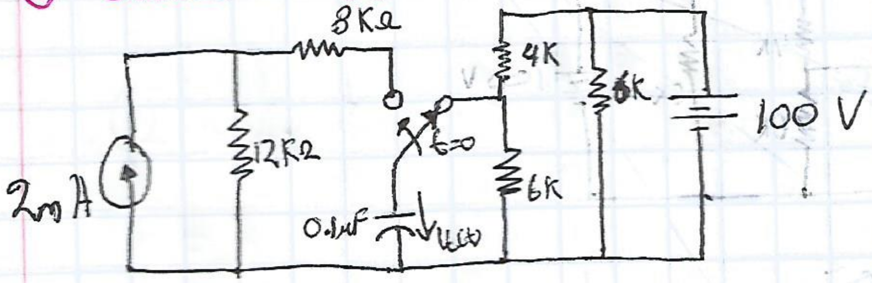
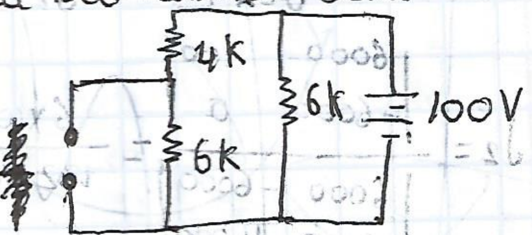
① Calcular $V_c(t)$ para $t \geq 0$



① Para $t < 0$ Calculamos C.i.

La Red auxiliar será:

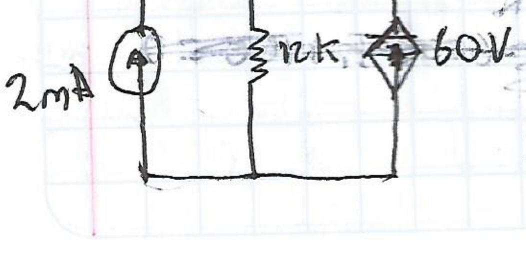


El voltaje en el capacitor será:

$$V_c = V_{R6K} = V_T \cdot \frac{6K}{10K}$$

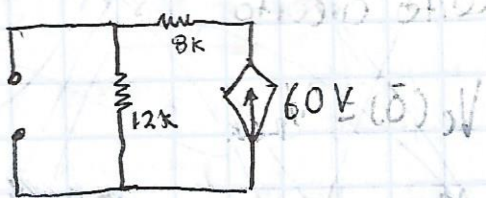
$$V_c = 60\ V$$

② Para $t=0$ se acciona el interruptor. La nueva red será:

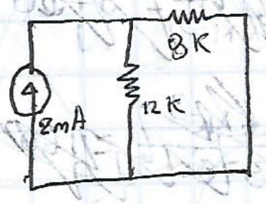


El capacitor se opone a cambios bruscos de voltaje por lo que se comportará como una fuente de voltaje a 60 V

Por superposición de fuentes



$$I_1 = \frac{60}{20K} = 3mA$$



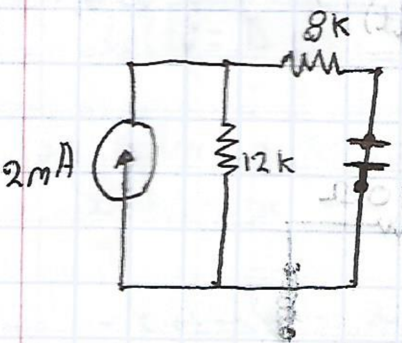
$$I_{R8k} = 2\times10^{-3} \cdot \frac{12K}{20K}$$

$$= 1.2\ mA$$

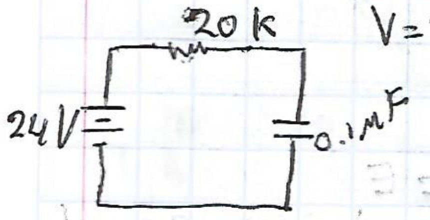
$$I_c(t=0) = 3mA - 1.2mA = 1.8\ mA$$

3. $t \geq 0$ Calcular la ED

la red auxilar será:



Transformando fuentes



$V = RI$

Por LVK

$V_R + V_C = E$

$R\,i(t) + \frac{1}{C}\int i(t)\,dt = 24V$

derivando

$R\frac{d\,i(t)}{dt} + \frac{1}{C}\,i(t) = 0$

$D = \frac{d}{dt}$

$RD\,i(t) + \frac{1}{C}\,i(t) = 0$

$\underbrace{\left(RD + \frac{1}{C}\right)}_{=0}\underbrace{i(t)}_{\neq 0} = 0$

$RD + \frac{1}{C} = 0$

$D = -\frac{1}{RC} = \frac{1}{(20K)(0.1\times10^{-6})}$

$D = -500$

Solución propuesta para la homogenea

$i(t) = Ke^{-500t}$

Calculando K con $t=0$ y $i(0) = 1.8mA$

$1.8mA = K\,\cancel{e}^{1}$

$K = 1.8\times10^{-3}$

$i_T(t) = (1.8\times10^{-3})\,e^{-500t}$

$V_R(t) = R\,i_T(t)$

$V_R(t) = (20\times10^{3})(1.8\times10^{-3}e^{-500t})$

$V_R(t) = 36\,e^{-500t}$

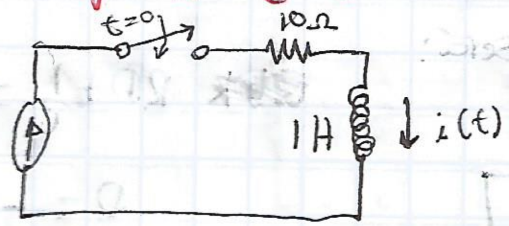
Despejando $V_C(t)$ de 1

$V_C(t) = -V_R(t) + E$

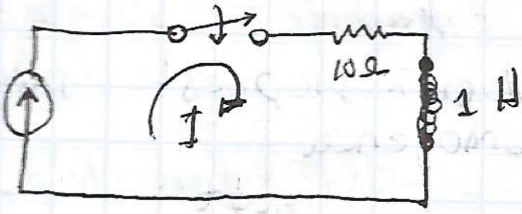
$\underline{= 24 + 36\,e^{-500t}}$

2. Calcular $i(t)$ para $t \geq 0$

$V(t) = 2 \operatorname{sen} t \ V$



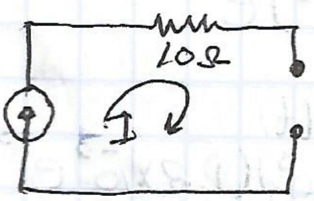
① $t<0$ determinar C i



el inductor se comporta como corto circuito

$I(0^-) = 0$

② $t \geq 0$ se cierra el circuito



el inductor se opone a cambios bruscos de voltaje

$I(0) = 0$

③ $t > 0$ determinar E.D

la red auxiliar

Por LVK

$V_R + V_L = E$

$10\, i(t) + L \frac{d}{dt} i(t) = 2 \operatorname{sen} t$

Solución propuesta para la homogenea

$i_h(t) = K e^{-\frac{R}{L} t}$

$D = \frac{d}{dt}$

$10\, i(t) + L D i(t) = 2 \operatorname{sen} t$

$\underset{=0}{(10 + LD)}\ \underset{\neq 0}{i(t)} = 2 \operatorname{sen} t$

$10 + LD = 0$

$D = -\frac{10}{L} = -\frac{10}{1} = -10$

$i_h(t) = K e^{-10t}$ (1)

Proponemos una solución particular

$i_p(t) = A\cos \omega t + B \operatorname{sen} \omega t$

La solucion particular debe satisfacer la ec. 1

Sustituyendo

$R(A\cos\omega t + B \operatorname{sen}\omega t) + L \dfrac{d(A\cos\omega t + B\operatorname{sen}\omega t)}{dt}$

$\ldots = V \operatorname{sen}\omega t$

Operando

$RA\cos\omega t + RB\operatorname{sen}\omega t + L\left[-A\omega\operatorname{sen}\omega t + B\omega\cos\omega t\right]$

$\ldots = V\operatorname{sen}\omega t$

$RA\cos\omega t + RB\operatorname{sen}\omega t - LA\omega\operatorname{sen}\omega t + LB\omega\cos\omega t$

$\ldots = V\operatorname{sen}\omega t$

$(RA + LB\omega)\cos\omega t + (RB - LA\omega)\operatorname{sen}\omega t = 2\operatorname{sen} t$

$RA + LB\omega = 0$

$RB - LA\omega = 2$

$$A = \frac{\begin{vmatrix} 0 & L\omega \\ 2 & R \end{vmatrix}}{\begin{vmatrix} R & L \\ -L\omega & R \end{vmatrix}} = \frac{-2L\omega}{R^2 + L^2\omega^2}$$

$$= \frac{-2(1)(1)}{(10)^2 + (1)^2(1)^2} = \underline{-0.0198}$$

la solución particular es:

$i_p(t) = \underline{-0.0198}\cos t + \dfrac{(10)(2)}{100+1}\operatorname{sen} t$

La $i_{total} = Ke^{-10t} + -0.0198 \cos t + 0.1980 \text{ sen} t$

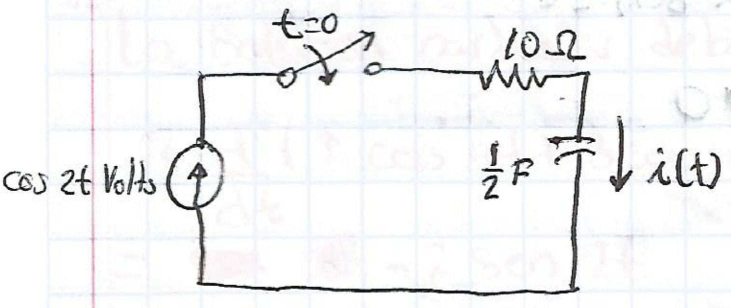
de las condiciones iniciales en $t=0$ y $i(t)=0$

$i(0) = k - 0.0198(1)$

$K = 0.0198$

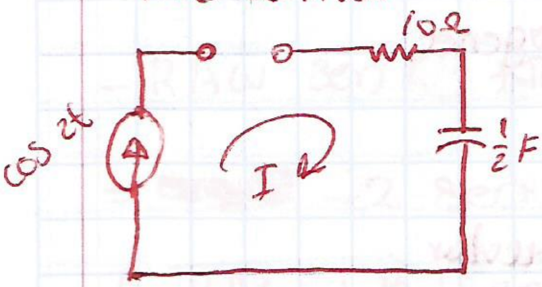
La $I_T = 0.0198 e^{-10t} + 0.1980 \text{ sen} t - 0.0198 \cos t$

3. Calcular $i(t)$ para $t \geq 0$



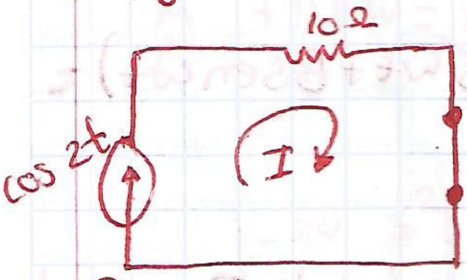
① $t<0$ C.i

Red auxilar



$i(0)=0$

② $t=0$

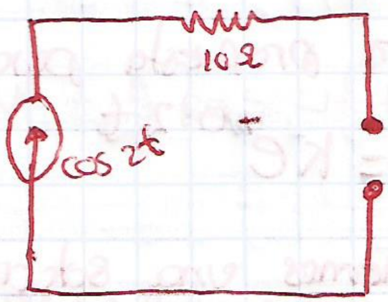


Capacitor se comporta como corto circuito

$I(0)=$ 1

③ $t>0$ E.D

Red auxilar



Capacitor se comporta como corto circuito

LVK

$V_R(t) + V_c(t) = \cos 2t$

$R\,i(t) + \frac{1}{C}\int i(t)\,dt = \cos 2t$

Derivando

$R\frac{di(t)}{dt} + \frac{1}{C}i(t) = -2\operatorname{sen} 2t$

$D = \frac{d}{dt}$

$RD\hat{i}(t) + \frac{1}{C} i(t) =$ [redacted] $-2 \text{ sen } 2t$

$\underbrace{\left(RD + \frac{1}{C}\right)}_{=0} \underbrace{\hat{i}(t)}_{\neq 0} =$ [redacted] 0

$RD + \frac{1}{C} = 0$

$D = -\frac{1}{RC} = -\frac{1}{(10)(0.5)} = -0.2$

Solucion propuesta para la homogenea

$i_h(t) = K e^{+0.2t}$

Proponemos una solucion particular

$i_p(t) = A \cos wt + B \text{ sen } wt$

La Solución particular debe satisfacer la E.D

$$R\frac{d}{dt}(A\cos wt + B\operatorname{sen} wt) + \frac{1}{C}(A\cos wt + B\operatorname{sen} wt)$$

$$= -2\operatorname{sen} 2t$$

$$R(-Aw\operatorname{sen} wt + Bw\cos wt) + \frac{1}{C}(A\cos wt + B\operatorname{sen} wt)$$

$$= -2\operatorname{sen} 2t$$

$$-RAw\operatorname{sen} wt + RBw\cos wt + \frac{A}{C}\cos wt + \frac{B}{C}\operatorname{sen} wt$$

$$= -2\operatorname{sen} 2t$$

$$\left(-RAw + \frac{B}{C}\right)\operatorname{sen} wt + \left(RBw + \frac{A}{C}\right)\cos wt = -2\operatorname{sen} 2t$$

$$-RAw + \frac{B}{C} = -2$$

$$\frac{A}{C} + RBw = 0$$

$$A = \frac{\begin{vmatrix} -2 & \frac{1}{C} \\ 0 & Rw \end{vmatrix}}{\begin{vmatrix} -Rw & \frac{1}{C} \\ \frac{A}{C} & Rw \end{vmatrix}} = \frac{-2Rw}{-R^2w^2 - \frac{1}{C^2}}$$

$$= 0.099099$$

$$B = \frac{\begin{vmatrix} -Rw & -2 \\ \frac{A}{C} & 0 \end{vmatrix}}{-R^2w^2 - \frac{1}{C^2}} = \frac{+2/C}{-R^2w^2 - \frac{1}{C^2}} = -9.90\times10^{-3}$$

$$i_p(t) = 99\times10^{-3}\cos 2t - 9.90\times10^{-3}\operatorname{sen} 2t$$

$i_T(t) = K e^{-0.2t} + 99\times10^{-3} \cos 2t + 9.90\times10^{-3} \operatorname{sen} 2t$

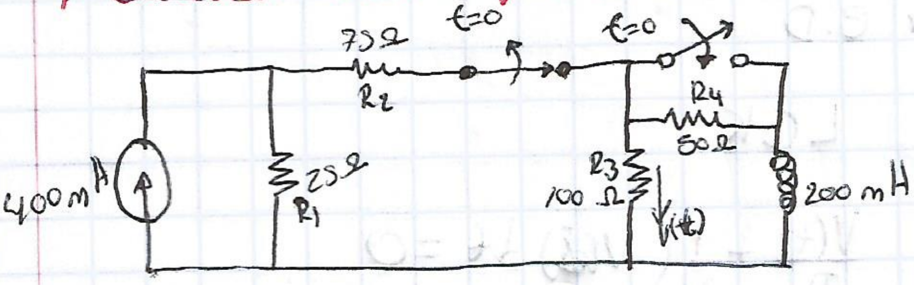
evaluando en $t=0$ y $i(0) =$

$i_T(0) = K + 99\times10^{-3}$

$K = 1 - 99\times10^{-3} = 0.901$

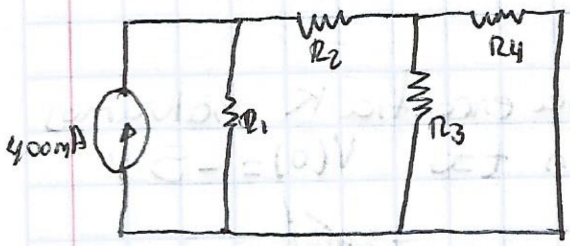
$$i_T(t) = 0.901 e^{-0.2t} + 99 \times 10^{-3} \cos 2t \pm 9.90 \times 10^{-3} \operatorname{sen} 2t$$

4. Calcular $V(t)$ para $t \geq 0$

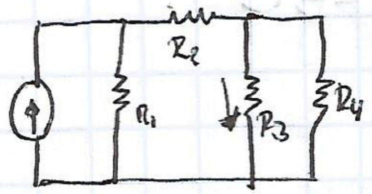


① En fco

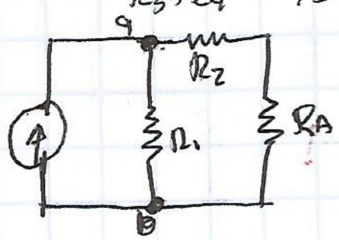
Simplificando la red



La bobina se comporta como un corto circuito



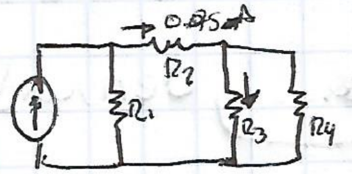
$$R_A = \frac{R_3 R_4}{R_3 + R_4} = \frac{(100)(50)}{150} = 33.333\ \Omega$$



$$I_{ab} = I_f \cdot \frac{R_1}{R_1 + R_2 + R_A} =$$

$$= (400 \times 10^{-3}) \frac{25}{25 + 75 + 33.33}$$

$$= 0.075\ A$$



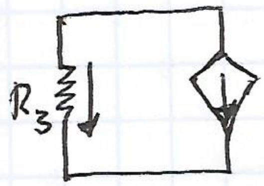
Calculando I_{R_3}

$$I_{R_3} = (0.075\ A) \cdot \frac{50}{150} = 25\ mA$$

$$V_{R_3} = (100)(0.025) = \underline{2.5\ V}$$

② en $t=0$ se cambia el interruptor (se activa)

la red auxiliar será



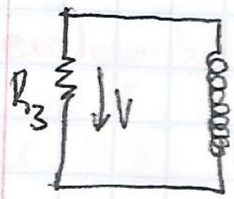
el inductor se opone a cambios bruscos de corriente

$$i_L(0) = i_L(0^-) = 50\ mA$$

$$i_{R_3} = -50\ mA$$

$$V_{R_3} = (100)(-50\ mA) = \underline{-5\ V}$$

③ $t>0$ Calcular e.D



LCK

$$\frac{V(t)}{R} + \frac{1}{L}\int V(t)\,dt = 0$$

no hay ninguna fuente conectada

derivando

$$\frac{V(t)\,d}{R\,dt} + \frac{1}{L}V(t) = 0$$

$$D = \frac{d}{dt}$$

$$\frac{V(t)}{R}D + \frac{1}{L}V(t) = 0$$

$$\underbrace{\left(\frac{D}{R} + \frac{1}{L}\right)}_{=0}\underbrace{V(t)}_{\neq 0} = 0$$

$$\frac{D}{R} + \frac{1}{L} = 0$$

$$D = -\frac{R}{L} = -\frac{100}{200mA} = -500$$

Proponemos la solucion a la homogenea

$$V(t) = Ke^{-500t}$$

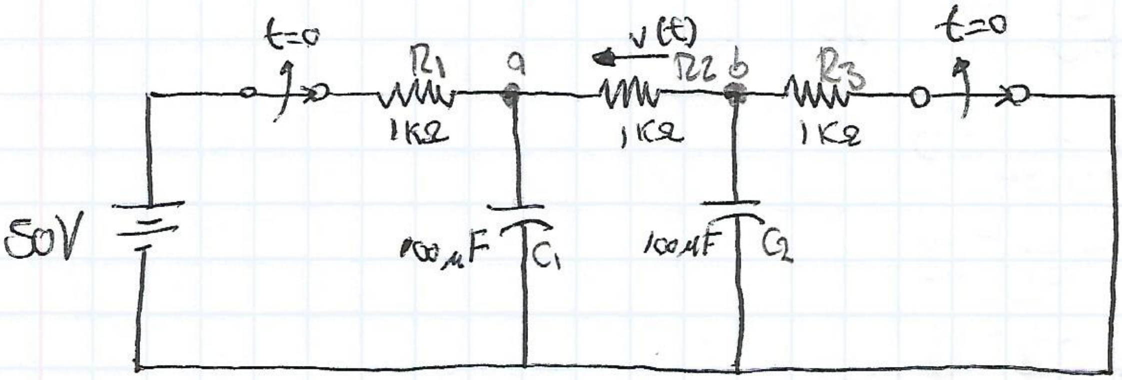
Para encontra K evaluamos con $t=0$ $V(0) = -5V$

$$-5 = K\cancel{e^{-500(0)}}$$

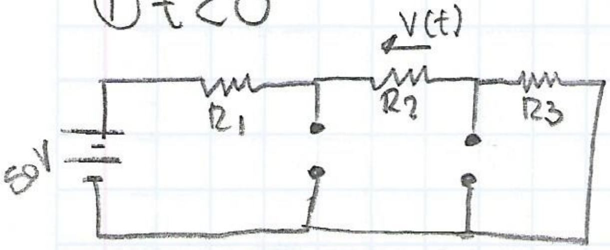
$$K = -5$$

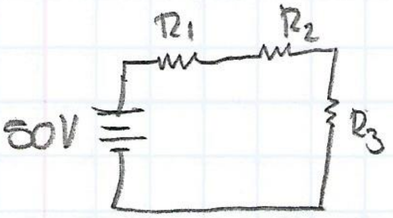
$$V(t) = -5e^{-500t}$$

5. Calcular V(t) para $t \geq 0$



① $t<0$





Por divisor de Voltaje

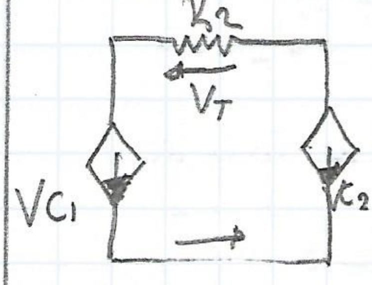
$$V_{R2} = V_T \frac{R_2}{R_1+R_2+R_3}$$

$$= 50V \frac{1\times10^3\,\Omega}{3\times10^3\,\Omega}$$

$$V(0) = 16.6666\ V$$

② $t=0$

la nueva red auxiliar sera:



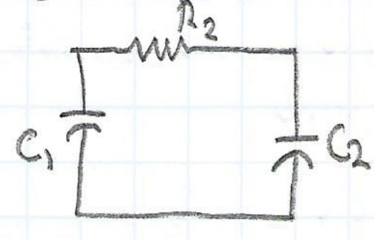
$$V_{C_1} = 50V - 16.66 = 33.34V$$

$$V_{C2} = 50V - 33.34V = 16.66\ V$$

$$V_T = 33.34 - 16.66 = 16.66\ V$$

$$V(0) = 16.66\ V$$

$t>0$



Por LVK

$$R\,i(t) + \frac{1}{C_1}\int i(t)\,dt + \frac{1}{C_2}\int i(t)\,dt = 0$$

$$R\frac{di(t)}{dt} + \frac{1}{C_1}i(t) + \frac{1}{C_2}i(t) = 0$$

$$D = \frac{d}{dt}$$

$$R D i(t) + \frac{1}{C_1} i(t) + \frac{1}{C_2}(i(t)) = 0$$

$$\left(RD + \frac{1}{C_1} + \frac{1}{C_2}\right) i(t) = 0$$
$$= 0 \qquad \neq 0$$

$$R_2 D + \frac{1}{C_1} + \frac{1}{C_2} = 0$$

$$R_2 D = -\frac{1}{C_1} - \frac{1}{C_2}$$

$$D = \frac{-\frac{1}{C_1} - \frac{1}{C_2}}{R_2} =$$

$$D = \frac{-\frac{1}{100\times10^{-6}} - \frac{1}{100\times10^{-6}}}{1\times10^{3}} = -20$$

Proponemos solución a la homogenea

$$i(t) = K e^{-20t}$$

Para encontra K sustituimos en $t=0$ $V(0) = -16.66\,A$

$$i(0) = \frac{-16.66}{1\times10^{3}} =$$

$$i(0) = -0.01666A$$

$$i(0) = K e^{-20(0)}$$

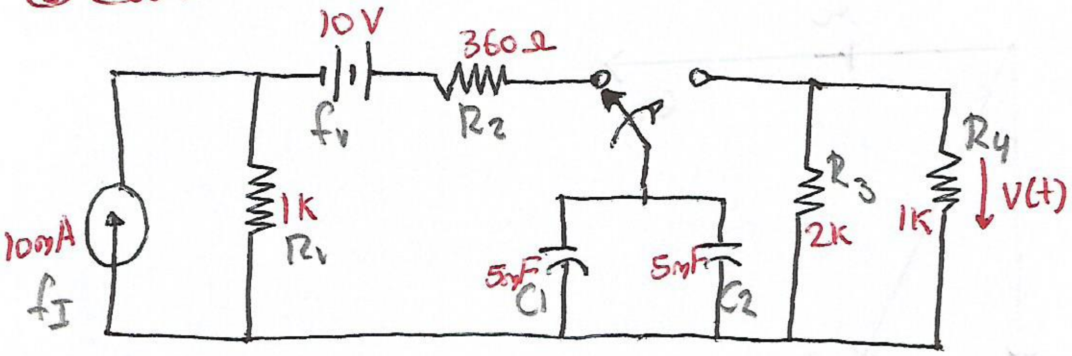
$$K = -0.01666$$

$$i(t) = -0.01666\, e^{-20t}$$

$$V(t) = (1\times10^{3})(-0.01666\, e^{-20t})$$

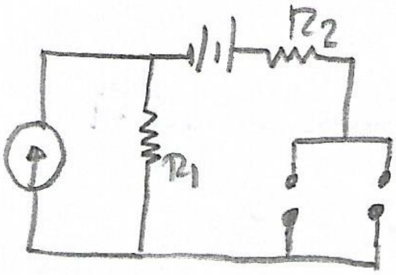
$$\underline{V(t) = -16.666\, e^{-20t}}$$

⑥ Calcular $V(t)$ para $t \geq 0$



① $t<0$

Red auxiliar



No hay voltaje en R_4 por lo tanto

$V(0^-)=0$

Calculando el Voltaje del Capacitor

Transformado fuente

$V=(1\times10^3)(10\times10^{-3})$

$V=10V$

Sumando fuentes

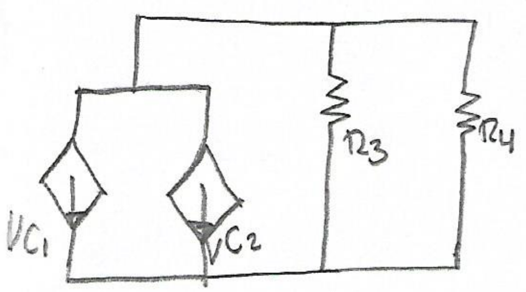
$10V+10V=20V$

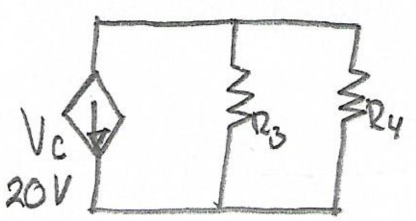
$V_{C_1}=V_{C2}$

$V_{C_1}=20V$

② $t=0$

la red auxiliar

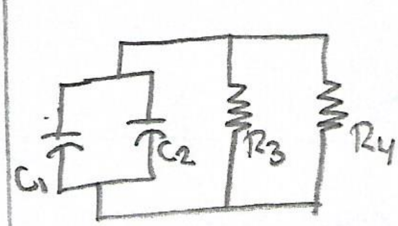




$V_{R4}=V_{R3}=V_C=20V$

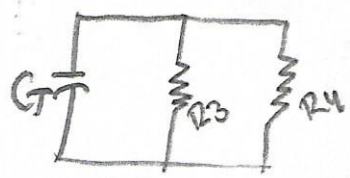
$t>0$

la red auxiliar



$C_T=C_1+C_2$

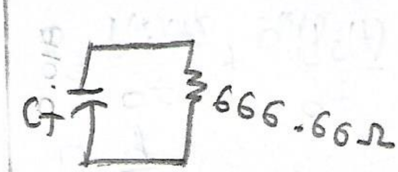
$C_T=1\times10^{-5}F$



$R_T=\frac{R_3 R_4}{R_3+R_4}$

$R_T=\frac{(2\times10^3)(1\times10^3)}{(2\times10^3)+(1\times10^3)}$

$R_T=666.66\ \Omega$



LVK

$R_T i(t)+\frac{1}{C}\int i(t)dt=0$

$R_T\frac{d}{dt}i(t)+\frac{1}{C}i(t)=0$

$R_T D i(t)+\frac{1}{C}i(t)=0$

$\underbrace{(R_T D+\frac{1}{C})}_{=0}\underbrace{i(t)}_{\neq0}=0$

$R_T D+\frac{1}{C}=0$

$D=-\frac{1}{RC}=-\frac{1}{(666.66)(1\times10^{-5})}$

$D=-150.0015$

Solucion a la homogenea

Propuesta.

$i(t) = ke^{-150t}$

Para encontrar k

usamos $t=0$

$V(0) = 20\ V$

$i(0) = \frac{20V}{666.66} = 0.03000$

$i(0) = k\cancel{e}^{1}$

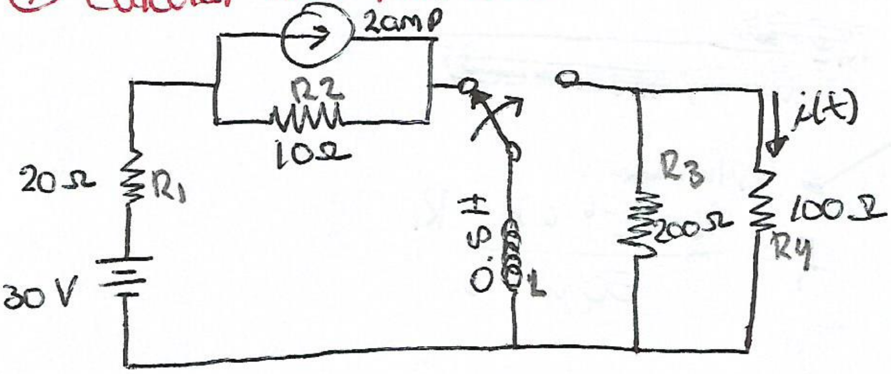
$k = 0.03000$

$i(t) = 0.0300e^{-150t}$

$V(t) = (666.66)(0.0300e^{-150t})$

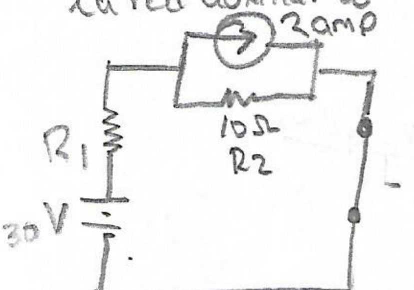
$V(t) = 20e^{-150t}$

7 Calcular $i(t)$ para $t \geq 0$



1 $t<0$

la red auxilar es



no hay flujo de corriente en R4 por lo que

$I(0^-)=0$

$t=0$

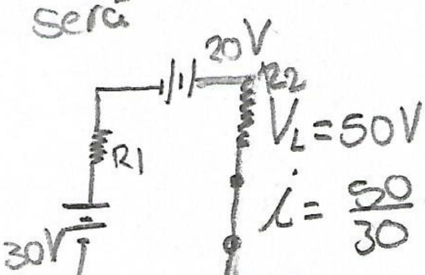
Calculando i_L

Transformando fuente.

$f_V = R\,i$
$= R_2 f_i = (10)(2)$

$f_V = 20\ V$

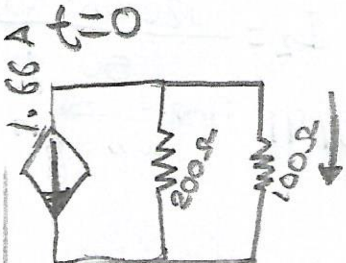
la red auxiliar será



$V_L = 50V$

$i = \frac{50}{30} = 1.66A$

$t=0$



$i_L(0) = i_L(0^-)$

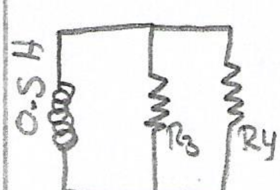
Divisor de corriente

$i_{R4} = (1.66)\frac{200}{300}$

$i_{R4} = 1.11\ A$

3 $t>0$

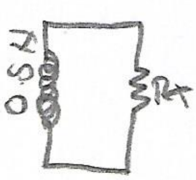
la red auxiliar será



$R_T = \frac{R_3 R_4}{R_3 + R_4}$

$R_T = \frac{(200)(100)}{300}$

$R_T = 66.66\ \Omega$



LVK

$R_T\, i(t) + L\frac{d\,i(t)}{dt} = 0$

$D = \frac{d}{dt}$

$R_T\, i(t) + L D\, i(t) = 0$

$\underbrace{(R_T + L\,D)}_{=0}\ \underbrace{i(t)}_{\neq 0} = 0$

$R_T + LD = 0$

$D = -\frac{R_T}{L} = -\frac{66.66}{0.5} = -133.33$

Calculamos k con $t=0$ y

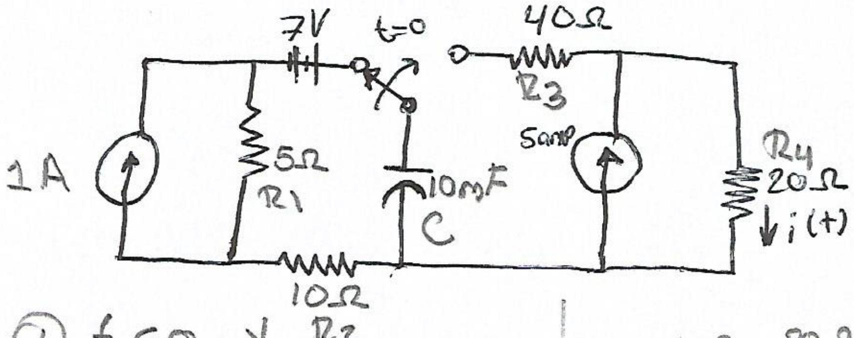
$i(0) = 1.11 A$

$i(0) = k\,e^{0}$

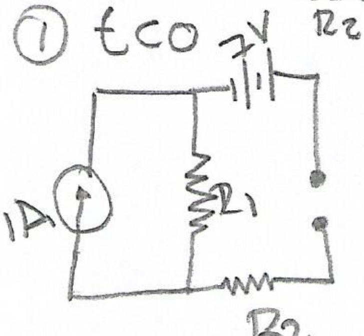
$K = 1.11\ A$

$i(t) = 1.11\,e^{-133.33t}$

(10) Calcular $i(t)$ para $t \geq 0$



(1) $t < 0$



no hay corriente en R4.

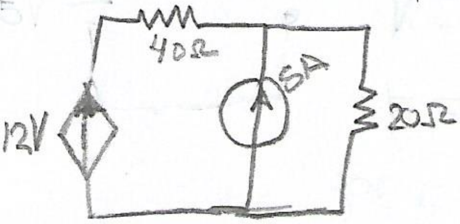
$i(0^-) = 0$

$V_{R1} = RI = (5)(1)$

$V_{R1} = 5V$

$V_C = V_R + 7V = 12V$

(2) $t = 0$

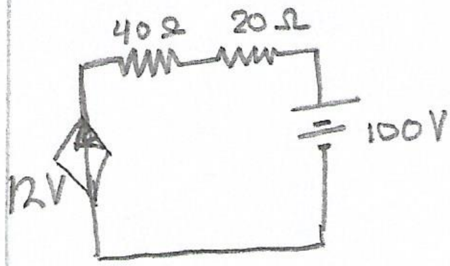


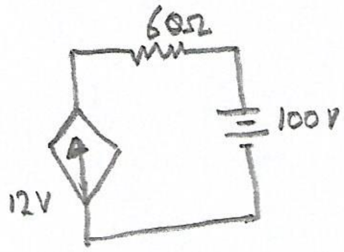
Transformando fuente

$V = RI$

$V = (20)(5A)$

$V = 100\ V$



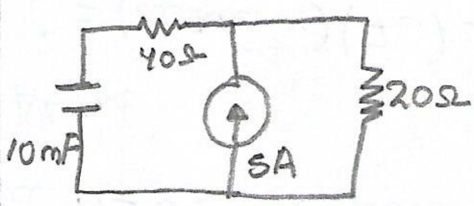


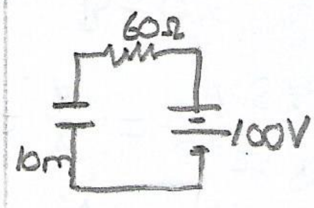
$V = 12 - 100 = -88\,V$

$I = \dfrac{-88V}{60} = -1.466A$

$i(0) = -1.466\,A$

$t > 0$ Se calculan la ec. Dif.





LVK

$V_C + V_R = 100$

$\frac{1}{C}\int i(t)dt + R\,i(t) = 100$

Derivando

$\frac{1}{C} i(t) + R\frac{di(t)}{dt} = 0$

$D = \frac{d}{dt}$

$\frac{1}{C} i(t) + RD\,i(t) = 0$

$\underbrace{\left(\frac{1}{C} + RD\right)}_{=0} \underbrace{i(t)}_{\neq 0} = 0$

$\frac{1}{C} + RD = 0$

$D = -\frac{1}{RC} = -\frac{1}{(60)(10\times 10^{-3})}$

$D = -1.6666$

Proponemos la Solucion a la homogenea

$i_h(t) = k e^{-1.666t}$

Calculamos k evaluando en $t=0$ $i(0) = -1.466A$

$i(0) = k\cancel{e}^{0}$

$K = i(0) = -1.466$

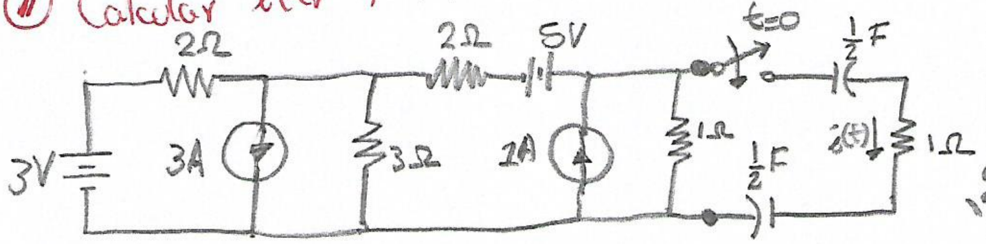
$i(t) = -1.466\,e^{-1.666t}$

Tomando la fuente del Circuito original ~~A~~

$i(t) = 5 - 1.466\,e^{-1.666t}$

~~(...) ... 5 ...~~

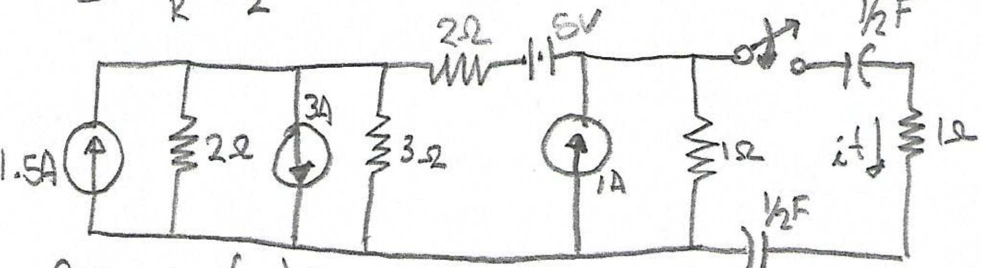
11 Calcular $i(t)$ para $t \geq 0$



Reduciendo el circuito

Transformando fuente

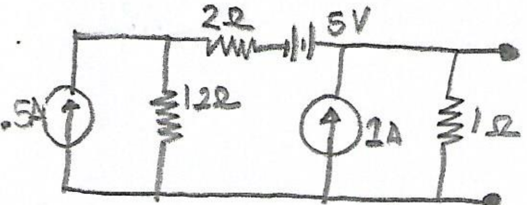
$I = \frac{V}{R} = \frac{3V}{2} = 1.5A$



Sumando fuentes

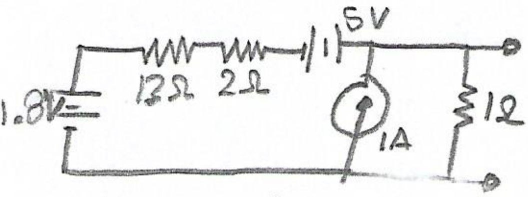
$I_{12} = I_1 + I_2 = -1.5 + 3 = \underline{1.5\ A}$

$R_A = \frac{(2)(3)}{2+3} = \frac{6}{5} = 1.2\,\Omega$

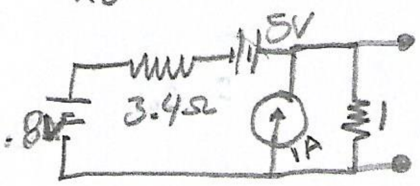


Transformando fuente

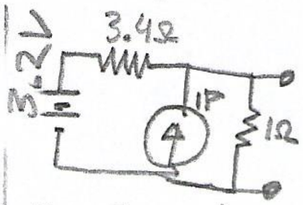
$V = (1.2)(1.5) = 1.8V$



$R_B = 1.2 + 2 = 3.2\,\Omega$

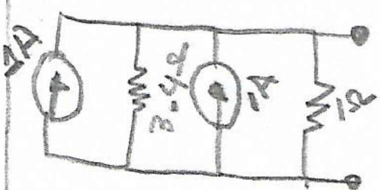


$V_B = -1.8 + 5 = 3.2\,V$

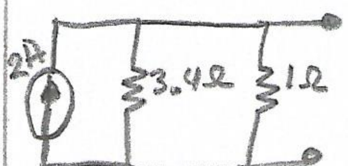


Transformando fuente

$I = \frac{V}{R} = \frac{3.2}{3.2} = 1\ A$

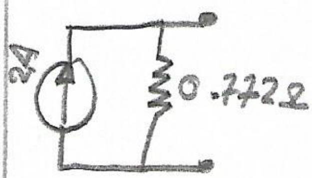


$I_c = 1 + 1 = 2A$



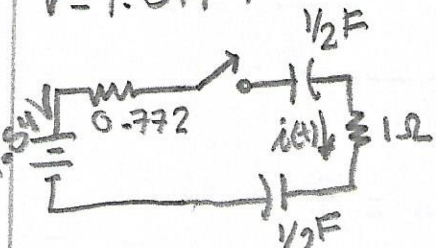
$R = \frac{(3.4)(1)}{3.4+1} = \frac{3.4}{4.4}$

$R = 0.772$



$V = R i = (0.772)(2)$

$V = 1.544\ V$

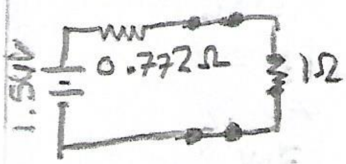


1 $t < 0$

$V(0^-) = 0$

$i(0^-) = 0$

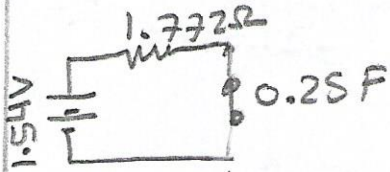
2 $t = 0$ se acciona el interruptor



Suma de capacitores en serie.

$C_T = \frac{C_1 C_2}{C_1 + C_2} = \frac{(\frac{1}{2})(\frac{1}{2})}{\frac{1}{2} + \frac{1}{2}} = 0.25$

$R_T = 0.772 + 1 = 1.772\,\Omega$

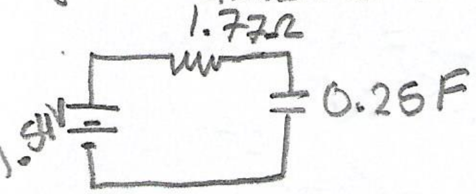


el capacitor se comporta como corto circuito y se opone a cambios bruscos de voltaje

$V_c(0^+) = 0$

$i(0) = i_R(0) = \frac{1.54}{1.77} = 0.87A$

$t>0$ Calculamos la E.D



LVK

$V_R + V_C = E$

$R\,i(t) + \frac{1}{C}\int i(t)\,dt = E$

derivando

$R\frac{di(t)}{dt} + \frac{1}{C} i(t) = 0$

$D = \frac{d}{dt}$ $\quad R\,D\,i(t) + \frac{1}{C} i(t) = 0$

$\underbrace{\left(RD + \frac{1}{C}\right)}_{=0} \underbrace{i(t)}_{\neq 0} = 0$

$RD + \frac{1}{C} = 0$

$D = -\frac{1}{RC} = -\frac{1}{(1.77)(0.25)}$

$D = -2.2598$

Proponemos la solución a la homogenea

$i(t) = K e^{-2.2598t}$

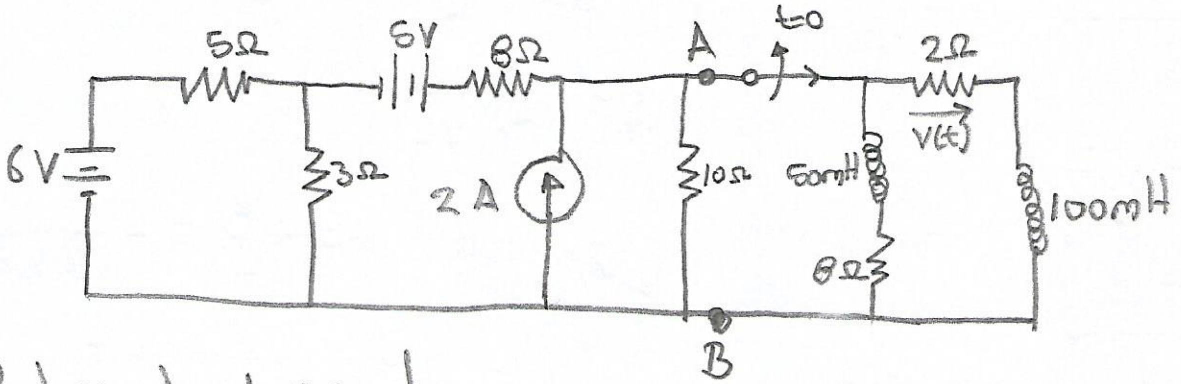
Encontramos k sustituyendo en $t=0$ y $i(0) = 0.87$ A

$i(0) = K \cancel{e^{0}} 1$

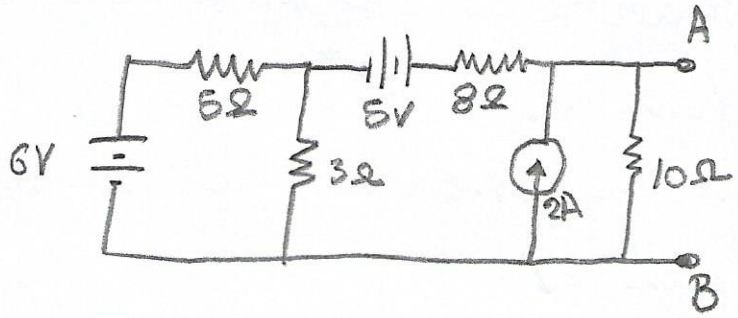
$K = 0.87$

$\underline{i(t) = 0.87\, e^{-2.2598t}}$

⑫ Calcular v(t) para t≥0

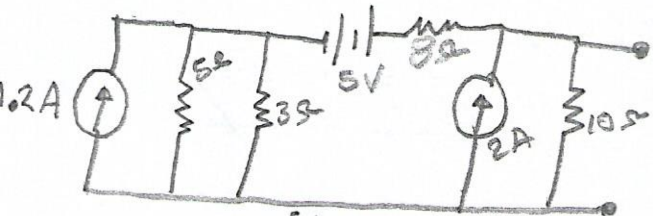


Reduciendo el circuito

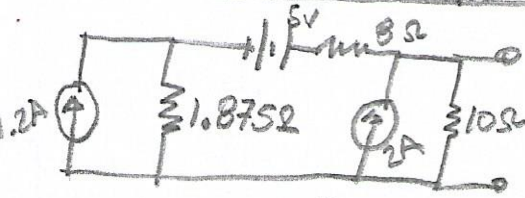


Por transformación de fuentes

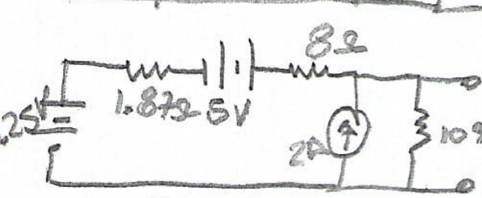
$I = \frac{V}{R} = \frac{6V}{5\Omega} = 1.2\ A$



$R_A = \frac{(5)(3)}{(5)+(3)} = \frac{15}{8} = 1.875\ \Omega$

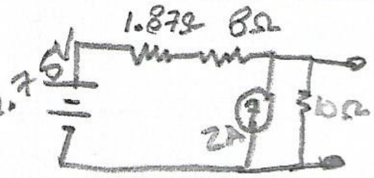


Transformando fuente $V = R.I = (1.875)(1.2A) = 2.25V$

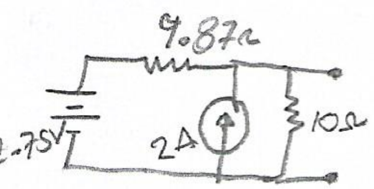


Sumando fuentes

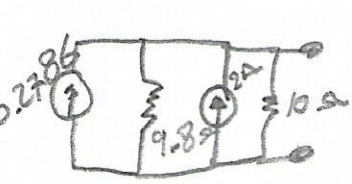
$-2.25\ V + 5\ V = 2.75$



$R_B = 1.87 + 8 = 9.87\ \Omega$

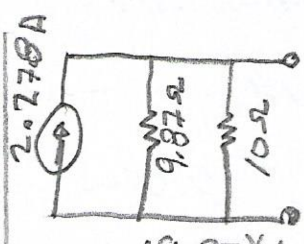


$I = \frac{V}{R} = \frac{2.75\ V}{9.87\ \Omega} = 0.2786\ A$

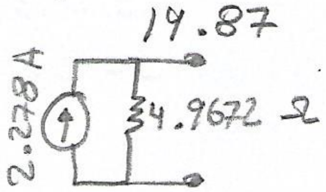


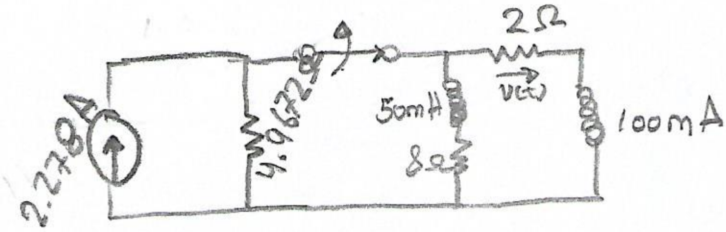
Sumando fuentes

$0.278 + 2A = 2.278\ A$

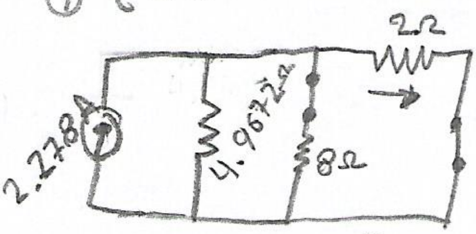


$R_T = \frac{(9.87)(10)}{19.87} = 4.9672\ \Omega$





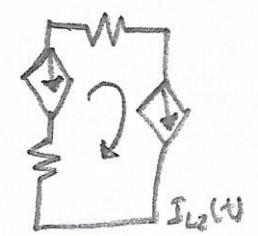
① $t<0$



$I_{L1}(0^-) = \frac{I_{ab}(2)}{(4.96)+(8)+(2)} = 0.3653A$

$I_{L2}(0^-) = \frac{I_{ab}(8)}{4.96+8+2} = 1.461\ A$

$t=0$ se acciona el interruptor



la bobina se opone a cambios bruscos de corriente:

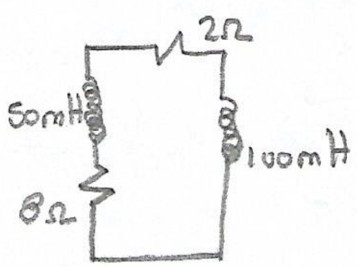
$I_{L1}(0) = I_{L1}(0^-) = 0.36534$

$I_{L2}(0) = I_{L2}(0^-) = 1.46125\ A$

$i(0) = i_{L2}(0) - i_{L1}(0) = 1.09595\ A$

$V_R = V(0) = i(0)(2) = 2.1919V$

$t>0$ se propone la E.D



Bobinas y resistores en serie

$R = 2+8 = 10Ω$

$L = 50+100 = 150mH$

Por LKC

$\frac{V(t)}{R} + \frac{1}{L}\int V(t)dt = 0$

$\frac{1}{R}\frac{dV(t)}{dt} + \frac{1}{L}V(t) = 0$

$D = \frac{d}{dt}$ $\quad \frac{1}{R}DV(t) + \frac{1}{L}V(t) = 0$

$\underbrace{\left(\frac{1}{R}D + \frac{1}{L}\right)}_{=0}\underbrace{V(t)}_{\neq 0} = 0$

$\frac{1}{R}D + \frac{1}{L} = 0 \quad D = -\frac{R}{L} = -\frac{10}{150\times10^{-3}}$

$D = -66.6667$

Proponemos la solución a la homogen

$V(t) = Ke^{-66.666t}$

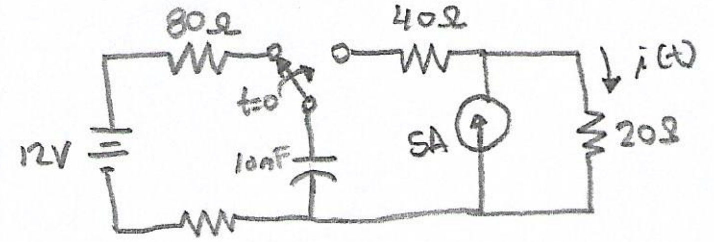
Sustituimos en $t=0$ y $V(0) = 2.191$

$V(0) = K\cancel{e^0}$

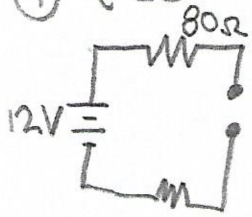
$K = 2.1919$

$\underline{V(t) = 2.1919e^{-66.6667t}}$

(18) Calcular $i(t)$ para $t \geq 0$



① $t < 0$



el capacitor se comporta como circuito abierto además esta cargado

$i(\bar{0}) = 0$

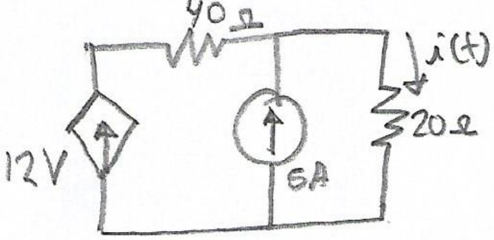
$V_c(\bar{0}) + V_{R_1}(\bar{0}) + V_{R_2}(\bar{0}) = 12V$

$V_R(\bar{0}) = R\, i(\bar{0}) = 0$

$V_c(\bar{0}) = 12V$

② se activa el interruptor $t=0$

la red auxiliar será



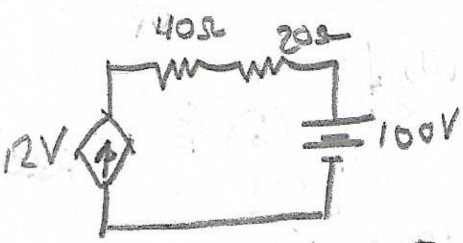
el capacitor se opone a cambios bruscos de voltaje

$V_c(0) = V_c(\bar{0})$

$V_c(0) = 12V$

Transformando la fuente

$V = (20)(5) = 100V$

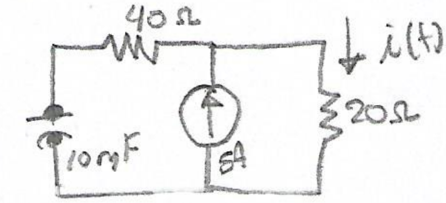


Sumando fuentes

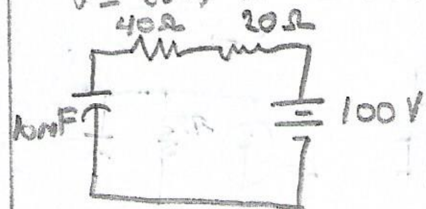
$-12 + 100 = 88V$

$I = \frac{88V}{60} = 1.4666A$

$t > 0$ se calculan k's e. D



$V = (20)(5) = 100V$



LVK

$V_c + V_R = 100V$

$\frac{1}{C}\int i(t)\,dt + R\,i(t) = 100$

derivando

$\frac{1}{C} i(t) + R\frac{d\,i(t)}{dt} = 0$

$D = \frac{d}{dt} \quad \frac{1}{C} i(t) + RD\,i(t) = 0$

$\left(\frac{1}{C} + RD\right) i(t) = 0 \quad \frac{1}{C} + RD = 0 \quad D = -\frac{1}{RC}$

$\left(\frac{1}{C} + RD\right) = 0 \quad i(t) \neq 0$

$D = -\frac{1}{(60)(10}$

$D = -1.666$

Proponemos una solución a la homogenea

$i(t) = K e^{-1.666t}$

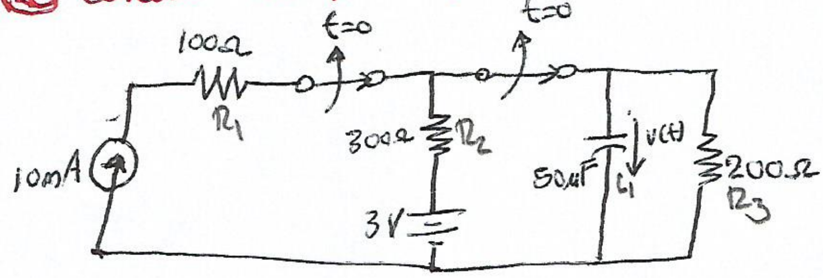
Calculamos k en $t=0$ $i(0) = 1.4666$

$i(0) = K e^{0} \quad K = 3.8$

$i(t) = 1.466\, e^{-1.666t}$

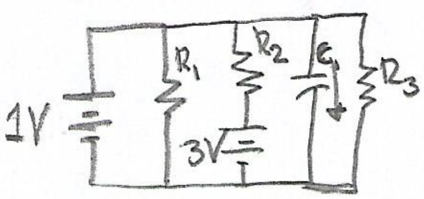
$i(t) = 5 - 1.466 e^{-1.666t}$

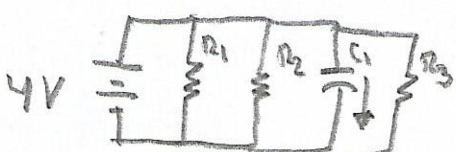
② Calcular $v(t)$ para $t \geq 0$



① $t<0$

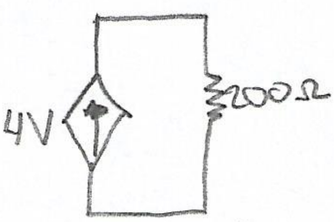
$V = (100)(10mA) = 1V$





$V_c = V_f = 4V$

② $t=0$ Se desactiva el interruptor

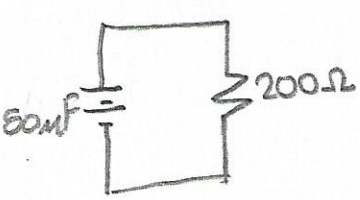


el capacitor se opone a cambios bruscos de voltaje

$V_c(0) = V_c(0^-) = 4V$

$i(0) = \frac{4}{200} = 0.02 \text{ A}$

③ $t>0$ determina la E.D



LVK

$V_R + V_c = 0$

$R\,i(t) + \frac{1}{C}\int i(t)\,dt = 0$

derivando

$R\frac{di(t)}{dt} + \frac{1}{C}\,i(t) = 0$

$D = \frac{d}{dt}$

$RD\,i(t) + \frac{1}{C}\,i(t) = 0$

$\underbrace{\left(RD + \frac{1}{C}\right)}_{=0}\ \underbrace{i(t)}_{\neq 0} = 0$

$RD + \frac{1}{C} = 0$

$D = -\frac{1}{RC} = -\frac{1}{(200)(50\times10^{-6})} = -100$

Proponemos la solución a la homogénea

$i(t) = K e^{-100t}$

Sostituimos en $t=0$ $\quad i(0) = 0.02A$

$i(0) = K e^{0}$

$K = 0.02$ $\qquad \underline{i(t) = 0.02\,e^{-100t}}$

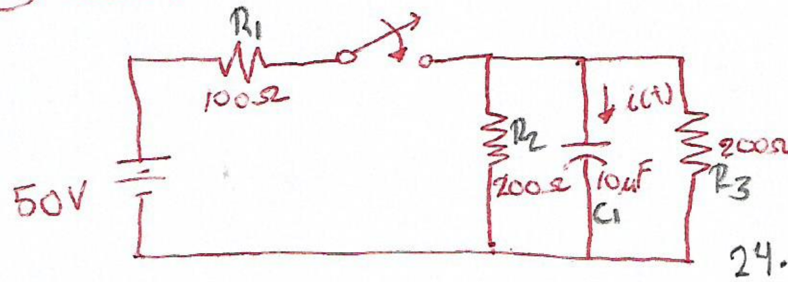
$V_R(t) = R\,i(t) = (200)(0.02)\,e^{-100t}$

$V_R(t) = 4e^{-100t}$

$V_c(t) + V_R(t) = 0$

$V_c(t) = -V_R(t) = \underline{-4e^{-100t}\ V}$

(22) Calcular $i(t)$ para $t \geq 0$

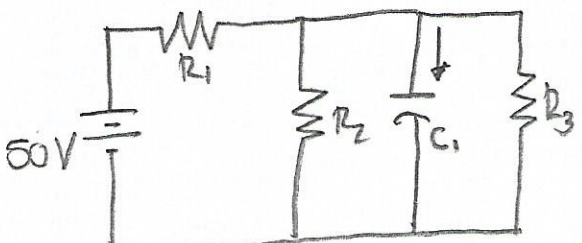


① $t<0$

$i(0^-)=0$

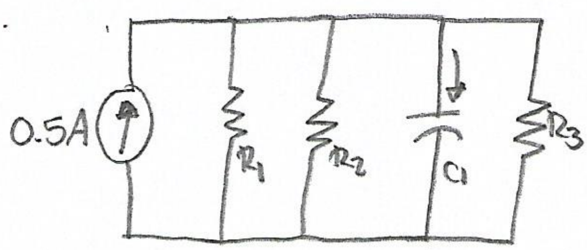
$V(0^-)=0$

② $t=0$ se activa el interruptor

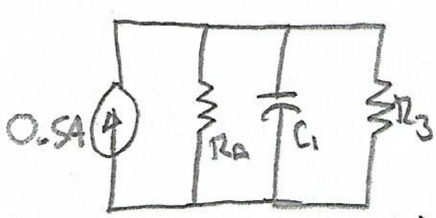


Intercambio de fuentes

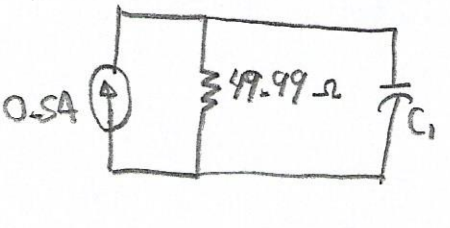
$$I = \frac{V}{R_1} = \frac{50\,V}{100} = 0.5A$$



$$R_A = \frac{R_1 R_2}{R_1+R_2} = \frac{(100)(200)}{100+200} = 66.66\,\Omega$$

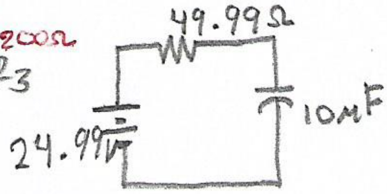


$$R_B = \frac{R_A R_3}{R_A+R_3} = \frac{(66.66)(200)}{66.66+200} = 49.99$$



Intercambio de fuentes

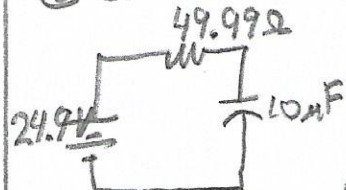
$$V = RI = (49.99)(0.5) = 24.99\,V$$



$i_c(0) = i_R(0) = \frac{24.}{49.}$

$\underline{i_c(0) = 0.5A}$

③ $t>0$ establecemos la E.D



LKV

$$V_R + V_C = E$$

$$R\,i(t) + \frac{1}{C}\int i(t)\,dt = 24.99V$$

derivando

$$R\frac{d\,i(t)}{dt} + \frac{1}{C}\,i(t) = 0 \qquad D = \frac{d}{dt}$$

$$RD\,i(t) + \frac{1}{C}\,i(t) = 0 \qquad \underbrace{\left(RD + \frac{1}{C}\right)}_{\neq 0}\underbrace{i(t)}_{=0} = 0$$

$$RD + \frac{1}{C} = 0 \qquad D = -\frac{1}{RC} = -\frac{1}{(49.99)(10\times10^{-6})}$$

$D = -2000$

Proponemos una solución a la homogenea

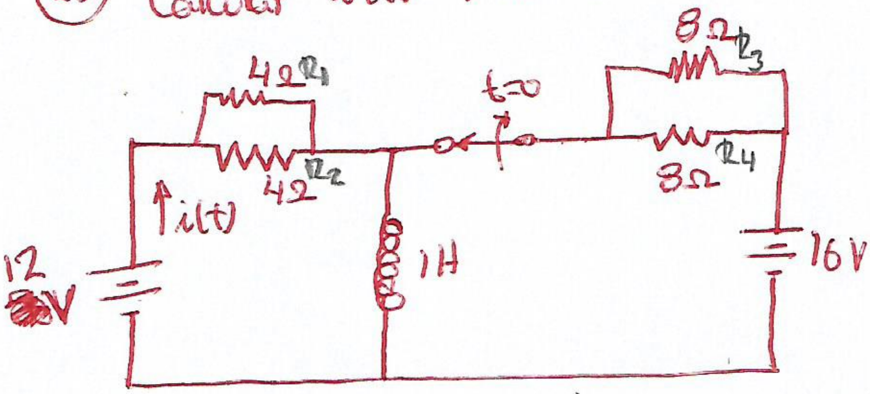
$$i(t) = Ke^{-2000t}$$

Sustituimos en $t=0$ $\quad i(0) = 0.5\,A$

$$i(0) = K\cancel{e}^{1} \qquad K = 0.5$$

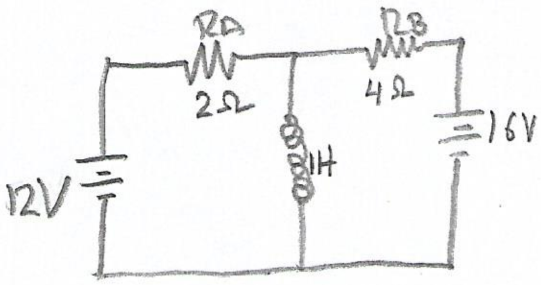
$$\underline{i(t) = 0.5e^{-2000t}}$$

23 Calcular $i(t)$ para $t \geq 0$



$R_A = \frac{R_1 R_2}{R_1+R_2} = \frac{(4)(4)}{8} = 2\Omega$

$R_B = \frac{R_3 R_4}{R_3+R_4} = \frac{(8)(8)}{8+8} = 4\Omega$

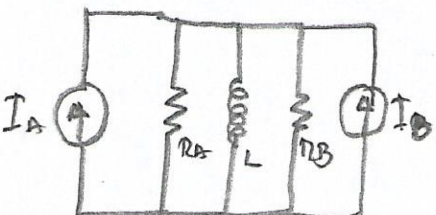


① $t<0$

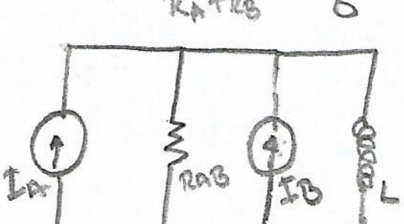
intercambiando fuentes

$I_A = \frac{12}{2} = 6\,V$

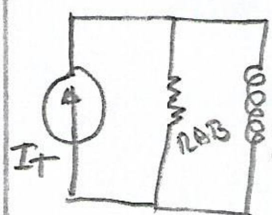
$I_B = \frac{16}{4} = 4V$



$R_{AB} = \frac{R_A R_B}{R_A+R_B} = \frac{(2)(4)}{6} = 1.333\Omega$



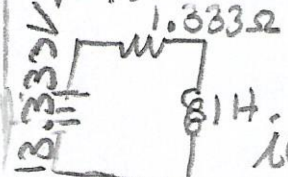
$I_T = 6+4 = 10A$



Intercambiando fuente

$V = R_{AB}\, I_T = (1.333)(10)$

$V = 13.333$

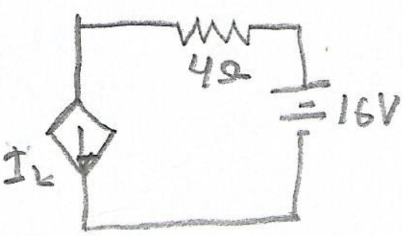


$i(\bar{0}) = \frac{V}{R}$

$i(\bar{0}) = \frac{13.333}{1.333}$

$i(\bar{0}) = 10\,A$

② $t=0$ se desactiva el interruptor.



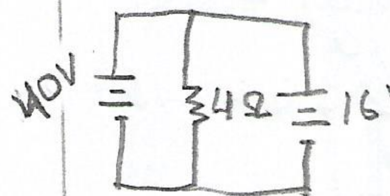
la bobina se opone a cambios bruscos de corriente por lo que

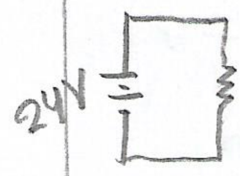
$I_L(0) = I_L(\bar{0}) = 10\,A$

Transformando fuente

$V = RI = (4)(10\,A)$

$V = 40\,V$



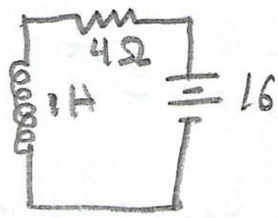


$I = \frac{24}{4} = 6$

$V(0) = 24V$

$i(0) = 6\,A$

③ $t>0$ se determina la E.D



LVK

$V_L + V_R = 16V$

$L\frac{di(t)}{dt} + Ri(t) = 16$

determinamos una solución a la homogénea

$D = \frac{d}{dt}$

$LDi(t) + Ri(t) = 0$

$\underbrace{(LD+R)}_{=0}\underbrace{i(t)}_{\neq 0} = 0$

$LD+R = 0$

$D = -\frac{R}{L} = -\frac{4}{1} = -$

la solución propuesta es

$i_h(t) = Ke^{-4t}$

la Solución Particular será

$i_p(t) = A$

la solución particular debe satisfacer la ecuación.

$$L\frac{d(\cancel{A})^{0}}{\cancel{dt}} + RA = 16$$

$$RA = 16$$

$$A = \frac{16}{R} = \frac{16}{4} = 4$$

$$i_p(t) = 4A$$

Calculando K evaluando en

$t=0$ $\quad i(0) = 6A$

$$i_h(0) = K\cancel{e^{-4t}}\,1$$

$$K = 6$$

$$i_h(t) = 6e^{-4t}$$

$$i_T = i_h(t) + i_p(t)$$

$$i_T = 4 + 6e^{-4t}$$