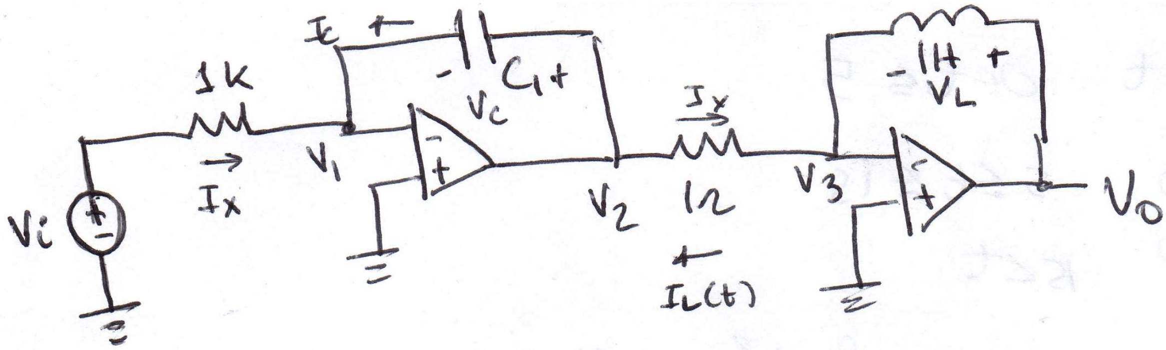
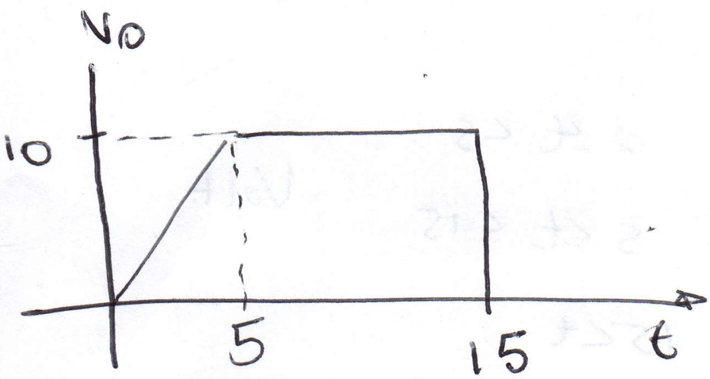


Problema #1

* Determine gráfica y analíticamente el voltaje de entrada V_i y la corriente por $C_1 = 1mF$, si el voltaje de salida del circuito esta dado por la gráfica.



Solución:

$V_1 = V_3 = 0 \Rightarrow \underline{\underline{V_L}} = V_0 - V_3 = \underline{\underline{V_0}}$

$V_c = V_2 - 0 = V_2$

$$\frac{V_i - V_1}{1K} = \frac{V_2 - V_3}{1\Omega} \Rightarrow \underline{V_i = 1000\, V_2}$$

$$V_L = \frac{di_L(t)}{dt} \Rightarrow i_L(t) = \int_0^t V_L(t)dt \;\cancel{\mp V_0}\; + \cancel{I_L(0)}^{\to 0}$$

$i_L(t) = \int_0^t V_0(t)$

Esto no es un caso con switches en $t = 0$ todo esta apagado.

$$V_0(t) = \begin{cases} 2t & 0 \le t \le 5 \\ 10 & 5 \le t \le 15 \\ 0 & 15 < t \end{cases}$$

$$\forall \quad i_L(t) = \underset{1H}{\frac{1}{L}} \int_0^t V_0(t)\,dt = \begin{cases} t^2 & 0 \le t \le 5 \\ 10t & 5 \le t \le 15 \\ 0 & 15 < t \end{cases} \quad \text{Amp}$$

$$\frac{V_3 - V_2}{1\Omega} = i_L(t)$$

$$-V_2 = i_L(t)$$

$$\Rightarrow V_2 = -i_L(t) = \begin{cases} -t^2 & 0 \le t < 5 \\ -10t & 5 \le t \le 15 \\ 0 & 15 < t \end{cases} \quad \text{Volt}$$

$$\cancel{i_c(t) = \frac{V_2 - V_1}{\quad}}$$

$$i_c(t) = C \cdot \frac{dV_c}{dt} = C \frac{dV_2}{dt} = 1mF \cdot \frac{dV_2}{dt}$$

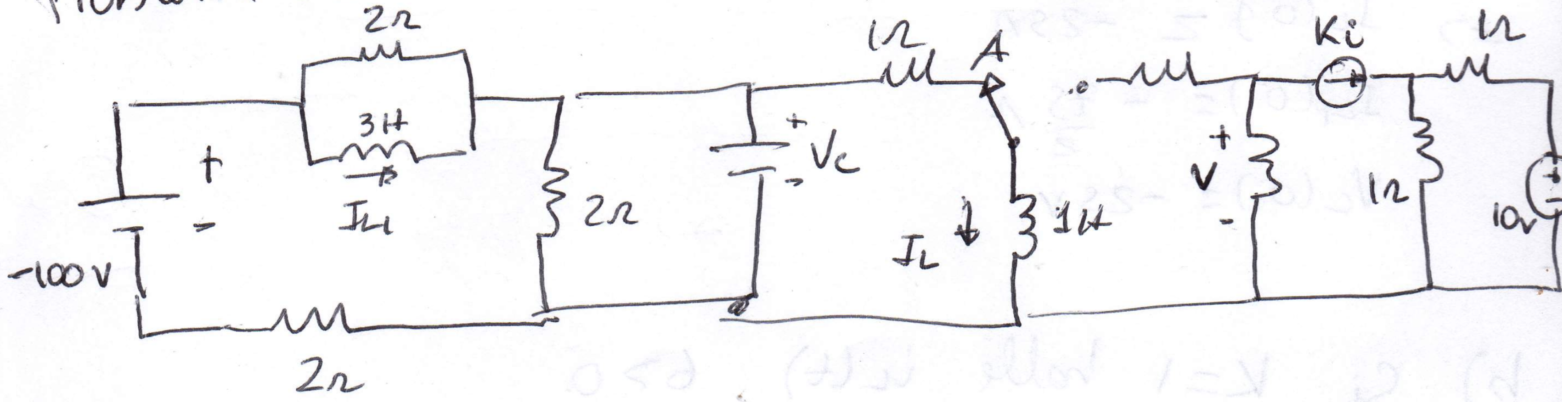
$$i_c(t) = \begin{cases} -0{,}002\,t & 0 \le t < 5 \\ -0{,}01 & 5 \le t < 15 \\ 0 & 15 < t \end{cases}$$

$$\frac{V_1 - V_i}{1k} = i_c(t)$$

$$V_i = -1000\, i_c(t) = \begin{cases} +2t & 0 \le t \le 5 \\ 10 & 5 \le t \le 15 \\ 0 & 15 < t \end{cases}$$

$$\Rightarrow \boxed{V_i = V_0} \,//$$

Problema #2



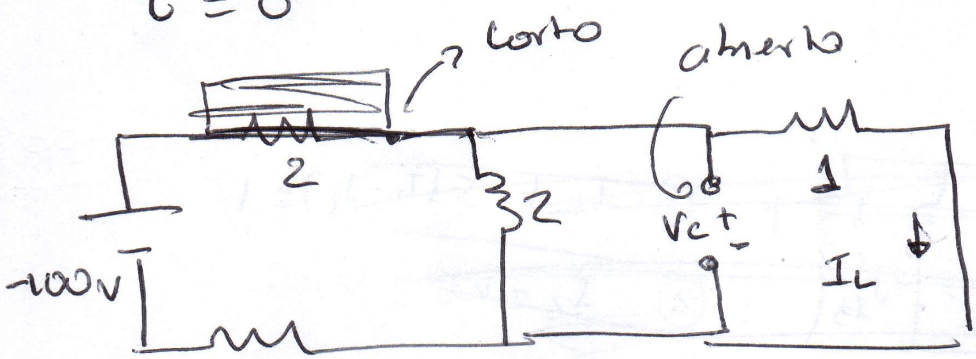
a) El interruptor ha permanecido mucho tiempo en A

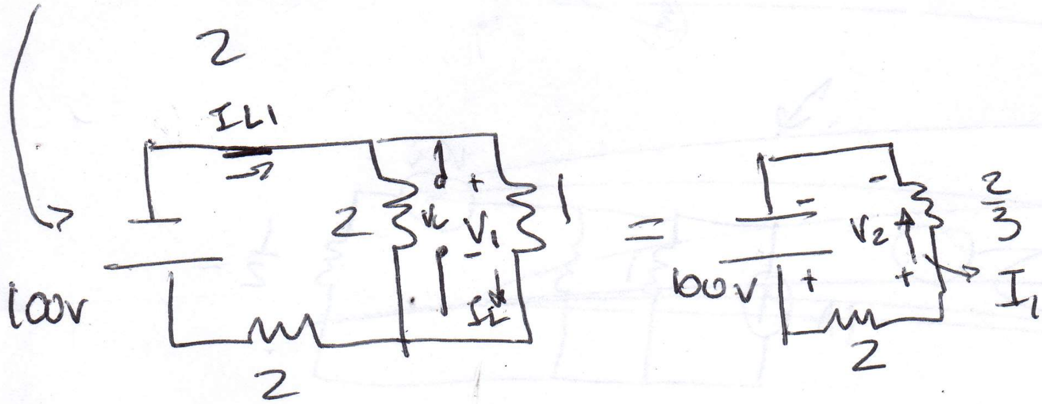
Pasando a B en t=0. hallar $i_L(0^-)$; $i_{L1}(0^-)$ y $V_C(0^-)$

Se sabe que un inductor cargado es un corto

y el capacitor un abierto

$t = 0^-$





$V_C(0^-) = V_1 = -25V$

$$V_2 = 100 \cdot \frac{\frac{2}{3}}{2+\frac{2}{3}} = 100 \cdot \frac{2}{8} = \frac{100}{4} = 25V$$

$I_{L1}(0^-) = -I_1 = \frac{V_2}{\frac{2}{3}}$

$V_2 = -V_1 \Rightarrow V_1 = -25V$ $\quad$ $I_L(0^-) = \frac{V_1}{1} = -25A$

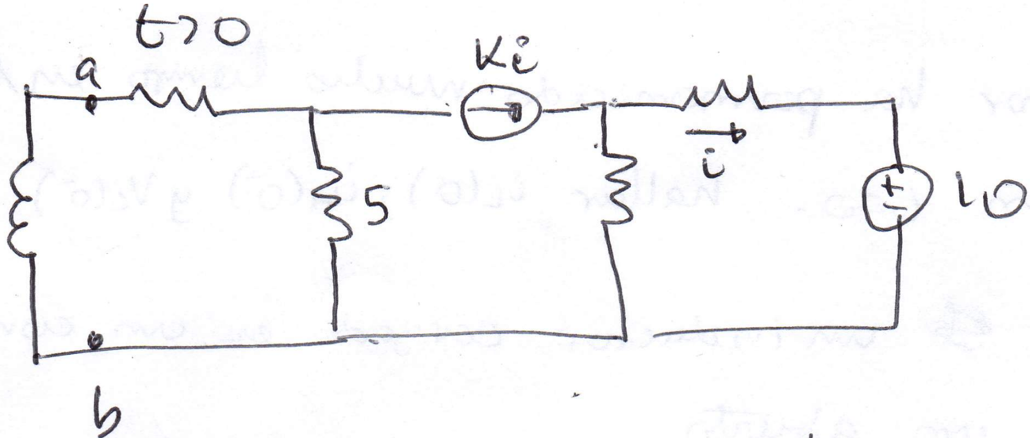
$I_{L1}(0^-) = -\frac{75}{2}$ A.

$\Rightarrow \quad I_L(0^-) = -25\,A$

$I_{L_1}(0^-) = -\frac{75}{2}\,A$

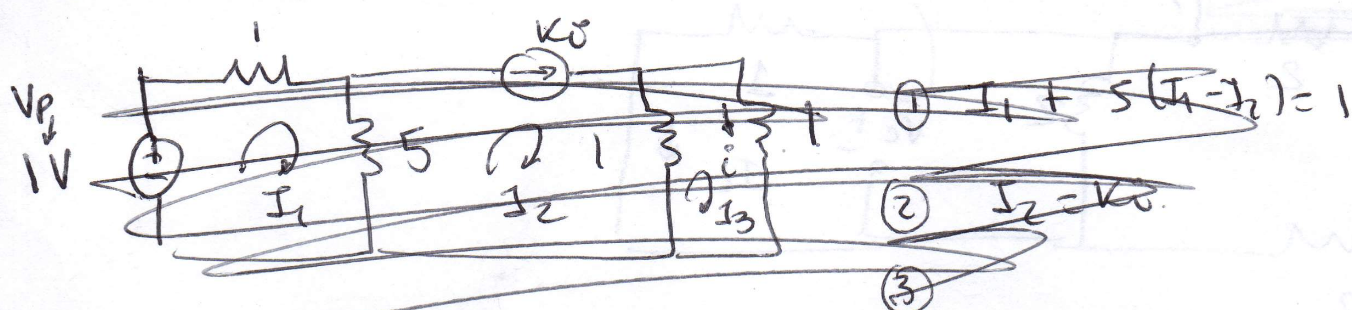
$V_C(0^-) = -25\,V$

b) Si $K=1$ halle $i_L(t)$ $t>0$.



Hallar equivalente de thevenin entre a y b

Para hallar R_{TH}.



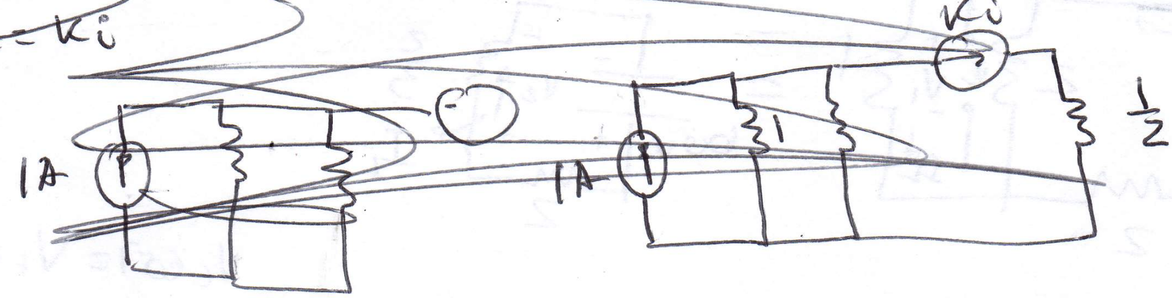
① $I_1 + 5(I_1 - I_2) = 1$

② $I_2 = Ki$

③

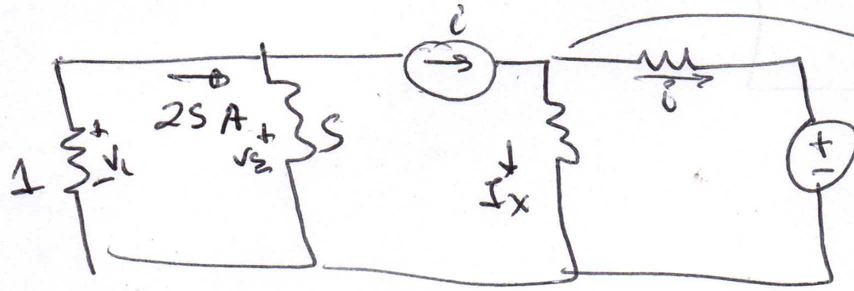
$I_1 + 5(I_1 - I_2) = 1$

$I_2 = Ki$



Como la fuente de corriente es una fuente de corriente DC => i es constante en todo t

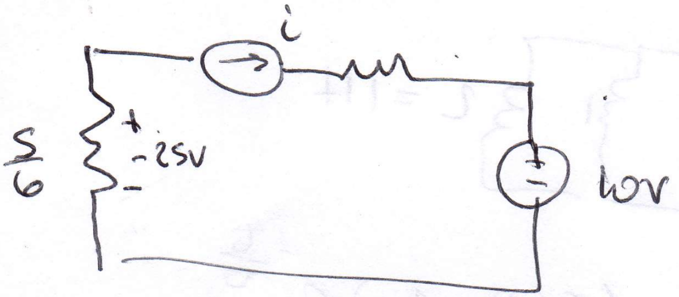
=> en t=0 $I_L(0^-) = I_L(0^+) = -25V$ (Inductor en t=0 sigue en corto).



$\vec{i} = I_x + i$

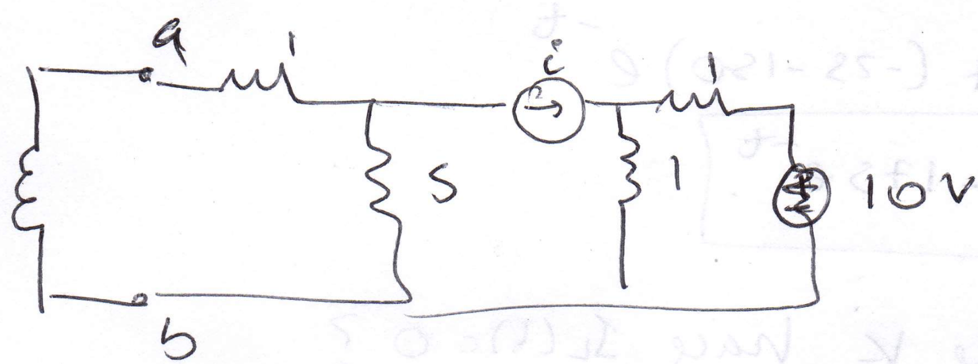
=> $I_x = 0$

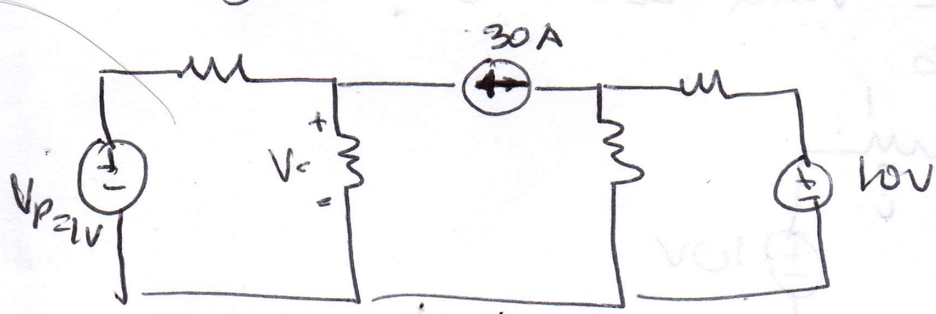
$V_1 = V_5 = V_{5/6} = -25V$



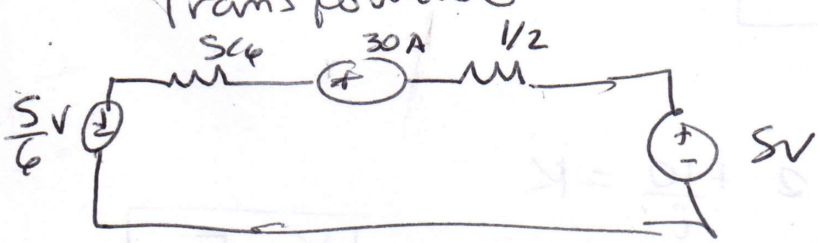
=> $i = \frac{V_{5/6}}{5/6} = \frac{-25V}{5/6} = -30$

=> $R_{TH_{ab}} = ?$ Para el circuito siguient





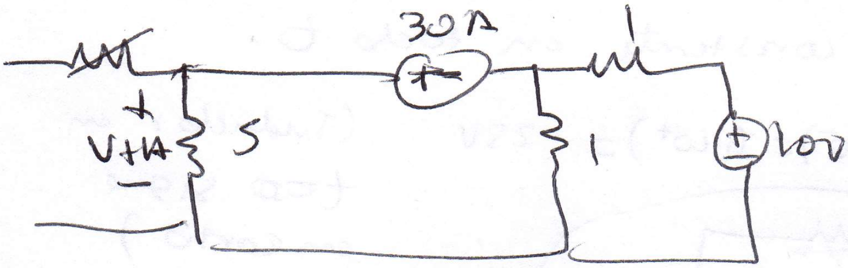
Transformando



=> $R_{TH} = \frac{V_p}{I_p} = 1\Omega$

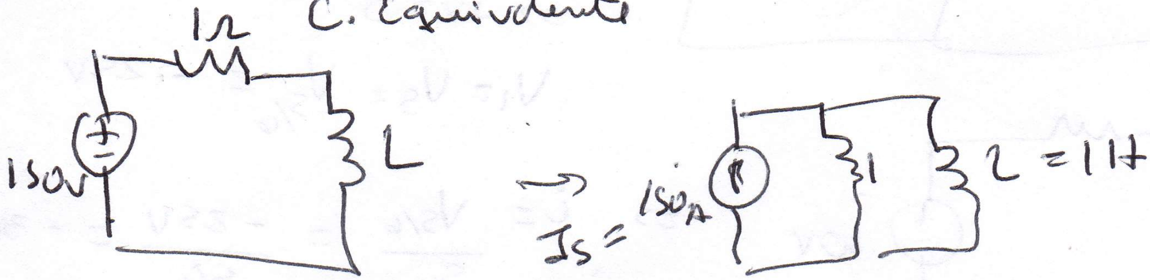
$V_{5/6} = V = -25V = V_5 = V_1$ => $I_1 = I_p = \frac{V_1}{1\Omega} = -25A$

V_{TH}



$V_{TH} = 5 \cdot 30A = 150\,V$

C. Equivalente



$\Rightarrow I_L(t) = \cancel{I_{L\,final}} = I_S + (I_L(0^+) - I_S)\, e^{-\frac{t}{\tau}}$

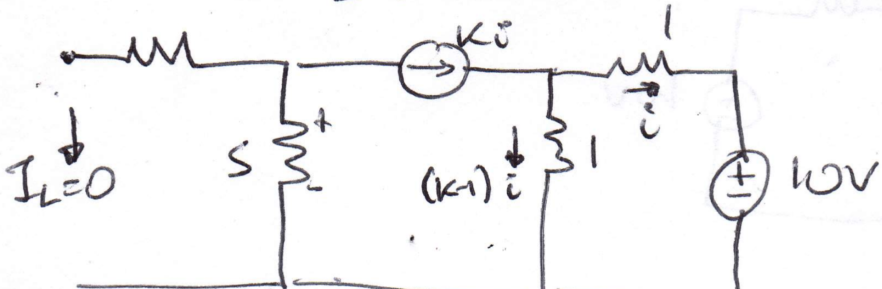
$\tau = 1\Omega \cdot 1H = 1s$

$\Rightarrow I_L(t) = 150 + (-25 - 150)\, e^{-t}$

$$\boxed{I_L(t) = 150 - 175\, e^{-t}}$$

c) Qué valor de K hace $I_L(t) = 0$?

$\Rightarrow$ L en abierto



$i + 10V = (K-1)\, i$

$1 + \frac{10}{i} = K - 1 \Rightarrow K = 2 + \frac{10}{i} = K$

$i = -30A \Rightarrow K = 2 + \frac{10}{-30} = 2 - \frac{1}{3} = \frac{5}{3} \Rightarrow \boxed{K = \frac{5}{3}}$