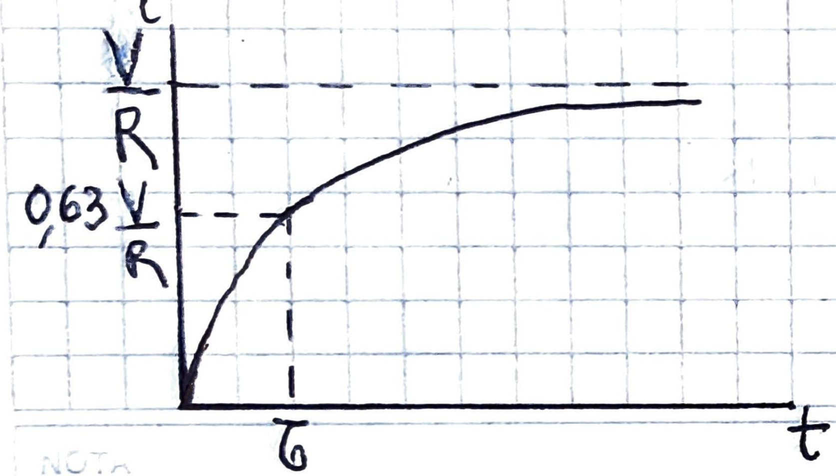
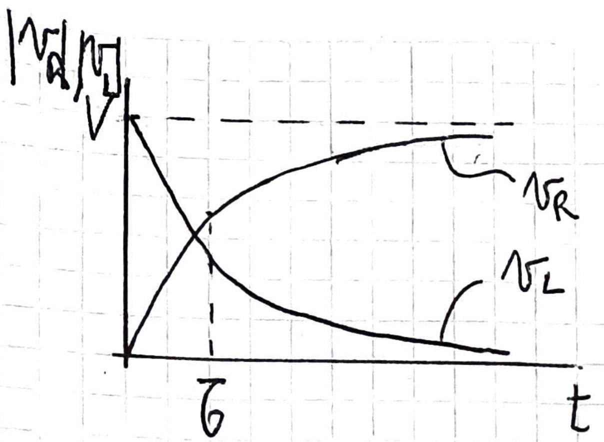


$[\tau] = \text{Seg.}$

Para $t = \tau \longrightarrow i = 63\%\ e/R$

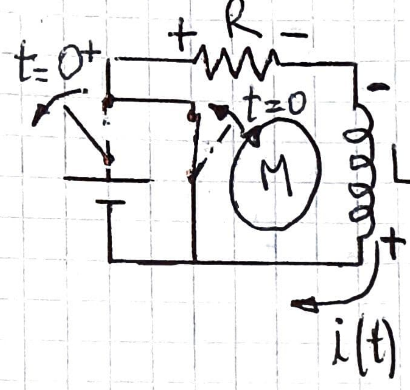
" $t = 5\tau \longrightarrow i = 99,3\%\ e/R$



$$|v_{R(t)}| = |i_{(t)} R| = V\left(1 - e^{-t/\tau}\right)$$

$$|v_{L(t)}| = \left|L\frac{di}{dt}\right| = V e^{-t/\tau}$$

DESCARGA DE LA BOBINA:



$$-iR - L\frac{di}{dt} = 0$$

$$-L\frac{di}{dt} = iR \Rightarrow \int\frac{di}{i} = -\frac{R}{L}\int dt + C_1$$

$$\ln|i| = -\frac{R}{L}t + C_1 \Rightarrow |i| = e^{-\frac{R}{L}t} \cdot \underbrace{e^{C_1}}_{C}$$

Como $i(t) > 0$:

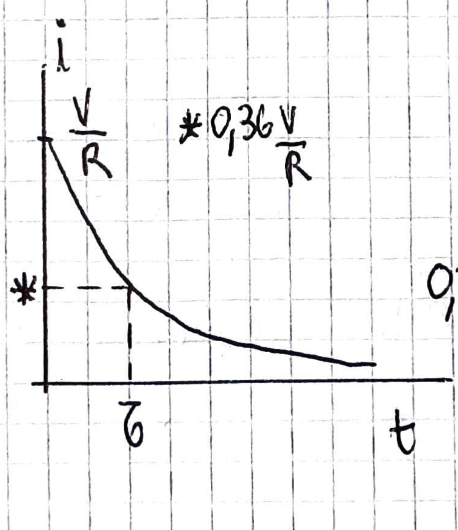
$i(t) = C e^{-t/\tau}$ Solución general, donde $\tau = \frac{L}{R}$

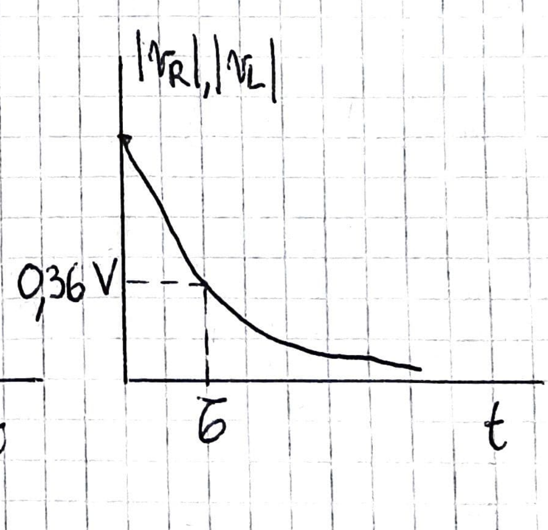
Condiciones iniciales: $i(t=0) = \frac{V}{R} \Rightarrow C = \frac{V}{R}$, reempl en S.G.

$$i(t) = \frac{V}{R} e^{-t/\tau}$$

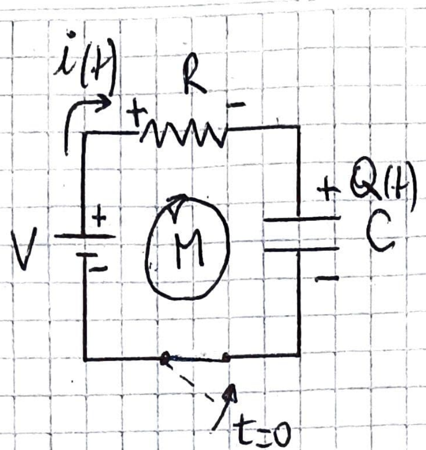
$$|v_{R(t)}| = |iR| = V e^{-t/\tau}$$

$$|v_{L(t)}| = \left|L\frac{di}{dt}\right| = V e^{-t/\tau}$$





Transitorio RC: CARGA DEL CAPACITOR:



M : $V - i(t)R - \frac{Q(t)}{C} = 0$, pero $i(t) = \frac{dQ(t)}{dt}$

$$V - \frac{dQ}{dt}R - \frac{Q(t)}{C} = 0$$

$-R\frac{dQ}{dt} = \frac{Q(t)}{C} - V$, por variables separables

$\frac{dQ}{Q-CV} = -\frac{1}{RC}dt$, llamando $u = Q - CV \Rightarrow du = dQ$

$$\int \frac{du}{u} = -\frac{1}{RC}\int dt + K_1 \Rightarrow \ln|u| = -\frac{t}{RC} + K_1$$

$$\ln|Q-CV| = -\frac{t}{RC} + K_1 \Rightarrow |Q-CV| = e^{-\frac{t}{RC}} \cdot \underbrace{e^{K_1}}_{K}$$

Mientras el capacitor se carga (aumenta Q) es $Q < CV \Rightarrow$

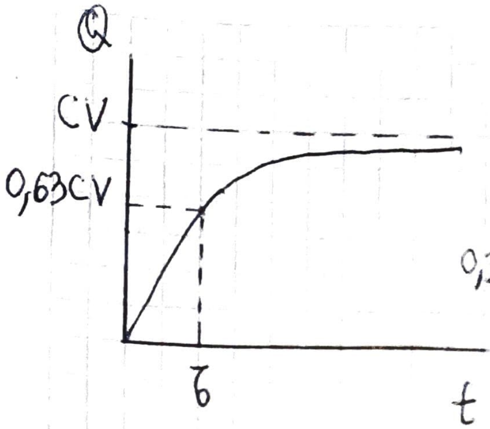
$-(Q(t) - CV) = Ke^{-t/RC} \Rightarrow Q(t) = CV - Ke^{-t/RC}$ Solución General.

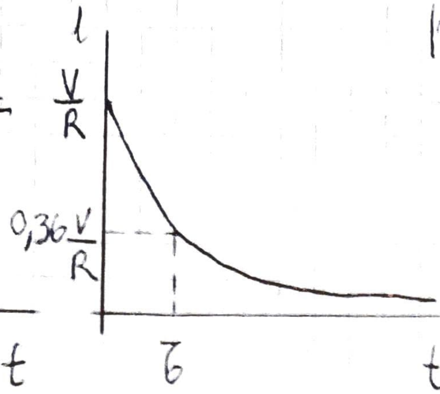
Condiciones iniciales: $Q(t=0) = 0$ (si $Q(t=0)$ fuera distinto de cero $i(t) =$ tendería a infinito por el escalón en Q y habría un voltaje infinito en la Resistencia, cosa imposible porque superaría al de la fuente). Reemplazando en S.G.

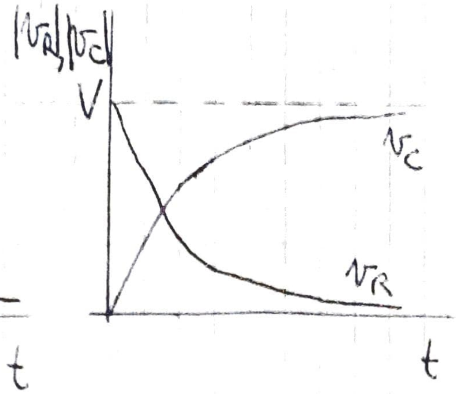
$0 = CV - Ke^0 \Rightarrow K = CV$, reempl. nuevamente en S.G.

$Q(t) = CV(1 - e^{-t/\tau})$, donde $\tau = RC$ es la constante de tiempo

$[\tau] = seg$



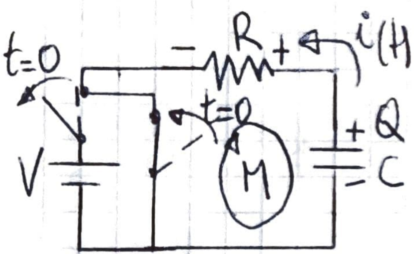




$$i(t) = \frac{dQ}{dt} = \frac{V}{R} e^{-t/\tau} \quad ; \quad |v_R(t)| = iR = Ve^{-t/\tau}$$

$$|v_C(t)| = \left|\frac{Q(t)}{C}\right| = V(1 - e^{-t/\tau})$$

DESCARGA DEL CAPACITOR:



M : $R\,i(t) - \frac{Q(t)}{C} = 0$, pero $i = -\frac{dQ}{dt}$

$$-R\frac{dQ}{dt} - \frac{Q(t)}{C} = 0 \Rightarrow \int \frac{dQ}{Q} = -\int \frac{dt}{RC}$$

$$\ln|Q| = -\frac{t}{RC} + K_1 \quad , \quad |Q| = e^{-t/RC} \cdot \underbrace{e^{K_1}}_{K}$$

Como $Q > 0$: $\quad Q = Ke^{-t/\tau}$ Solución General donde $\tau = RC$

Condiciones iniciales: $Q(t=0) = CV \Rightarrow K = CV$, reemp. en S.G.

$$Q(t) = CVe^{-t/\tau}$$

$$|i(t)| = \left|\frac{dQ}{dt}\right| = \frac{V}{R} e^{-t/\tau}.$$

$$|v_R| = |i|R = Ve^{-t/\tau}$$

$$|v_C| = \frac{|Q|}{C} = Ve^{-t/\tau}$$