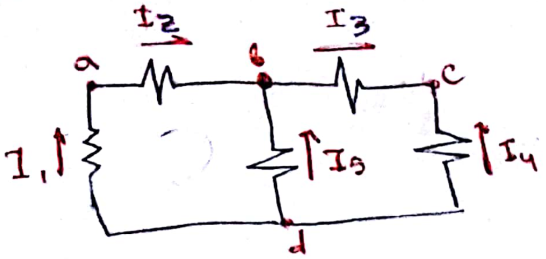
A_1 (Kirchoff)



"Escribir base det. con Kirchoff"

(Si un valor de corriente nos dá positivo, es por q' está bien el sentido q' le indicamos)

20-8-19

Analisis de Circuitos.

- campus (nos van a agregar)
- 2 Parciales
- 1 oral (TP)
- Van haber ejercicios para corregir.

1er Parcial:
23/10
13/11
27/11

2do Parcial:
11/12
18/12
12/02

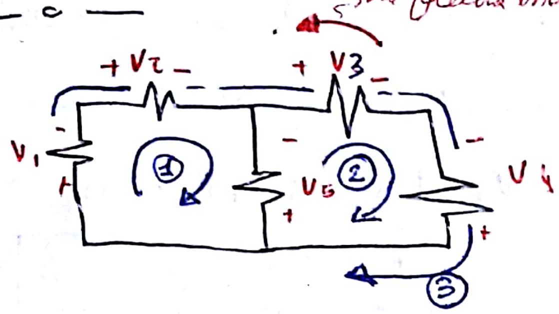
$$\sum I = 0 \;;\; \sum I_E - \sum I_S = 0 \;;\; \sum I_E = \sum I_S$$

- modo a: $I_1 + I_2 = 0$; $\boxed{I_1 = I_2}$
- modo b: $I_2 + I_3 + I_5 = 0$; $\boxed{I_2 + I_5 = I_3}$
- modo c: $I_3 + I_4 = 0$; $// \; I_3 = -I_4$
- modo d: $I_1 + I_5 + I_4 = 0$; $I_1 + I_4 + I_5 = 0$

— o —

A_2

La flecha indica crecimiento de potencial



Hay 3 posibles caminos cerrados. Por lo que hay 3 mallas.

1) $-V_1 - V_2 + V_5 = 0$.

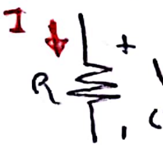
2) $-V_5 - V_2 + V_4 = 0$.

3) $-V_1 - V_2 - V_3 + V_4 = 0$.

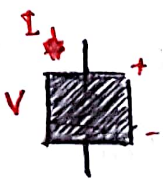
(Son LD, despues veremos como hacer para plantear menos ecuaciones.)

— o —

Ley de Ohm

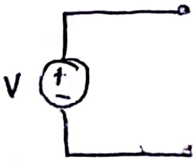


$V = I\,R$ (sin vector)

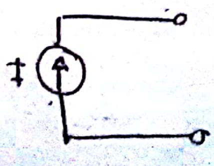


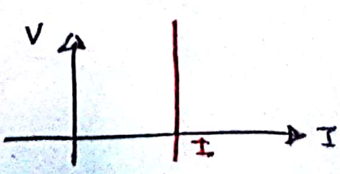
$P = VI$

$\sum P = 0$. (al final de las clase, esto no estan así)

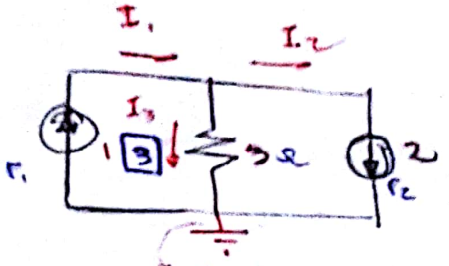


CS. lo pongo en corto, tengo "una imolet."





Sadiku
Hayt
Libros



La única q' indica q' es mi referencia de potencial.

Det. P. de cada elemento.

Entrante = saliente

$I_1 = I_2 + I_3$

$\Rightarrow \boxed{I_3 = 5 - 2 = 3}$

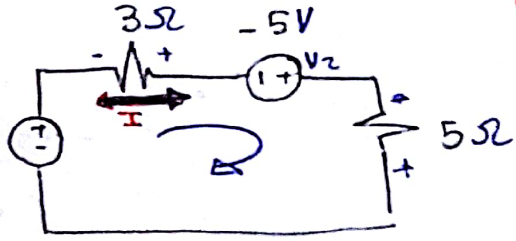
$V_1 = 9$ (t.a: 3·3)

- $P_{F_1} = V_1 \cdot (-I_1) = -45W$ (Entrega potencia
- $P_{Res} = V_1 \cdot I_3 = 3 \cdot 9 = 27W$
- $P_{F_2} = V_1 \cdot I_2 = 9 \cdot 2 = 18W$

$\Sigma P = 0.$

A4

(La potencia en todos los elementos).



$\overset{10}{V_1} - I \cdot 3\Omega - 5V - I \cdot 5\Omega = 0$

$I \cdot (-8\Omega) + 10V - 5V = 0$

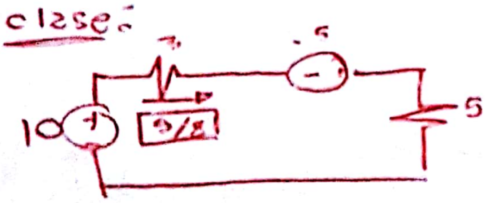
$\boxed{I = \frac{-5V}{-8V} = 0{,}625\ A}$

- $V(3\Omega) = 1{,}875V = \frac{15}{8}$
- $V(5\Omega) = 3{,}125V$

- $P_{V_1} = V_1 \cdot I = 10 \cdot -(5/8) = -6{,}25W$
- $P_{R(3\Omega)} = 3.125V \cdot +0{,}625A = +1{,}94W$
- $P_{V_2} = -5V \cdot -0{,}625A = 3.125W$
- $P(5\Omega) = - \cdot - = 1{,}95W$

Revisar

clase:



$P_{F_1} = 10 \cdot (-5/8) = \boxed{-25/4}$

$P_{F_2} = (-5) \cdot (-5/8) = \boxed{\frac{25}{8}}$

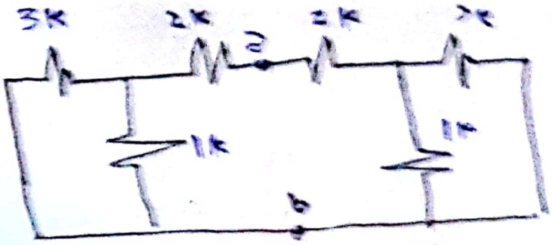
$P_{R_1} = 3\left(\frac{5}{8}\right)^2 = \boxed{75/64}$

$P_{R_2} = 5\left(\frac{5}{8}\right)^2 = \boxed{125/64}$

$P = VI$

$P = IR \cdot I = I^2R$

A5



¿Rab?

Es simétrico

$R_{ab} = 2 + \frac{3}{4} = \frac{11}{4}\ k\Omega \cdot \frac{1}{2}$

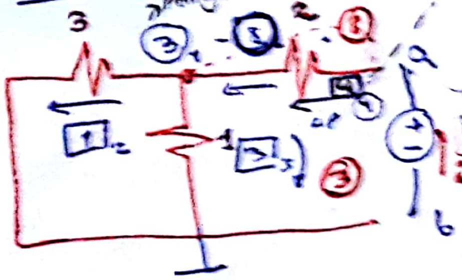
Tiene paralelo

$\boxed{R_{ab} = \frac{11}{8}\ k\Omega}$

más adelante esto es más rápido.

modo PRO

pongo una tensión de prueba arbitraria



$R_{ab} = \frac{V_p}{i_p}$

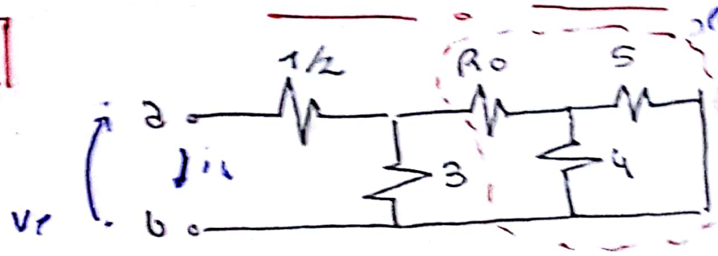
$\frac{V_P = 11/4}{i_P} = \frac{11}{4} = R_{ab}'$

$\boxed{R_{ab}\ (11/8)k}$

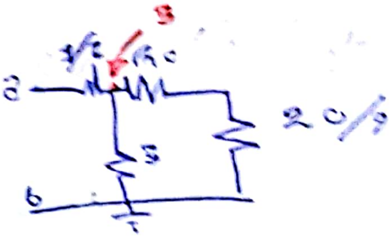
○ → Tensiones

□ → Corrientes

A6



$=$

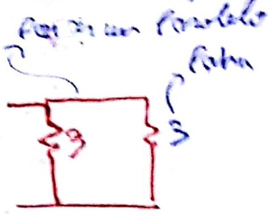


$R_{ab} = 2$

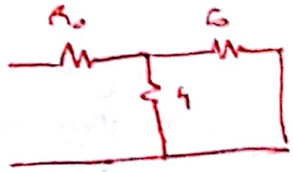
manera simple

$\equiv$

$\Rightarrow R_x = 3/2 \Rightarrow 3/2$



$3 =$

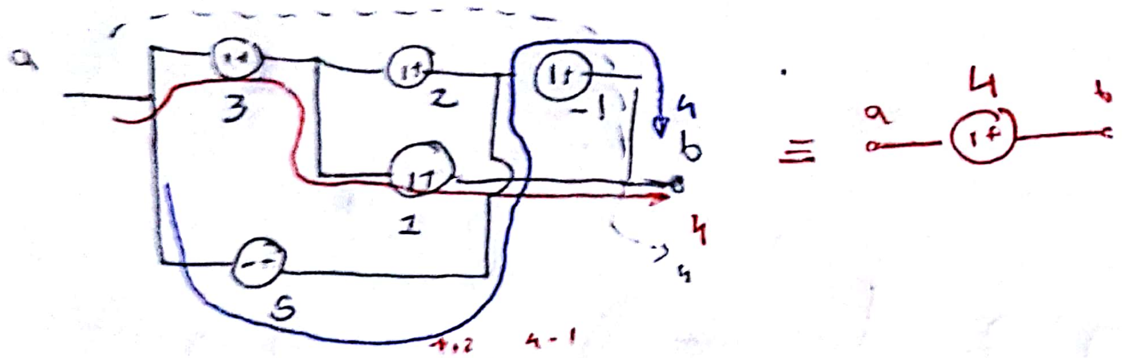


$\Rightarrow$

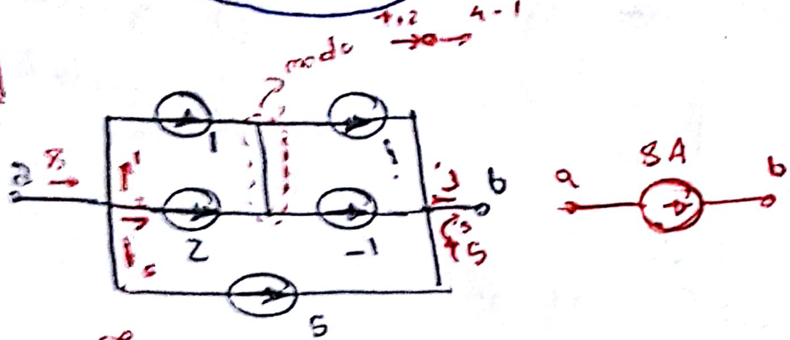
$\Rightarrow R_o + \frac{20}{9} = 3$

$\boxed{R_o = 7/9}$

A7

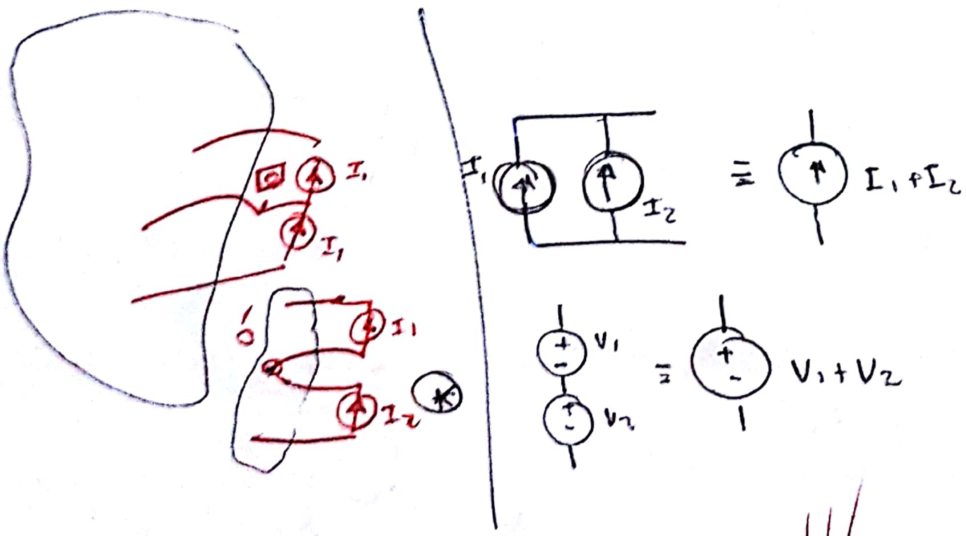


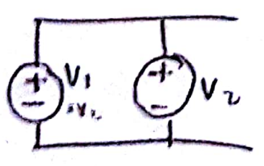
A8



Entra 8 y sale 8

A9

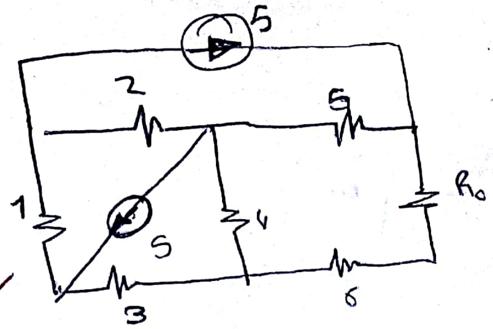


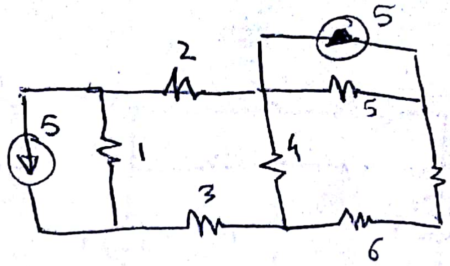


Si $V_1 \neq V_2$ ... aparece un Big Bang!!!

Si son iguales $I_3 = 0$, sino solo por I_3

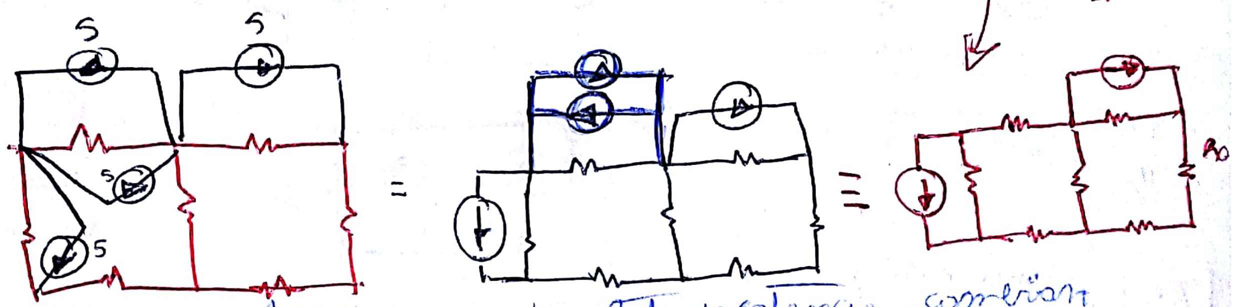
$\boxed{A_9}$





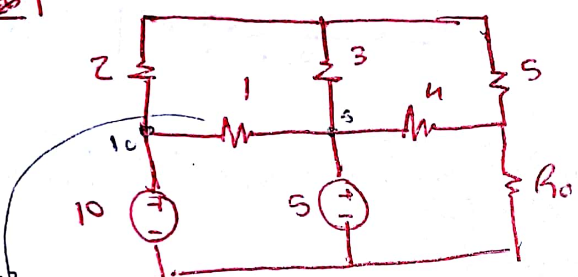
" ver q' los circuitos son lo mismos a efectos de Ro "

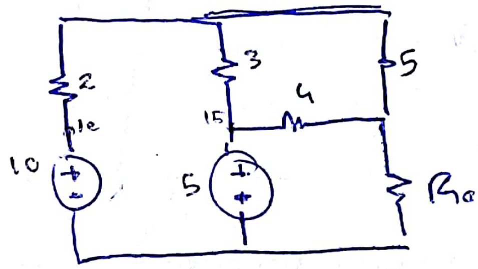
Son lo mismo Para $\boxed{Ro}$



rigurosamente no son lo mismo ya q' a efectos de potencia, cambian.

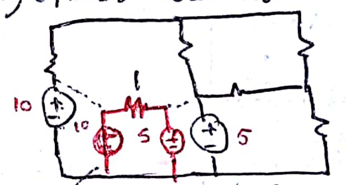
$\boxed{A}$



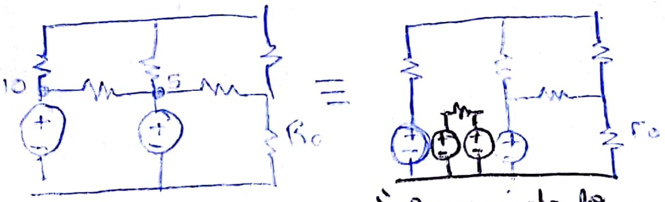


Lo unico q' hace es meter corriente de una fuente y meterla a la otra. no cambia la tension, por ser fuentes ideales (mantienen su tension).

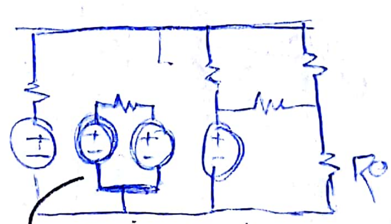
// y o puedo hacer esto



y acá se ve claramente q' la resistencia no molesta al circuito.

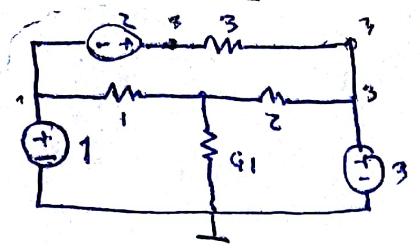


" Sigue siendo lo mismo "

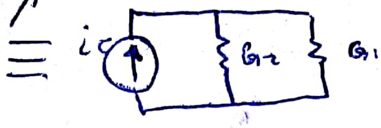


quizás así se vea mejor.
pero el punto es que a efectos practicos, para el circuito, esa resistencia no afecta el funcionamiento.
Lo unico que la resistencia hace es pasar corriente de una fuente a otra, pero las tensiones no cambian, por ser fuentes ideales.

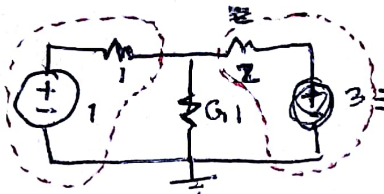
A10

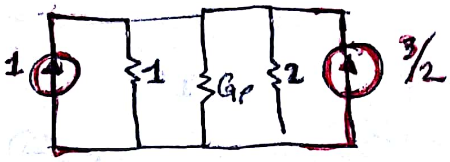


→ demostrar:



aplico Norton

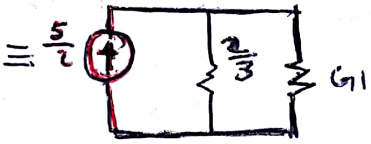


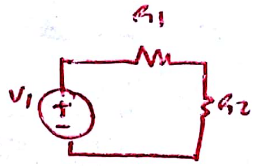


$V = IR$

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

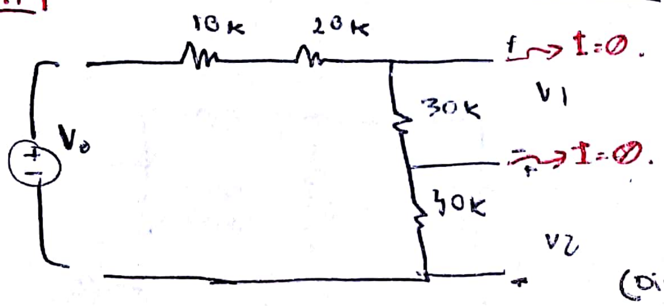
$I_2 = \frac{3}{2}$





$V_2 = V_1 \cdot \frac{R_2}{R_1+R_2}$

A11 "Divisor de tensión"



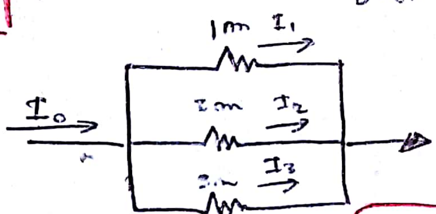
$\frac{V_1}{V_0} = \frac{30K}{100K} = \boxed{\frac{3}{10}}$

$\frac{V_2}{V_0} = \frac{40K}{100K} = \frac{4}{10} = \boxed{\frac{2}{5}}$

(Divisor de tensión) → funciones de transferencia.

A12 "Divisor de corriente"

Siemens



$I_{R_1} = I_1 \cdot \frac{R_2}{R_1+R_2}$

Con conductancias ... $\boxed{I_{R_1} = I_1 \cdot \frac{G_1}{G_2+G_1}}$

La fórmula con conductancias es parecida a la del divisor de tensión.

$\boxed{G = \frac{1}{R}}$

entonces si resolvemos

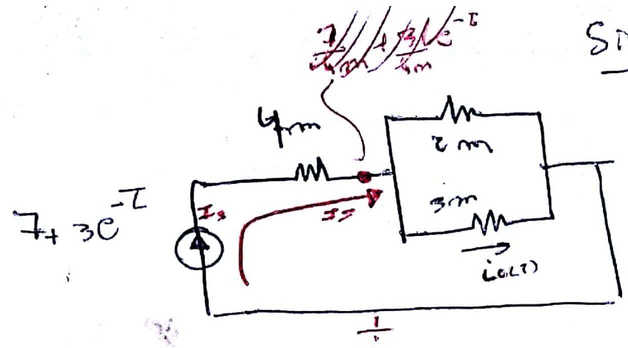
$\frac{I_1}{I_0} = \frac{1m}{(1+2+3)m} = \boxed{1/6}$

$\frac{I_2}{I_0} = \frac{2m}{(1+2+3)m} = \boxed{1/3}$

$\frac{I_3}{I_0} = \frac{3m}{(1+2+3)m} = \boxed{1/2}$

$\boxed{A_{13}}$

Siemens



¿ $i_{o(t)}$?

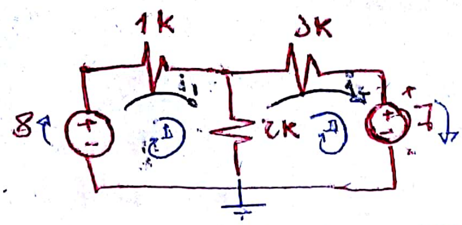
$$i_{o(t)} = \frac{3}{5}\underbrace{(7+3e^{-t})}_{I_s} = I_s \cdot \frac{3m}{2m+3m}$$

- mecharri@fi.uba.ar → fecha límite $\boxed{21/8}$ 18 AM

Enviar un correo, si no me anotan al campus.

$\boxed{\text{Parcial 14}}$

A-15



(I) $8 = i_1(1+2) - i_2(2) \Rightarrow \boxed{8 = 3 i_1 - 2 i_2}$

(II) $-7 = -i_1 \cdot (2) + i_2(3+2) \Rightarrow \boxed{-7 = -2 i_1 + 5 i_2}$

→ incognitas

$$\Rightarrow \begin{bmatrix} 8 \\ -7 \end{bmatrix} = \begin{bmatrix} 3 & -2 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

Para ello Busco la inversa / $Y = AX$

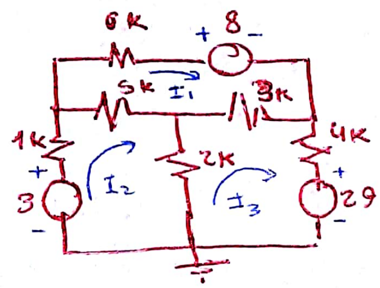
$$\frac{1}{\det(A)} [(A)]^T Y = X$$

$$\begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \frac{1}{11} \cdot \begin{bmatrix} 5 & +2 \\ +2 & 3 \end{bmatrix} \begin{bmatrix} 8 \\ -7 \end{bmatrix} = \frac{1}{11} \begin{bmatrix} 26 \\ -5 \end{bmatrix} = \begin{bmatrix} 26/11 \\ -5/11 \end{bmatrix}$$

$\boxed{i_1 = 26/11}$ $\boxed{i_2 = -5/11}$

o sea que va en el otro sentido.

A20



$①_1 \; -8 = I_1(5+3+6) - I_2(5) - I_3(3)$.

$①_2 \; 3 = -I_1(5) + I_2(1+5+2) - I_3 \cdot (2)$.

$①_3 \; -29 = -I_1(3) - I_2(2) + I_3(2+3+4)$

$\Rightarrow \det(A) = 786$

$$\begin{bmatrix} -8 \\ 3 \\ -29 \end{bmatrix} = \begin{bmatrix} 14 & -5 & -3 \\ -5 & 8 & -2 \\ -3 & -2 & 9 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix}$$

TAREA

A14 una fuente de tensión ideal $V_s(t) = 3 \cdot \cos 2t$ V se conecta a una red resistiva, como se muestra en la figura a-14. Encuentre una expresión para la tensión $V_o(t)$.

ohm

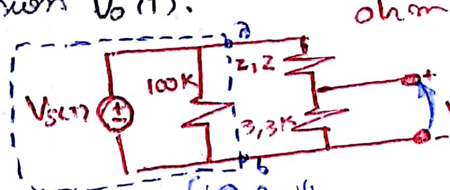
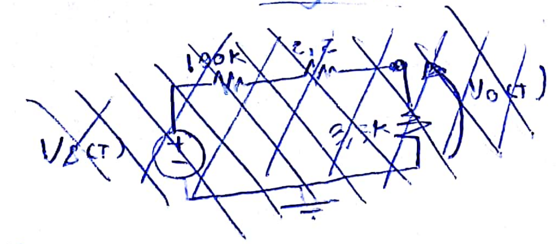


fig a-14

~~aplico Thevenin $V_{th} = V_s(t)$ $R_{th} = 100K$~~

(Enredo lo de la 2,2K

$\Rightarrow$



~~$V_o(t) = \frac{V_s(t) \cdot 3,3K}{103,302K}$~~

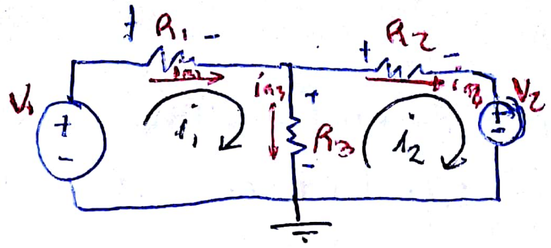
~~$V_o(t) = \left(\frac{3,3 \ldots}{103,302}\right) \cos(2t)$ V~~

se desprecia en 100K lo que Vs(t), entonces es un divisor de tensión

$$V_o(t) = \frac{3,3K}{3,3K + 2,2} \cdot V_s(t) \simeq \boxed{2,998 \cos(2t) \text{ V} = V_o(t)}$$

• metodo de mallas.

22-agosto



• mas olvidado mor de la malla de afuera.

$i_{R_1} = i_1$
$i_{R_2} = i_2$
$i_{R_3} = i_1 - i_2$

malla 1

$V_1 - V_{R_1} - V_{R_3} = 0$

$V_1 - i_{R_1} R_1 - i_{R_3} R_3 = 0$

$\Rightarrow V_1 = i_1 R_1 + (i_1 - i_2) R_3$

$$\boxed{V_1 = i_1(R_1+R_3) - i_2 R_3}$$

malla 2:

$V_{R_2} - V_{R_1} + V_2 = 0$

⋮

$$\boxed{V_2 = -i_1(R_3) + i_2 \cdot (R_2+R_3)}$$

• Σ fuentes de la malla = corriente de las malla · $\left(\Sigma\left(\text{Resistencias de las mallas}\right)\right) - \Sigma\left(\text{corriente de las mallas } i\right) \cdot \Sigma\left(\text{Resistencias de las mallas compartidas}\right)$

$\rightsquigarrow V_M = I_M \Sigma R_M - \Sigma I_i(\Sigma R_{comp})$.

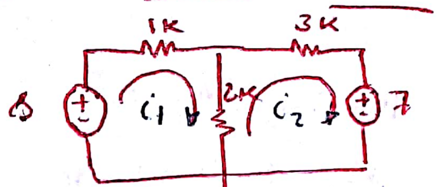
(Plantear todas las corrientes en sentido horario. Es mas convencional.)

$V_1 = i_1(R_1+R_3) - i_2 R_3$
$V_2 = -i_1 R_3 + i_2(R_2+R_3)$

$$\rightsquigarrow \begin{pmatrix} V_1 \\ V_2 \end{pmatrix} = \underbrace{\begin{pmatrix} R_1+R_3 & -R_3 \\ -R_3 & R_2+R_3 \end{pmatrix}}_{\text{Es simetrica}} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix}$$

(a menos que sea fuente controlada siempre va a ser simetrica).

A 15



$\begin{cases} 8 = i_1(1+2) - i_2(2). \\ -7 = -i_1(2) + i_2(2+3). \end{cases}$

$$\begin{bmatrix} 8 \\ -7 \end{bmatrix} = \begin{bmatrix} 3 & -2 \\ -2 & 5 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

Invertir matriz:

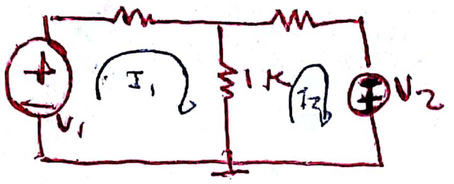
$$\underbrace{\begin{pmatrix} a & b \\ c & d \end{pmatrix}}_{A} \rightsquigarrow \underbrace{\frac{\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}}{\det \begin{vmatrix} a & b \\ c & d \end{vmatrix}}}_{A^{-1}}$$

• $i_1 = \frac{26}{11}$ mA

• $i_2 = \frac{-5}{11}$ mA

A16

¿V_1, V_2?



$i_1 = 2mA \qquad i_2 = 3mA$

$V_1 = I_1(3k + 1k) - i_2(1k)$

$+V_2 = -I_1(1k) + I_2(1k + 2k)$

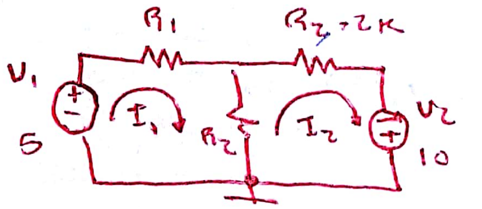
$V_1 = 2 \cdot 4 - 3 \cdot 1 = 5V \Rightarrow \boxed{V_1 = 5V}$

$+V_2 = -2 \cdot 1 + 3 \cdot 3 = 7V \Rightarrow \boxed{V_2 = +7V}$

$$\begin{pmatrix} V_1 \\ V_2 \end{pmatrix} = \begin{pmatrix} (3+1) & -1 \\ -1 & (2+1) \end{pmatrix} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix}$$

queda una matriz simetrica

A17



$I_1 = 1mA$

$I_2 = 2mA$

Hallar R_1 y R_2

① $V_1 = I_1(R_1 + R_2) - I_2 R_2$

② $V_2 = -I_1 R_2 + I_2(R_2 + R_3) \Rightarrow V_2 = I_2 \cdot R_3 + R_2(I_2 - I_1)$

① $\dfrac{V_1 + I_2 R_2}{I_1} - R_2 = \boxed{11K}$

② $\dfrac{V_2 - I_2 R_3}{I_2 - I_1} = \boxed{R_2 = 6K}$

$\underline{R_1 = 11K}$

otra forma: ① $V_1 = I_1 R_1 + (I_1 - I_2) R_2$

② $V_2 = (I_2 - I_1) R_2 + I_2 R_3$

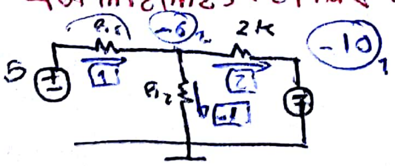
$$\Rightarrow \begin{cases} 5 = I_1 R_1 + (I_1 - I_2) R_2 = 1m\, R_1 - 1m\, R_2 \\ 10 = (I_1 - I_2) R_2 + I_2 R_3 = 1m\, R_2 + 2\cancel{m} \cdot 2\cancel{K} \end{cases}$$

$\Rightarrow \boxed{R_2 = \dfrac{10 - 4}{1m} = 6K}$; $5 = 1m\, R_1 - 1\cancel{m} \cdot 6\cancel{K}$

$R_1 = \dfrac{5 + 6}{1m} = \dfrac{11}{1} K$

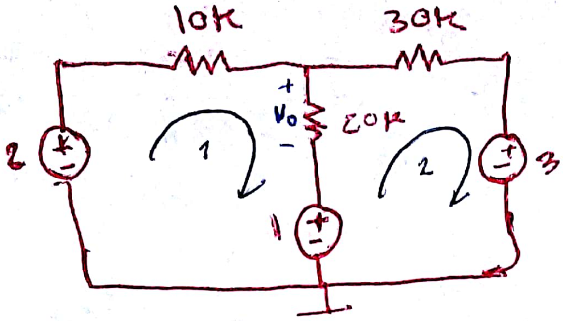
Forma mas rapida.

$11 = 5 - (-6)$



$\underline{R_1 = \dfrac{11}{1} = 11K} \qquad \underline{R_2 = 6K}$

$\boxed{A_{18}}$



$$2-1 = I_1(10k+20k) - I_2(20k)$$

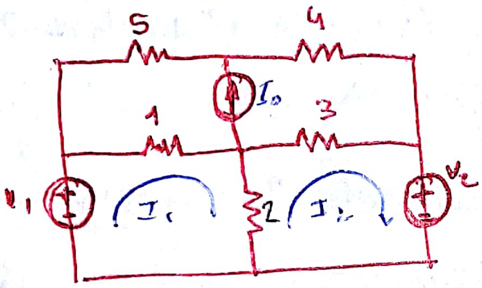
$$1-3 = -I_1(20k) + I_2(20k+30k)$$

$$\begin{pmatrix}1\\-2\end{pmatrix} = \begin{pmatrix}3 & -2\\-2 & 5\end{pmatrix}\begin{pmatrix}I_1\\I_2\end{pmatrix}$$

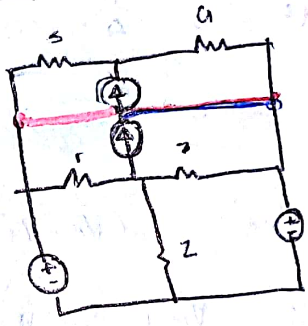
$$\Rightarrow \begin{pmatrix}I_1\\I_2\end{pmatrix} = \frac{1}{11}\begin{pmatrix}5 & 2\\2 & 3\end{pmatrix}\begin{pmatrix}1\\-2\end{pmatrix} \Rightarrow \begin{cases} I_1 = \frac{1}{11}(5-4) = \frac{1}{11} \cdot \frac{1}{10k} \\ I_2 = \frac{1}{11}(2-6) = \frac{-4}{11} \cdot \frac{1}{10k} \end{cases}$$

$$\boxed{V_0 = \overset{20k}{\widehat{2}}\,\overset{\frac{1}{10k}}{\overline{(I_1 - I_2)}} = 2\left(\frac{5}{11}\right) = \frac{10}{11}}$$

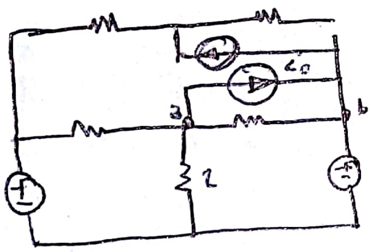
$\boxed{A_{19}}$



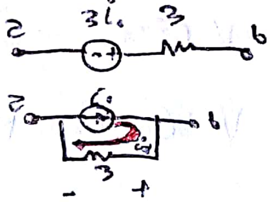
$\equiv$



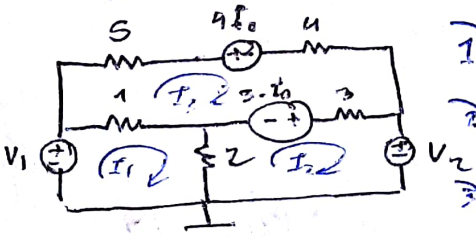
$\Rightarrow$



$\|$



$\Rightarrow$

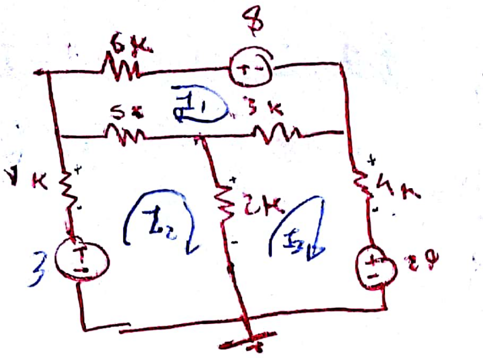


1) $V_1 = I_1(1+2) - I_2(2) - I_3(1)$.

2) $3I_0 - V_2 = -I_1(2) + I_2(2+3) - I_3(3)$.

3) $4I_0 - 3I_0 = -I_1(1) - I_2(3) + I_3(5+4+3+1)$.

A20



Simular

$T = A . I \Rightarrow I = A^{-1} . T$

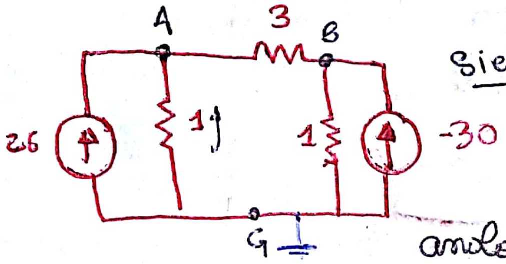
$$3 = -I_1(5) + I_2(5+2+1) - I_3(2)$$
$$-29 = -I_1(3) - I_2(2) + I_3(2+3+4)$$
$$-8 = I_1(3+5+6) - I_2(5) - I_3(3)$$

$$\Rightarrow \overbrace{\begin{pmatrix} 3 \\ -29 \\ -8 \end{pmatrix}}^{T} = \overbrace{\begin{pmatrix} -5 & 8 & -2 \\ -3 & -2 & 9 \\ 14 & -5 & -3 \end{pmatrix}}^{A} \overbrace{\begin{pmatrix} I_1 \\ I_2 \\ I_3 \end{pmatrix}}^{I}$$

$I_1 = \frac{-81}{35}$ $\quad I_2 = \frac{-1304}{595}$ $\quad I_3 = \frac{-2667}{595}$ es uno

A21

Nodos



siemems $\quad \Sigma I_i = 0.$

$26 + 1(V_G - V_A) + 3(V_B - V_A) = 0.$

analogo a lo de mallas....

A) $26 = -1(V_G - V_A) - 3(V_B - V_A)$ (Por del lado A los vamos a dejar positivos)

$26 = V_A(1+3) - V_B(3) - \cancel{V_G}^{0}(1)$ (las resistencias en las cc. aparecen 2 veces).

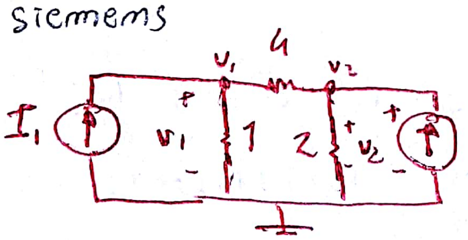
$\Sigma FC_i = V_i(\Sigma G) - \sum_j V_j(G_j)$

B) $-30 = V_B(3+1) - V_A(3) - \cancel{V_G}^{0}(1)$.

En la fuente de corriente si es entrante al circuito conserva su signo, si es saliente, cambia

A22

siemems

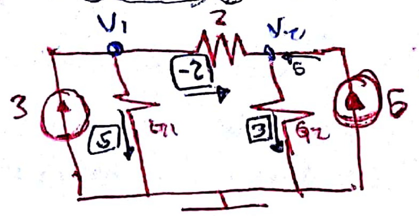


$V_1 = 3$
$V_2 = 1$

$$I_1 = V_1(4+1) - V_2(4).$$
$$I_2 = -V_1(4) + V_2(4+2).$$

$$\begin{pmatrix} I_1 \\ I_2 \end{pmatrix} = \begin{pmatrix} 5 & -4 \\ -4 & 6 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix} = \begin{pmatrix} 9 \\ -6 \end{pmatrix}$$

A23 Siemems



$V_1 = 1$ $V_2 = 2$

¿G_1, G_2?

$G_2 = \frac{I}{V} = \frac{3}{2}$

$G_1 = \frac{I}{V} = 5$

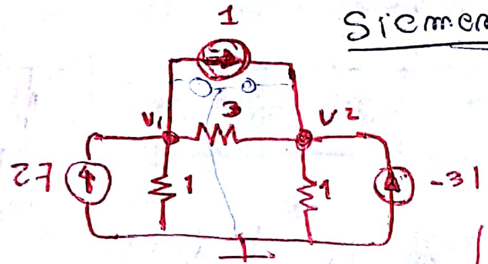
$3 = V_1(2+G_1) - V_2(2)$

$5 = -V_1(2) + V_2(2+G_2)$

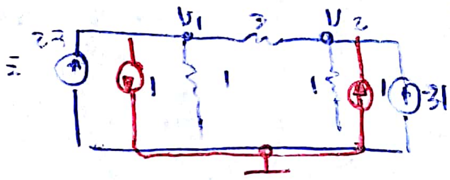
$\frac{3+V_2 \cdot 2}{V_1} - 2 = \underline{G_1 = 5}$

$\frac{5+V_1 \cdot 2}{V_2} - 2 = \underline{G_2 = \frac{3}{2}}$

A24 Siemems



$\begin{cases} 27-1 = V_1(1+3) - V_2(3). \\ -31+1 = -V_1(3) + V_2(3+1). \end{cases}$



$\begin{cases} 26 = V_1(1+3) - V_2(3) \\ -30 = -V_1 3 + V_2(3+1) \end{cases}$

(Parecido al A_{21})

Ej 2.5 marcado

Repaso: mallas $\sum F(V) = I_M(\sum R_M) - I_{M.c}(\sum R_c)$

a una distancia de un elemento

nodos $\sum_{(nodos)} F_{eE} = V_n\left(\sum \frac{1}{R}\right) - V_{n'}\left(\frac{1}{R}\right)$

Preguntar sobre la simulación del ej 20 en SPICE ¿q' razón pongo la resistencia me cambia el signo de la corriente

Simulación Ej 25

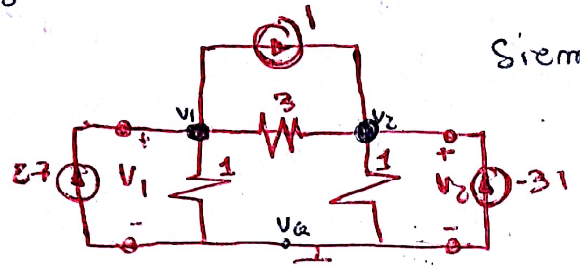
$V_1 = 4V$

$V_2 = 5{,}51724\ V$

$V_3 = 1{,}72414\ V$

A24 ~~Encuentre las tensiones de nodo para el circuito q' se muestra. Simule el circuito y compare resultados.~~

Encuentre las tensiones del nodo en la red que se muestra en la fig. Compare los resultados con el A21.

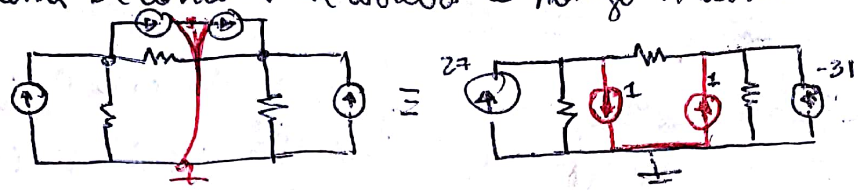


Siemens, $\sum F_{CE} = V_N(\Sigma G) - V_N(G)$

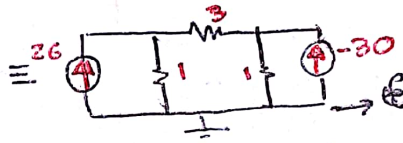
$(V_1)\ 27-1 = V_1(3+1) - V_2(3) - \cancel{V_G}(1)$

$(V_2)\ -31+1 = -V_1(3) + V_2(3+1) - \cancel{V_G}(1)$

Si mi fuente de corriente de arriba la pongo a tierra:



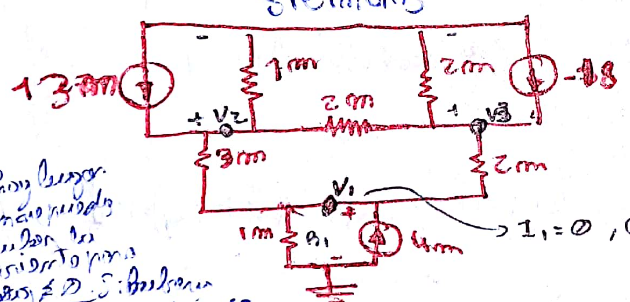
$I_{eq} = I_1 + I_2$



→ Es el mismo que el 21.

A25

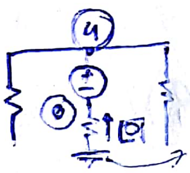
Siemens



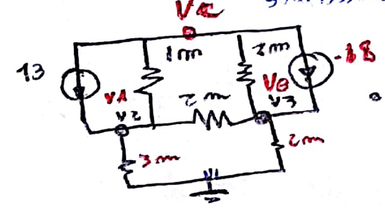
$V = IR = \frac{I}{G}$

• $V_1 = \frac{4m}{1m} = 4V$

→ $I_1 = 0$, xq toda la corriente en R_1, por lo q' a efectos prácticos la corriente en ese nodo es cero.



no hay lugar donde pueda circular la corriente para q' esta ≠ 0. Si hubiera otra tierra sería ≠ 0.



• ahora falta plantear los nodos.

no supongo $V_C = 4$, lo mando a tierra y después le sumo a las tensiones nomás 4V y todo a todo.

$+13 = V_A(1+2+3) - 2V_B - 1V_C$,

$-(18) = -2V_A + V_B(2+2+2) - 2V_C$,

$13-13 = -1V_A - 2V_B + V_C(1+2)$,

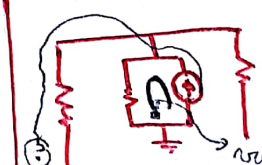
$$\begin{pmatrix} 13 \\ -18 \\ 5 \end{pmatrix} = \begin{pmatrix} 6 & -2 & -1 \\ -2 & 6 & -2 \\ -1 & -2 & 3 \end{pmatrix} \begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix}, \quad V_A = V_2, \quad V_B = V_3$$

$$\begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix} = \begin{pmatrix} 1{,}51724 \\ -2{,}27586 \\ 0{,}65517 \end{pmatrix} + 4$$

(*)

$$\Rightarrow \begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix} = \begin{pmatrix} 44/29 \\ -66/29 \\ 19/29 \end{pmatrix} + 4 \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

$\boxed{V_A = 160/29}$ $\boxed{V_B = 50/29}$ $\boxed{V_C = \frac{135}{29}}$

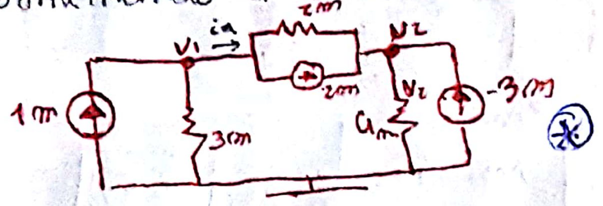


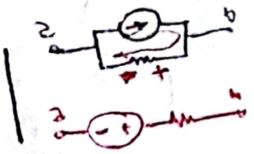
Si no tiene forma de volver a tierra por lo q' no puede haber corrientes afuera.

A20 Para el circuito q' se encuentra en la fig.

a - Encuentre i_a usando transformaciones de fuentes.

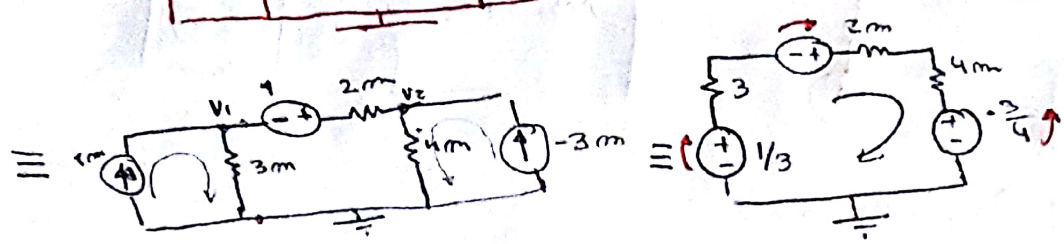
b - Verifique su respuesta resolviendo las ecuaciones de nodo para V_1 y V_2 y determinando el valor de la corriente en la conductancia de 2 mS. Siemens





$V = IR$

$V = \frac{I}{G}$

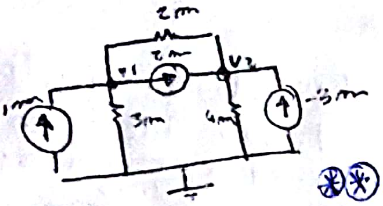


Kirchhoff $= \frac{1}{3} + 1 - \frac{-3}{4} = I_a(\frac{1}{3} + \frac{1}{2} + \frac{1}{4})$

$\boxed{I_a = \frac{25}{13}}$

¡Si la corriente es entrante al circuito entonces sumar!!

b -



⊛⊛
$$\begin{cases} 1-2 = V_1(3+2) - V_2(2) - \cancel{V_0}\,3 \\ -3+2 = -V_1(2) + V_2(2+4) \end{cases} \Rightarrow \begin{cases} -1 = 5V_1 - 2V_2 \\ -1 = -2V_1 + 6V_2 \end{cases}$$

$$\begin{pmatrix} -1 \\ -1 \end{pmatrix} = \begin{pmatrix} 5 & -2 \\ -2 & 6 \end{pmatrix} \begin{pmatrix} V_1 \\ V_2 \end{pmatrix} \Rightarrow \begin{pmatrix} V_1 \\ V_2 \end{pmatrix} = \frac{1}{26} \begin{pmatrix} 6 & 2 \\ 2 & 5 \end{pmatrix} \begin{pmatrix} -1 \\ -1 \end{pmatrix} = \frac{1}{26} \begin{pmatrix} -8 \\ -7 \end{pmatrix} = \begin{matrix} -8/26 \\ -7/26 \end{matrix}$$

$I(2mS) = (V_1 - V_2)2m$

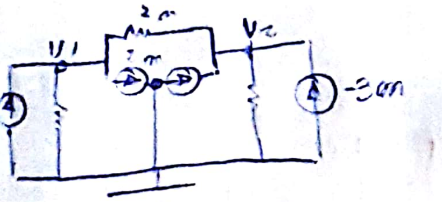
$2\left(\frac{-8}{26} - \frac{-7}{26}\right).2$

$I(2mS) = \frac{-1}{13} \Rightarrow \sum I = 0 \Rightarrow i_a = -\frac{1}{13} + 2 = \frac{25}{13}$

$i_a = I_2 (V_1 - V_2) G_2$

(complificada operación, nunca mallas) así serían 6 mallas, pero tendría 2 nodos.

⊛ clon



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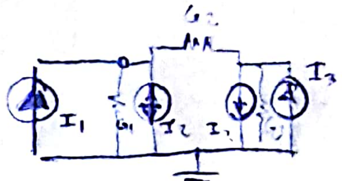
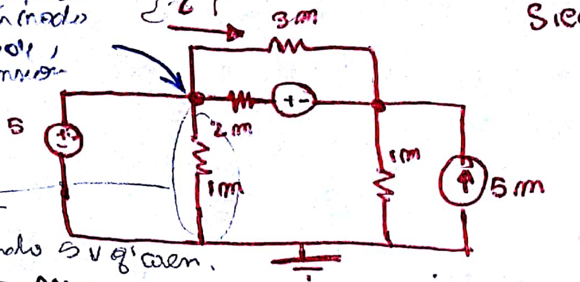


$$\begin{cases} I_1 - I_2 = V_1 G_1 + (V_1 - V_2) G_2 \\ I_2 + I_3 = V_2 G_3 + (V_2 - V_1) G_2 \end{cases} \Rightarrow \begin{cases} I_1 - I_2 = V_1(G_1 + G_2) - V_2 G_2 \\ I_2 + I_3 = -V_1 G_2 + V_2(G_3 + G_2) \end{cases}$$ ⊛⊛

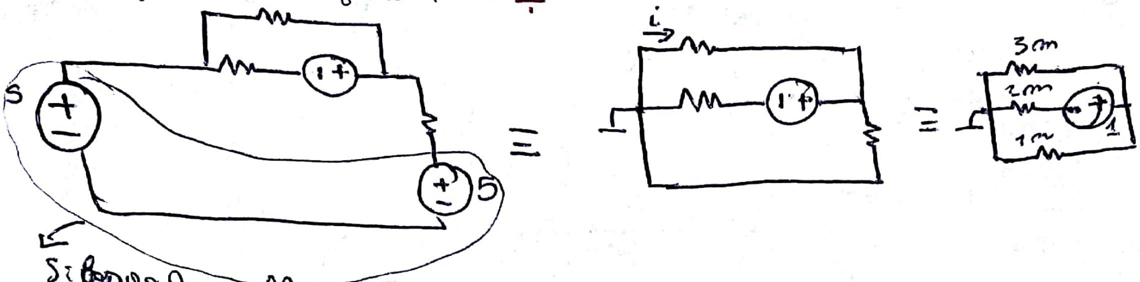
A27 no es nodo flotante nodo en fuente de tensión

¿i?

Siemens

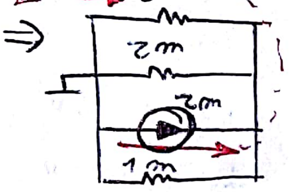


Esto no aporta nada porq' sigue siendo 5 V q' caen.



Si hago la malla, estos son cero

va en sentido contrario entonces es negativo.



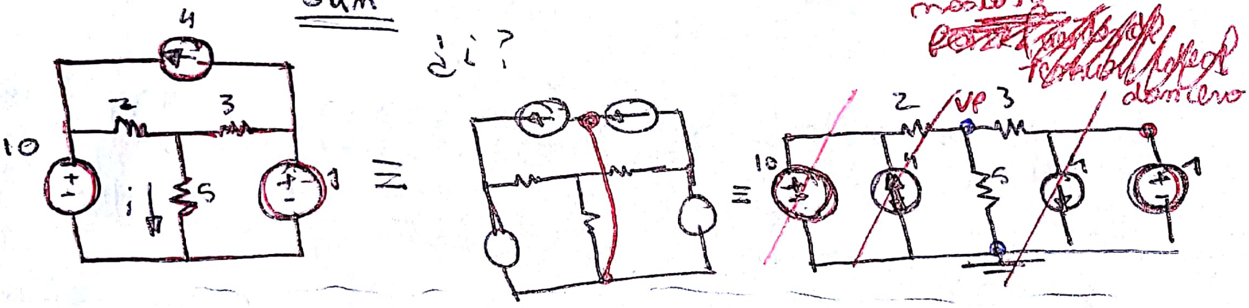
$i = \frac{3}{6}(-2m) = -1m$

Porq' tengo fuentes de tensión ideal, las tensiones me mantiene en la tensión en los nodos.

A28

ohm

¿i?



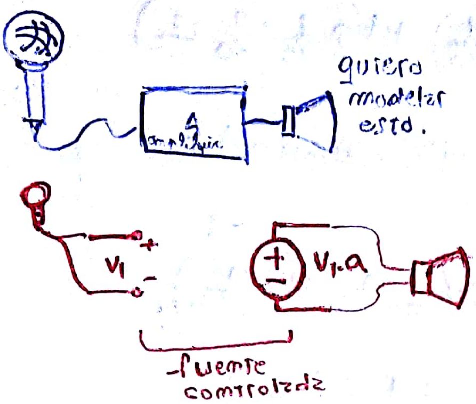
dan cero

P) $\underbrace{\frac{10}{2} - \frac{1}{3}}_{\frac{32}{6}} = V_P\underbrace{\left(\frac{1}{2} + \frac{1}{5} + \frac{1}{3}\right)}_{31/30} \Rightarrow V_P = \frac{32}{6} \cdot \frac{30}{31} = 5 \cdot \frac{32}{31}$

$\boxed{i = \frac{V_P}{5} = \frac{5\,\frac{32}{31}}{5} = \frac{32}{31}}$

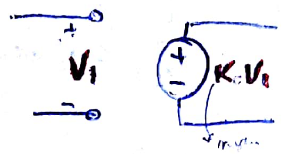
hasta acá chau repaso.

Fuentes controladas.

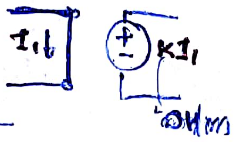


quiero modelar esto.

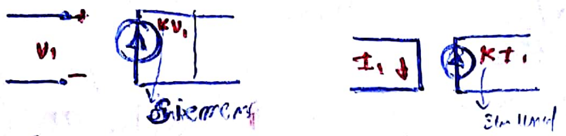
-fuente controlada



fuente de tensión controlada por tensión



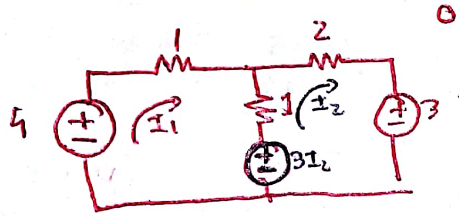
fuente de corriente controlada por la corriente



Trans resistencia

OHM

A29



$$\begin{cases} ① & 4-3I_2 = I_1(1+1) - I_2 \cdot 1 \\ ② & 3I_2 - 3 = -I_1 \cdot 1 + I_2(1+2) \end{cases}$$

$\Rightarrow$ $4 = I_2 \cdot 2 \quad - I_2(1-3) = I_1 \cdot 2 \quad I_2 \cdot 2$

$-3 = -I_1 \cdot 1 + I_2(3-3) = -I_1 + I_2 \varnothing$

$\Rightarrow \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} 2 & 2 \\ -1 & \varnothing \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$ (*)

Se rompió la simetría (El sist es ld), puedo quizás no tener Sción.

(*) $\boxed{I_1 = 3}$

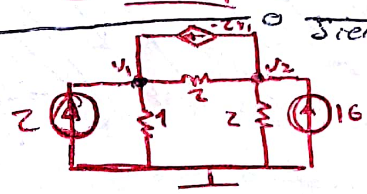
$\Rightarrow 4 = \overset{3.2}{6} + 2I_2$

$\frac{-2}{2} = \boxed{I_2 = -1}$

~> Resist ≈ f. controladas.

Siemens

A30



① $2 - 2V_1 = V_1(1+2) - V_2(2)$

② $16 - (-2V_1) = -V_1(2) + V_2(2+2)$

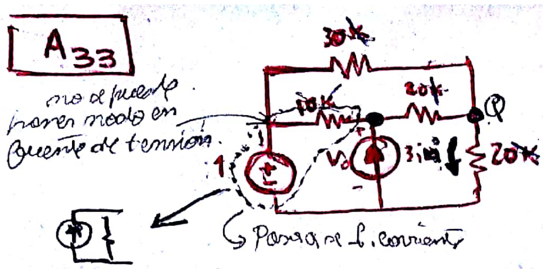
$$\Rightarrow \begin{cases} (2 = 5V_1 - 2V_2) \times 2 = 10 = 10V_1 - 4V_2 \\ 16 = -4V_1 + 4V_2 \qquad = 16 = -4V_1 + 4V_2 \end{cases}$$

sumo: $26 = 6V_1 \Rightarrow \boxed{V_1 = 10/3}$

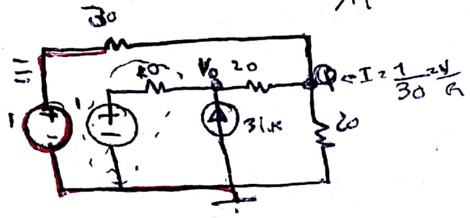
$4V_2 = 16 + 4 \cdot \frac{10}{3} \Rightarrow V_2 = 4 + \ldots \boxed{V_2 = 22/3}$

[A33

no se puede poner nodo en fuente de tensión



$V = IR \Rightarrow I = V/R$



V_0) $3\cancel{K}i + \frac{1}{10} = V_0\left(\frac{1}{10} + \frac{1}{20}\right) - V\varphi\left(\frac{1}{20}\right)$

$V\varphi$) $\frac{1}{30} = -V_0\left(\frac{1}{20}\right) + V\varphi\left(\frac{1}{20} + \frac{1}{20} + \frac{1}{30}\right)$

i) $i = \frac{V\varphi}{20}$ (Ley de OHM).

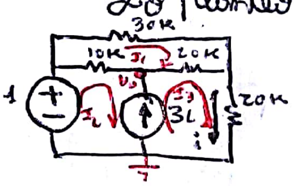
$$\begin{cases} 3k\,i + \frac{1}{10} = V_0\left(\frac{3}{20}\right) - V\varphi\left(\frac{1}{20}\right) \\ \frac{1}{30} = -V_0\left(\frac{1}{20}\right) + V\varphi\left(\frac{2}{15}\right) \\ i = \frac{V\varphi}{20} \end{cases}$$

$$\begin{cases} \frac{1}{10} = V_0\left(\frac{3}{20}\right) - V\varphi\left(\frac{3001}{20}\right) \\ \frac{1}{30} = \frac{-V_0}{20} + V\varphi\left(\frac{8}{60}\right) \end{cases} \Longrightarrow \left[\begin{array}{l} V\varphi = -4/2993 \\ V_0 = -\frac{2006}{2993} \end{array}\right.$$

(Está mal)

Lo planteo por mi cuenta, con mallas

$V = I.R$



$$\begin{cases} \text{I)}\ \emptyset = I_1(10+20+30)k - I_2\,10k - I_3\,20k \Rightarrow \emptyset = 60kI_1 - 10kI_2 - 20kI_3 \\ \text{II)}\ 1 - V_0 = -I_1\,10k + I_2(10k) - I_3(\emptyset) \Rightarrow 1 - V_0 = -10kI_1 + 10kI_2 \quad (*) \\ \text{III)}\ V_0 = -I_1\,20k - I_2(\emptyset) + I_3(20+20)k \Rightarrow V_0 = -20kI_1 - \emptyset + 40kI_3 \end{cases}$$

$\Sigma I = \emptyset$

$3i_3 + I_3 + I_2 = \emptyset$

$I_3 = 3I_3 + I_2$

$\Rightarrow 0 = 2I_3 + I_2$

$\boxed{I_2 = -2I_3}$ (*)

$V_0 = 3I\,i = 3I_3$

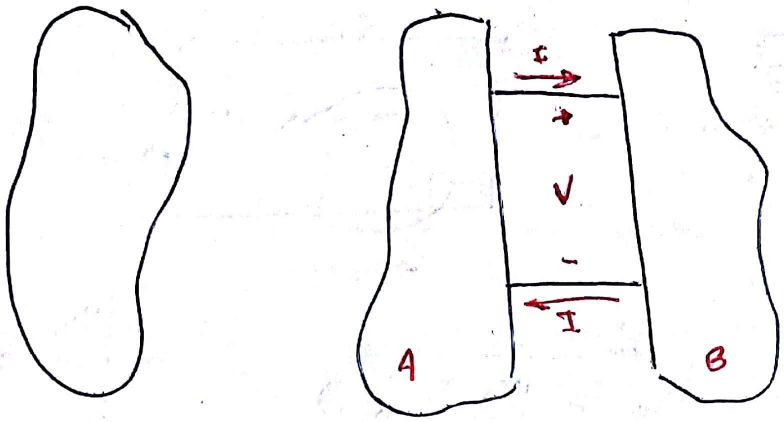
$$\begin{cases} \emptyset = 6I_1 + 2I_3 - 2I_3 \Rightarrow I_1 = \emptyset \\ 1 - V_0 = -10k.\emptyset + 10kI_2 \Rightarrow I_2 = \frac{1 - V_0}{10k} \\ V_0 = -20k\emptyset - \emptyset + 40kI_3 \end{cases}$$

$$\begin{cases} \cancel{\emptyset = 6I_1 - I_2 - 2I_3} \\ \cancel{\frac{1}{10k} = -I_1 + I_2 + 3I_3} \\ \cancel{\emptyset = -2I_1 - \emptyset + (4-3)I_3} \end{cases}$$

$\cancel{\frac{7}{2}I_1 = I_3}\ 2I_1 = 2I_3$

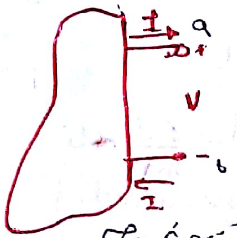
(*) $I_3 = \frac{V_0}{40k} \Rightarrow \frac{1 - V_0}{10k} = -2\,\frac{V_0}{40k}$

$1 - V_0 = -\frac{1}{2}V_0 \Rightarrow 1 = \frac{1}{2}V_0 \Rightarrow \boxed{V_0 = 2V}$

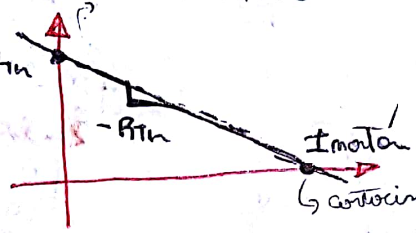


Si quiero pensar en el circuito A, sus eq equivalentes son

$E \in (A) + (I, V)$

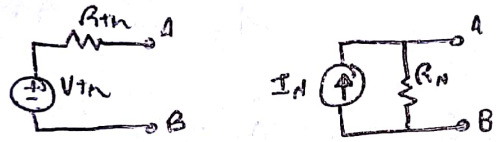


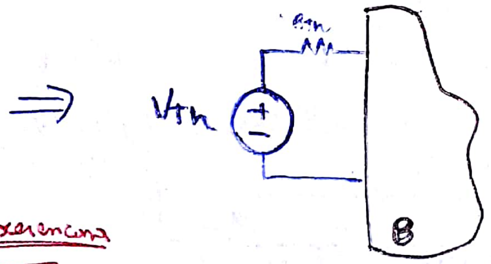
mido a y b a circ. abierto



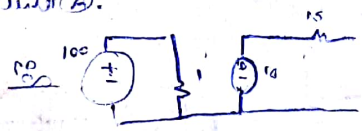
↳ cortocircuito a y b y mido corriente a cortocircuito.

Los circuitos mas chicos q' cumplen las ec. son.





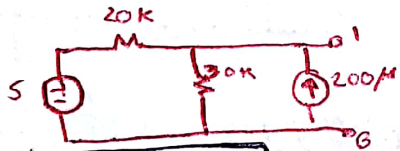
... Lo curioso: La pot q' disipa el eq. no tiene nada q' ver con la Pot q' disipa (A), Pierdo el circuito (A).



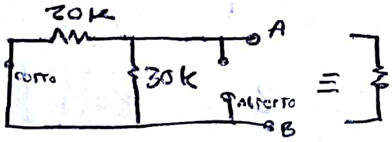
② Recurrencia

A34 b)

eq Th, Nor.

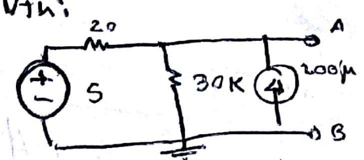


Pasivo Fuentes Independientes



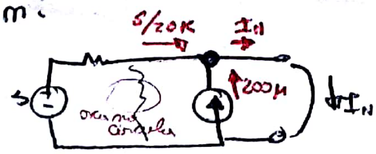
$\equiv$ $R_{eq} = \frac{(20 \cdot 30)K}{50K} = \boxed{12K = R_{th}}$

V_{th}?



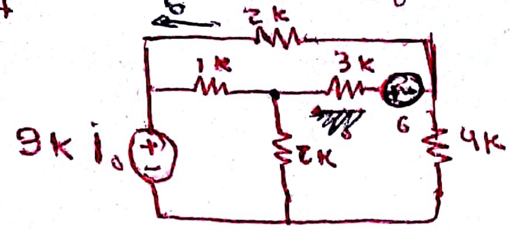
Sale facil con nodos $\Rightarrow$ $200\mu + \frac{5}{20K} = V_{th}\left(\frac{1}{20K} + \frac{1}{30K}\right) \to \boxed{5,4 = V_{th}}$

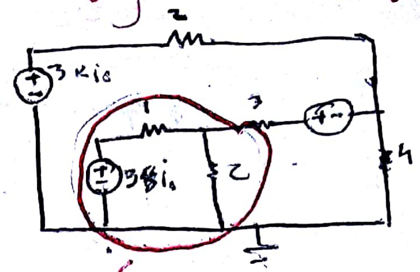
I_N?



$I_N = 200\mu + \frac{5}{20K} = 450\mu$

$\boxed{A_{31}}$ Para el circuito q' se muestra en la fig encuentre i_0 — Tarea.

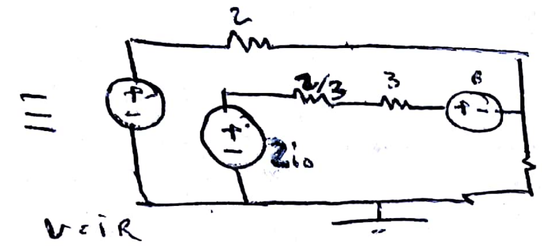




Thevenin.

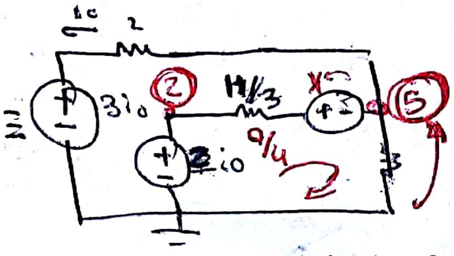
$V_{Th} = \frac{3I_0 \cdot 2}{2+1} = 2I_0$, $\frac{6 i_0}{3} = 2 i_0$

$R_{Th} = \frac{1 \cdot 2}{2+1} = \frac{2}{3}$



$V = iR$

$\frac{3 i_0}{2} = i$



$2 - 5 + \left(\frac{11}{3} \cdot \frac{9}{4}\right) - X = 0$

$$\Rightarrow \boxed{X = \frac{45}{4}}$$

$\frac{9}{4} \cdot \frac{11}{3} \cdot X = \frac{-25}{4} \cdot 5$

ahora una regla de 3

1 ——— $-45/4$

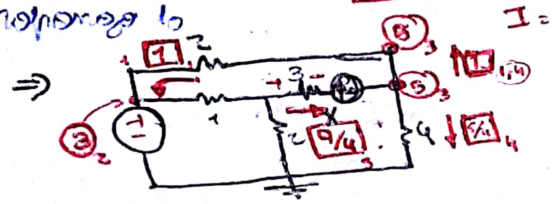
$\frac{-8}{15} = 6 \cdot \frac{4}{-45} = i_0$ ——— 6

metodo Pro

Propongo i_0

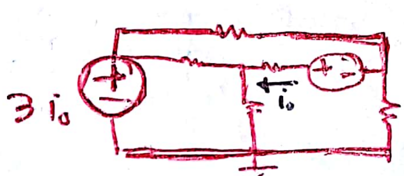
Si $\boxed{i_0 = 1}$?

$I = \frac{V}{R}$

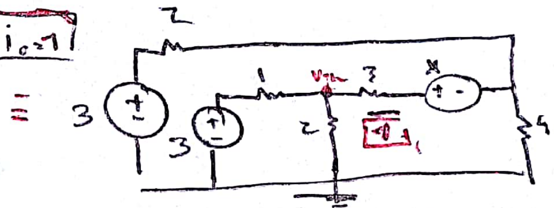


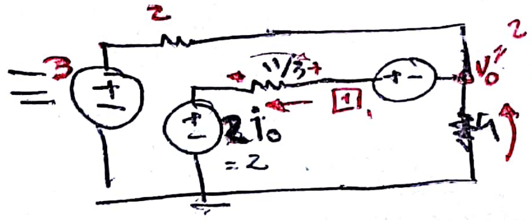
$$\Rightarrow \boxed{i_0 = \frac{-8}{15}\ mA}$$

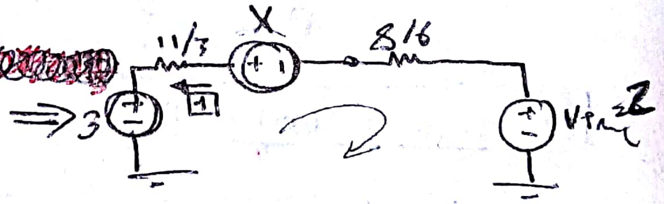
$\boxed{A_{32}}$



$\boxed{i_0 = 1}$







$V = I(2+4)$

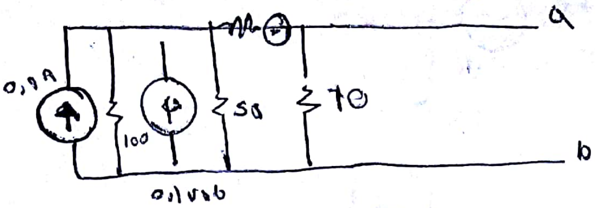
$\frac{3}{6} = I = \frac{1}{2} \Rightarrow V_0 = \frac{1}{2} \cdot 4 = 2$

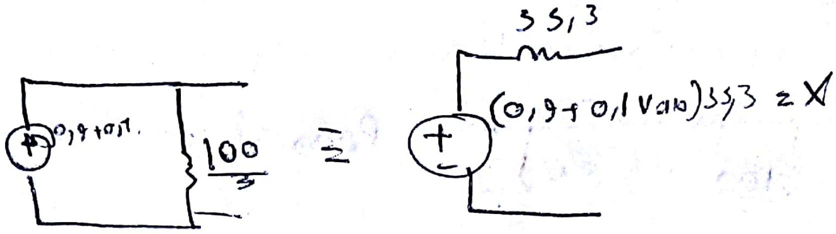
$3 + \frac{11}{3} - X + 8/6 - 2 = 0 \Rightarrow \boxed{X = 5}$

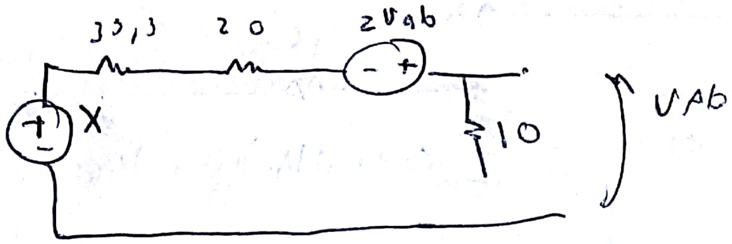
$\Rightarrow i = 1$ ——— $X = 5$

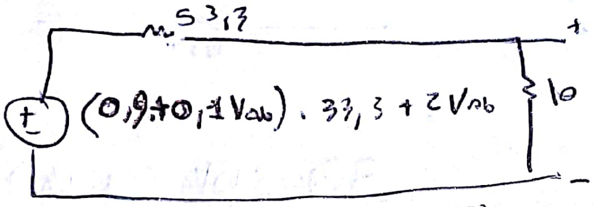
i_0 ——— $X = 6$ $\Rightarrow \boxed{i_0 = \frac{6}{5}\ mA}$

1° Parc,









$$V_{ab} = \frac{\left[\overbrace{(0,9 + 0,1 V_{ab}) . 33,3 + 2V_{Ab}}^{*}\right] \cdot 10}{53,3 + 10}$$

$$\overset{*}{=} \left(0,9 \cdot \frac{100}{3} + 0,1 \cdot \frac{100}{3} V_{ab}\right)$$

$$\overset{*}{=} \frac{\left[30 + \frac{10 V_{Ab}}{3} + 2V_{Ab}\right] 10}{160/3}$$

$$V_{ab} = \frac{3\left[90 + 30 V_{Ab} + 6 V_{Ab}\right]}{19}$$

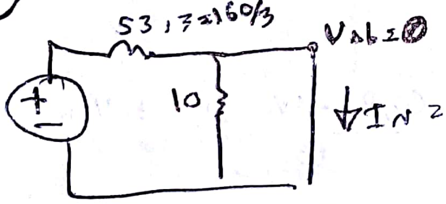
$$+90 = 35 V_{Ab}$$

$$V_{Ab} = +\frac{90}{35} \simeq -2,57$$

Para I_N

despejar

$V_{ab} = V_{Th}$



$$I_N = \frac{0,9 . 33,3}{53,3} = \frac{30}{160/3}$$

$$0,9 \cdot 33,3 = 0,9 \cdot \frac{100}{3} = 30$$

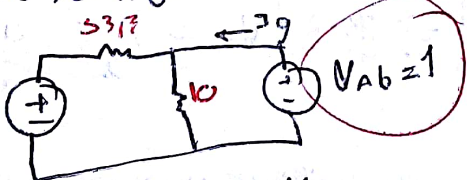
$$\rightarrow I_N = \frac{90}{100} \simeq 0,56$$

$$V = IR \Rightarrow \frac{V}{R} = I \simeq 0,56$$

$$\Rightarrow R_{Th} = \frac{30}{\left(\frac{90}{100}\right)} = \frac{V_{Th}}{I_N}$$

$$\Rightarrow \boxed{R_{Th} = \frac{100}{3}}$$

Si uso otra forma



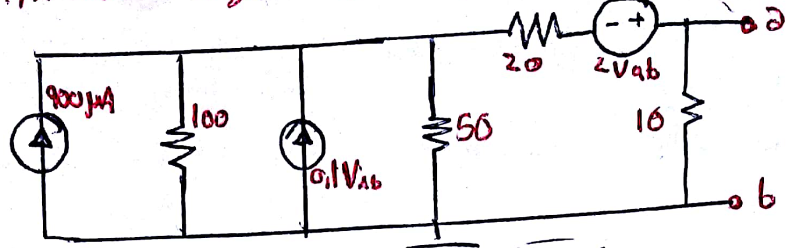
fuente de prueba

$0,1 V_{ab} \cdot 33,3 + 2V_{Ab}$

(chequeo el resultado V_{ab})

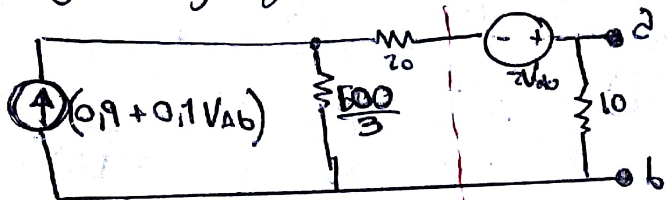
Pasivo las fuentes independientes

El mismo ejercicio del Parcial, Pero mas Prolijo.



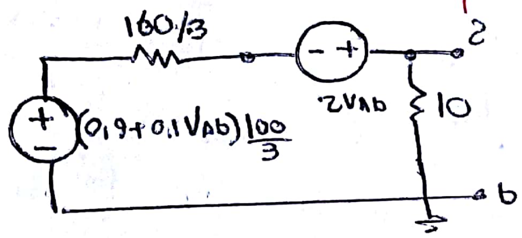
Sumo las fuentes y luego el paralelo de resistencias

$\equiv$

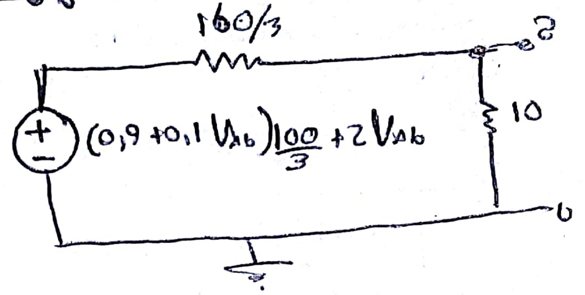


Paso al eq de Thevenin

$\equiv$



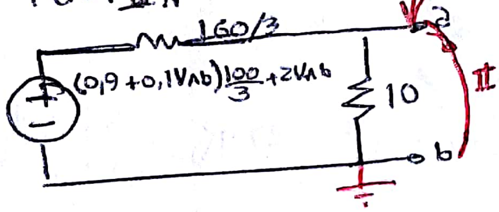
$\equiv$



$$\Rightarrow V_{ab} = \frac{\cancel{10}\cdot\left[(0{,}9 + 0{,}1V_{ab})\frac{100}{3} + 2V_{ab}\right]}{\frac{160}{3} + 10 = \frac{190}{3}} = \frac{3(30 + 10V_{Ab}/3 + 2V_{Ab})}{19} = \frac{3}{19}\left(30 + \frac{16}{3}V_{Ab}\right)$$

$$V_{Ab} - \frac{16}{19}V_{Ab} = \frac{3\cdot 30}{19} = \frac{90}{19} \Rightarrow \frac{3}{19}V_{Ab} = \frac{90}{19} \Rightarrow \boxed{V_{Ab} = 30} = V_{Th}$$

Para I_N



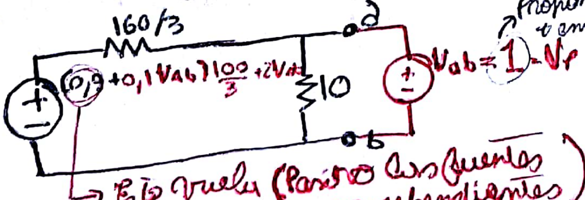
$$\Rightarrow I_N = \frac{V}{R} = \frac{(0{,}9 + 0{,}1V_{Ab})\frac{100}{3} + 2V_{Ab}}{160/3}$$, Como $V_{Ab} = 0$ en este caso

$$\Rightarrow I_N = \frac{0{,}9\cdot\cancel{100/3}}{\cancel{160/3}} = \frac{90}{160}$$

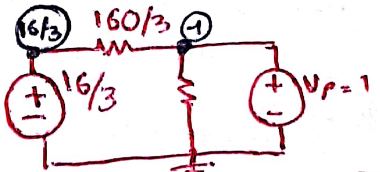
$$\Rightarrow R_{Th} = \frac{V_{Th}}{I_N} = \frac{30}{90/160} = \frac{160}{3} = \boxed{\frac{160}{3}}$$ (1/3)

$\Rightarrow$ $\boxed{RTA}$ $V_{Th} = 30$, $I_N = \frac{90}{160}$, $R_{Th,N} = \frac{160}{3}$

Otra forma de buscar R_{Th} es proponiendo una fuente de prueba.



$\equiv$



$$i_p = \frac{1 - 16/3}{\frac{160}{3}} + \frac{1}{10} = \frac{3}{160}$$

$$\Rightarrow R_{Th} = \frac{V_p}{i_p} = \frac{1}{3/160}$$

$$\boxed{R_{Th} = \frac{160}{3}}$$

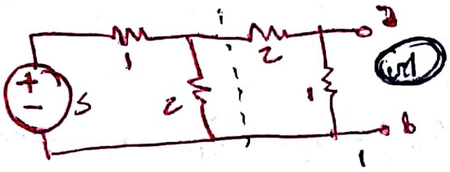
A34 Para los circuitos q! se presentan en la figura 2-34.

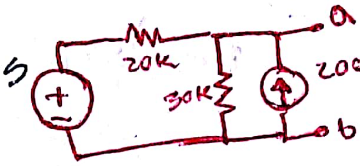
tarea

a- Encuentre el eq. Thevenin en a-b.

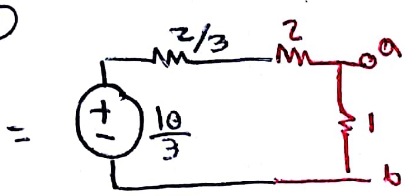
b- " " " Norton " ".

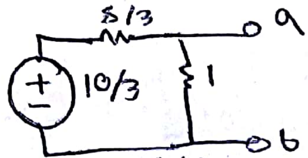
ohm

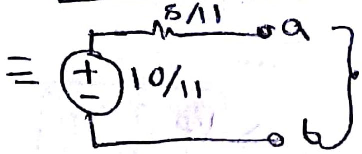




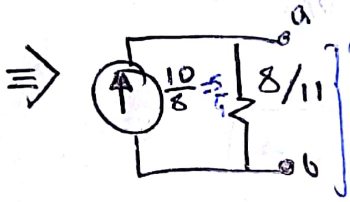
①



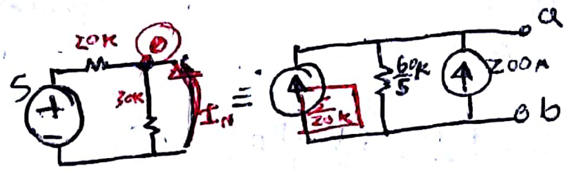


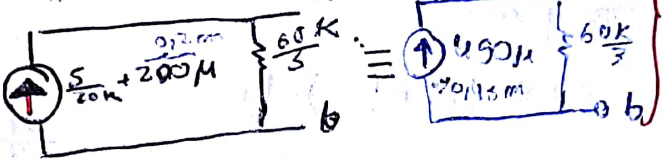


eq Thevenin



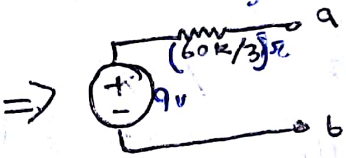
eq Norton





eq Norton

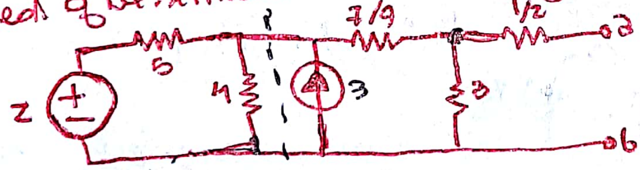
$V_{ab} = V_{Th} = \frac{60K}{3} \cdot 0{,}45 m = 9$

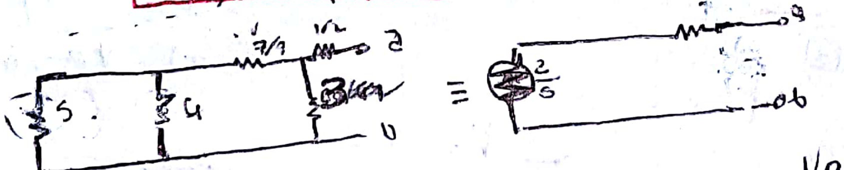


A35 Encuentre los circuitos equivalentes de Thevenin y de Norton en los terminales a-b. para las red que se muestran en las fig. ohm

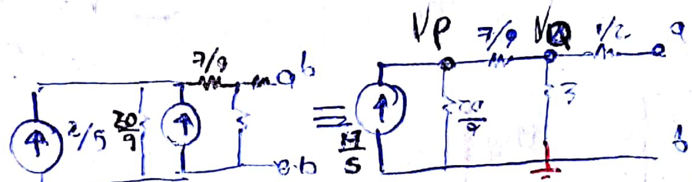
clase

Otro metodo es para ... ve ...



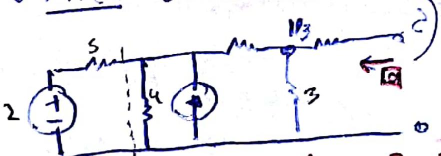


$\Rightarrow \boxed{R_{TH} = 2}$



mejor / Nortons nodales.

° V_{TH}? circ. abierto



Ⓟ $\frac{17}{5} = V_P\left(\frac{9}{20} + \frac{9}{7}\right) - V_Q\,\frac{9}{7}$

Ⓠ $0 = -V_P\left(\frac{9}{7}\right) + V_Q\left(\frac{9}{7} + \frac{1}{3}\right)$

$\Rightarrow \begin{cases} \frac{17}{5} = V_P\left(\frac{243}{140}\right) - V_Q\,\frac{9}{7} \\ 0 = -V_P\,\frac{9}{7} + V_Q\,\frac{34}{21} \Rightarrow V_P = \frac{34}{27} V_Q \end{cases}$

$\Rightarrow V_{TH} = 34/9$

$= \frac{17}{5} = \frac{34}{27} V_Q\left(\frac{243}{140}\right) - V_Q\,\frac{9}{7}$

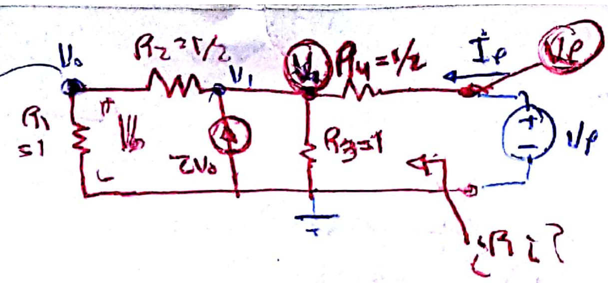
$\Rightarrow \boxed{I_N = \frac{V_{TH}}{R_{TH}} = \frac{34/9}{2}} = \boxed{17/9}$

$V_Q = \frac{34}{9}$

$= \frac{153}{70} V_Q - \frac{9}{7} V_Q = \frac{9}{10} V_Q$

$\boxed{V_Q = \frac{34}{9}}$ = 0.95 mal

A36



Ponemos opn. de prueba (de donde yo quiera) ... verlo como una equivalente

$$\left\{\begin{array}{l} \emptyset = \dfrac{V_0}{R_1} + \dfrac{V_0 - V_1}{R_2} \\[2ex] 2V_0 = \dfrac{V_1 - V_0}{2} + \dfrac{V_1}{3} + \dfrac{V_1 - V_P}{R_4} \end{array}\right.$$

agrupamos

$$\left\{\begin{array}{l} \emptyset = V_0\left(\dfrac{1}{R_1} + \dfrac{1}{R_2}\right) - \dfrac{V_1}{R_2} \\[2ex] \emptyset = V_0\left(-2 - \dfrac{1}{R_2}\right) + V_1\left(\dfrac{1}{R_3} + \dfrac{1}{R_4}\right) - \dfrac{V_P}{R_4} \end{array}\right.$$

Reemplazando valores queda

$$\left\{\begin{array}{l} \emptyset = V_0 \cdot 3 - V_1 2 \\ 2V_P = -3V_0 + 5V_1 \end{array}\right.$$

$\Delta = 9$

$$V_1 = \frac{\begin{vmatrix} 3 & \emptyset \\ -3 & 2V_P \end{vmatrix}}{9} = \frac{6}{9} V_P \Rightarrow \boxed{V_P = \frac{9}{6} V_1}$$

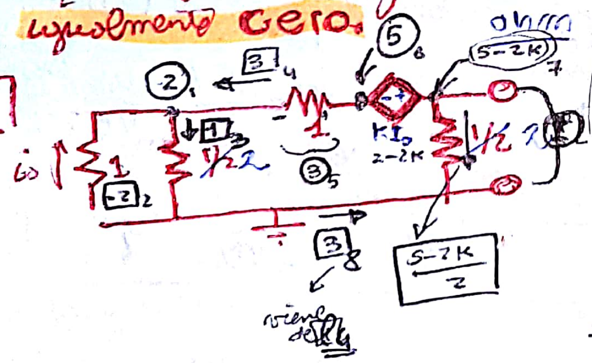
Reemplazando

$$I_P = \frac{V_P - V_1}{R_4} \overset{?}{=} \frac{2}{3} V_P \Rightarrow \boxed{R_{Th} = \frac{V_P}{I_P} = \frac{3}{2}}$$

Obs: vemos que no hay fuentes independientes por lo q' V_{Th} e I_N son igualmente cero.

A37

hallar K / $R_{eq} = 6\Omega$



∘ Es mejor poner una fuente de prueba.

$$R_{ent} = \frac{V_P}{I_P} = 6$$

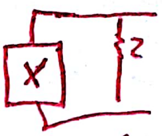
$$\Rightarrow \left\{\begin{array}{l} V_P = 5 - 2K \\ i_P = \dfrac{5-2K+6}{2} \end{array}\right. \quad \text{despejo}$$

$$\frac{5-2K \cdot 2}{5-2K+6} = 6$$

$$5-2K = 3(5-2K+6)$$

$$5-2K = 15-6K+18$$

$$\boxed{K = 7}$$



$= R_{eq} = 6$

como es posible q' el eq' me de mayor q' la mínima resistencia en paralelo? $\left(\frac{1}{X} + \frac{1}{2}\right)^{-1} = 6$

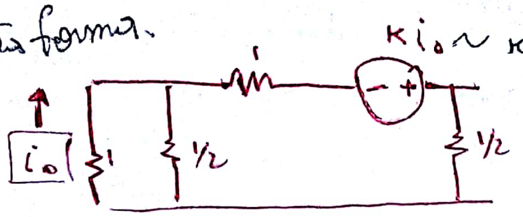
$\Rightarrow \boxed{X = -3}$ ¿Resist negativa?

↳ Esto solo aparece en la teoría

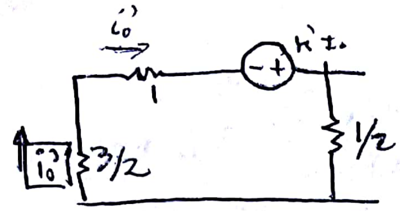
y lo de $R_{eq} < R_i$ solo para resistencias reales, no f. controlados

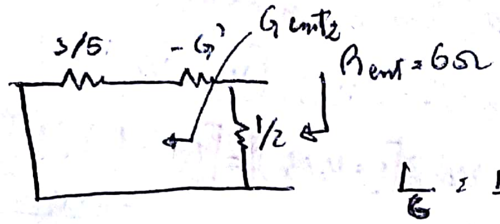
Si vemos otra forma.

$K i_0 \sim K' i_0'$?



$\equiv$



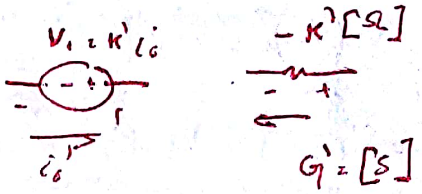


Podemos convertir el "KI_0"?

$\Rightarrow K i_0 = K' i_0'$ ⊛

$i_0 = i_0' \cdot \frac{1}{1+\frac{1}{2}}$

$\boxed{i_0 = i_0' \cdot \frac{2}{3}}$



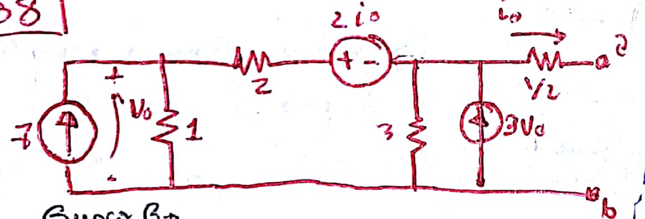
$\frac{1}{6} = \frac{1}{2} + G_{ent_2} \rightarrow G_2 = -\frac{1}{3}$

$\Rightarrow R_2 = -3 = -K' + \frac{5}{3}$

$-\frac{14}{3} = -K' \Rightarrow K' = \frac{14}{3}$

⊛ $\boxed{K = K' \cdot \frac{i_0'}{i_0} = \frac{14}{3} \cdot \frac{3}{2} = \frac{14}{2} = 7}$

A38



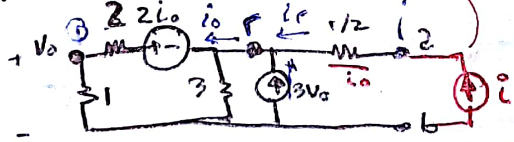
Busco R_{th}.

eq Thevenin y Norton.

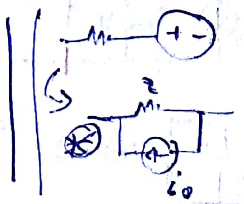
no podemos el modelo por el ... ≡ ... de la planteo, ... quedan una ... la 2da ... 3 ... mismo

Podemos poner una fuente de corriente así fijamos i_0

Pasito



$\boxed{i_0 = -i_p}$



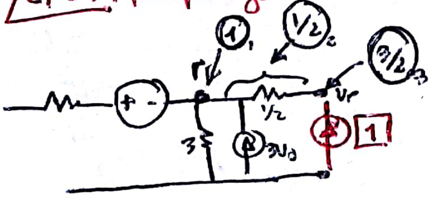
$\cdot ①\ \ i_0 = V_0\left(\frac{1}{2}+1\right) - V_r\left(\frac{1}{2}\right)$ ($-i_p$)

$\cdot r\ \ 3V_0 - i_0 + i_p = -V_0\left(\frac{1}{2}\right) + V_r\left(\frac{1}{3}+\frac{1}{2}\right)$ ($5/6$)

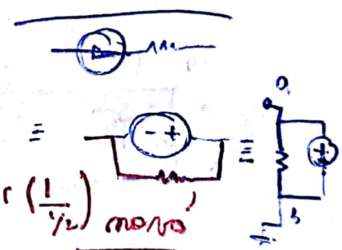
"Podemos poner un valor a i_p."

$$\begin{pmatrix} -i_p \\ 2i_p \end{pmatrix} = \begin{pmatrix} 3/2 & -1/2 \\ -7/6 & 5/6 \end{pmatrix} \begin{pmatrix} V_0 \\ V_r \end{pmatrix} \Rightarrow \begin{pmatrix} -1 \\ -\frac{1}{3} \end{pmatrix} = \begin{pmatrix} 3/2 & -1/2 \\ 0 & -\frac{2}{3} \end{pmatrix}$$

$\boxed{i_p = 1}$ propongo



el $V_r\left(\frac{1}{1/2}\right)$ mono



$\boxed{V_r = -\frac{1}{3} \cdot \left(-\frac{3}{2}\right) = 1}$

$\Rightarrow V_p = 3/2$

$i_p = 1$

$\Rightarrow \boxed{R_{TH} = \frac{V_p}{i_p} = \frac{3}{2}}$

Otra

$I_N = -32{,}\hat{6}$

$V_{TH} = -49$ ó -44

mortes a la $i\ 15$

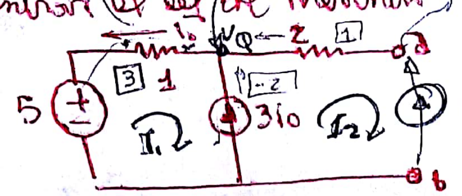
Tarea 4.3

$\boxed{4_{39}}$ Encontrar el eq. de Thevenin $V_p \cdot V_{TH}$? Ohm

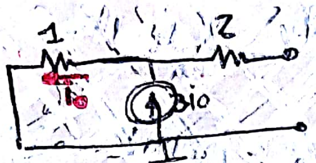
Ohm

$V = IR$

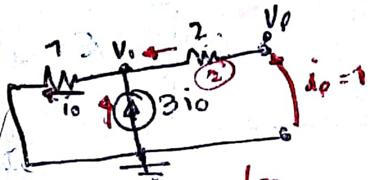
$I = \frac{V}{R}$



Primero planteamos R_{TH}



Tengo que poner una fuente de prueba, en este caso, me conviene poner una fuente de corriente.



Resolvamos por nodos.

$$\begin{cases} 3i_o = V_1\left(1+\frac{1}{2}\right) - V_P\left(\frac{1}{2}\right) \\ 1 = -V_1\left(\frac{1}{2}\right) + V_P\left(\frac{1}{2}\right) \\ i_o = i_P + 3i_o \end{cases}$$

$\hookrightarrow i_o - 3i_o = i_P$

$-2i_o = i_P$

$\boxed{i_o = \frac{i_P}{-2} = \frac{-1}{2}}$

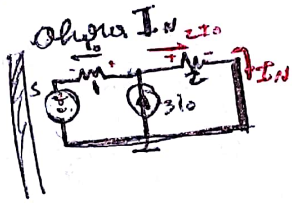
→ Sumo $3i_o + 1 = V_1(1)$ $\boxed{V_1 = -1/2}$

$V_P = \frac{2}{1}\left[1 + V_1\left(\frac{1}{2}\right)\right] = \left[1 + \left(-\frac{1}{2}\right)\cdot\left(\frac{1}{2}\right)\right]2 = 3/2$

$\Rightarrow V_P = 3/2$

$\Rightarrow \boxed{R_{TH} = 3/2}$

Ahora I_N



$\Sigma V = 0$

$\Rightarrow 5 + 1 i_o \cdot 1 - 2 i_o \cdot 2 = 0$

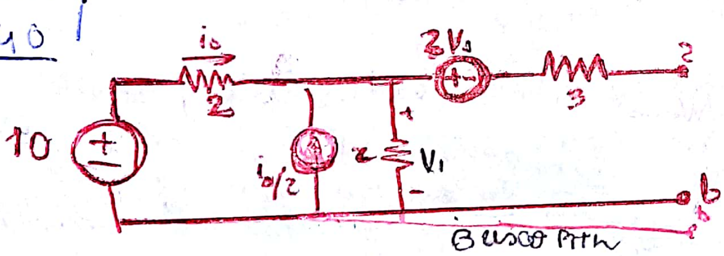
$5 - 3I_o = 0$

$I_o = 5/3$, como $I_N = 2I_o$

$\Rightarrow \boxed{I_N = 10/3}$

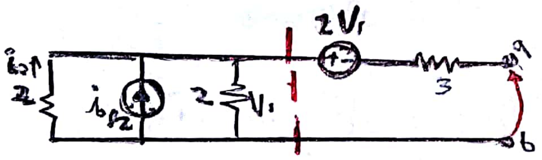
$\Rightarrow \boxed{V_{TH} = \frac{10}{2}}$

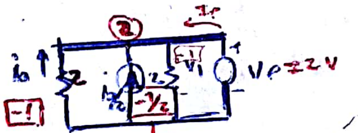
$\boxed{4{,}40}$



Para R_{TH}, pasivo a única fuente

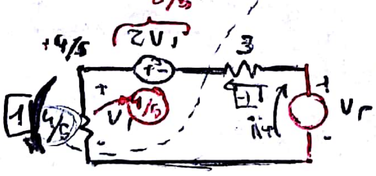
Busco R_{TH}





$i_P = -1 - 1/2 = 1$ $\boxed{R_{TH} = 4/5}$

$i_P = 5/2$



Propongo $\boxed{i_P}$

$i_P = 1$

$V_P = 11/5$

$\Rightarrow R_{TH} = \frac{11/5}{1}$

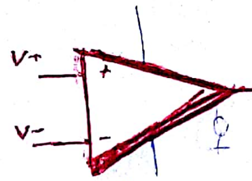
$\rightarrow V_{TH} = -6$ → Preguntar x q' obtenía mal.

$4/5 - 2\cdot\frac{4}{5} + 3 = V_P = \frac{11}{5}$

NOTA: Preguntar como hizo para llegar a $V_{TH} = -6V$ y por q' obtenía mal.

armamos orden de menor laleop

Amplificadores operacionales. OPAMP



ganancia diferencial — ganancia de modo común

$$V_o = (V_+ - V_-) \cdot A_1 + \left(\frac{V_+ - V_-}{2}\right) A_c$$

queremos q' sea muy grande, → será inf

queremos q' sea muy chico → será cero

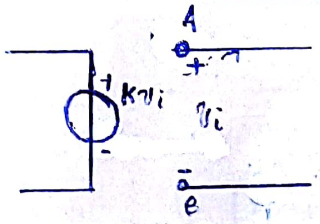
modelizo, la salida, a una fuente de tensión, No se plantean modos

Sin nodos
Sin mallas
Porq' no conocés la corriente de salida.

Los amplificadores operacionales son un caso particular de fuentes de tensión controlados por tensiones

$$\boxed{A_d \to \infty \Rightarrow V_+ = V_-}$$

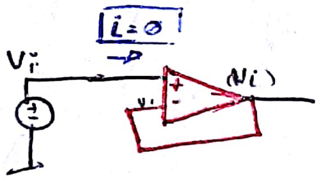
$$\boxed{I_+ = I_- = 0}$$



$K \to \infty$

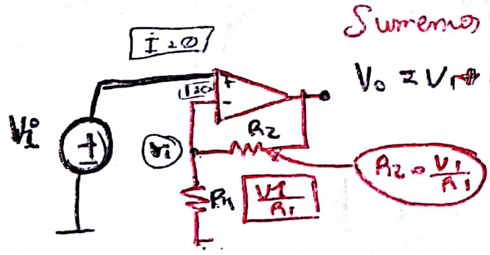
$i_{AB} = 0$

$\frac{V_o}{V_i} = A_v$



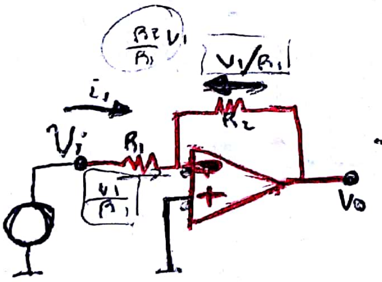
← Buffer o seguidor

Sumemos las tensiones



$V_o = V_1 + R_2 \frac{V_1}{R_1} \Rightarrow V_o = V_1\left(1 + \frac{R_2}{R_1}\right)$ ← Amplificador no inversor

(La corriente viene por la salida)



$-\frac{R_2}{R_1} V_i = V_o$ ← amplificador inversor

uso Kirchoff (usando nodo - como masa virtual)

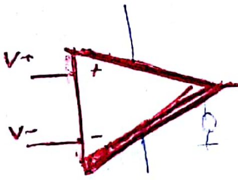
$i_1 + i_2 = 0$

$i_1 = -i_2$

$\frac{V_i}{R_1} = -\frac{V_o}{R_2} \Rightarrow \boxed{V_o = -\frac{R_2}{R_1} V_i}$

Amplificadores operacionales. OPAMP

Armamos como un diodo ideal?



ganancia diferencial

ganancia de modo común

$V_o = (V_+ - V_-) \cdot A_1 + \left(\frac{V_+ - V_1}{2}\right) A_c$

A_1: queremos q' sea muy grande, → sea inf

A_c: queremos q' sea muy chico → sea cero

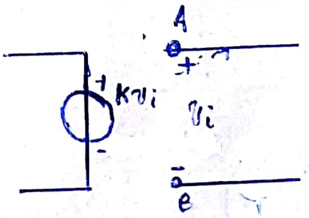
monolítico, la salida es una fuente de tensión, No se alimentamos

Sin nodos
Sin mallas
Porq' no conocemos la corriente de salida.

Los amplificadores operacionales son un caso particular de fuentes de tensión controlados por tensión

$$\boxed{A_d \to \infty \Rightarrow V_+ = V_-}$$

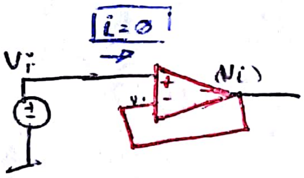
$$\boxed{I_+ = I_- = 0}$$



$K \to \infty$

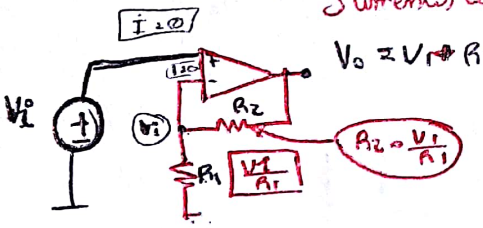
$i_{AB} = 0$

$\frac{V_o}{V_i} = A_v$



← Buffer o seguidor

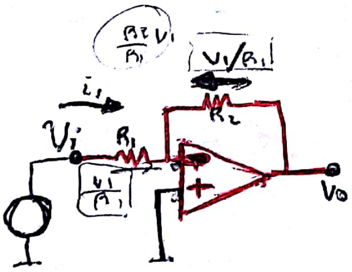
Sumemos las tensiones



$R_2 \cdot \frac{V_1}{R_1}$

$V_o = V_1 + R_2 \frac{V_1}{R_1} \Rightarrow V_o = V_1\left(1 + \frac{R_2}{R_1}\right)$ ← Amplificador no inversor

(La corriente viene por la salida)



$-\frac{R_2}{R_1} V_i = V_o$ ← amplificador inversor

uso Kirchoff (usando nodo - como masa virtual)

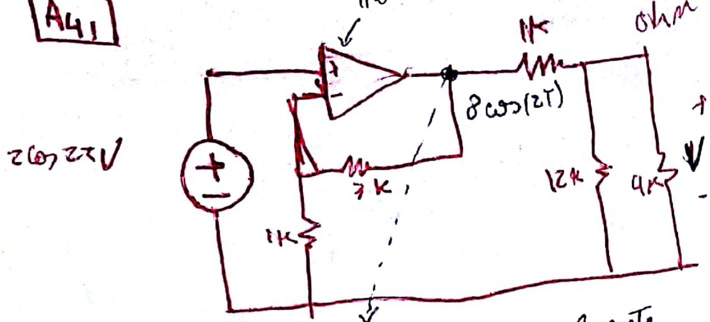
$i_1 + i_2 = 0$

$i_1 = -i_2$

$\frac{V_i}{R_1} = -\frac{V_o}{R_2} \Rightarrow \boxed{V_o = -\frac{R_2}{R_1} V_i}$

A41

no inversor



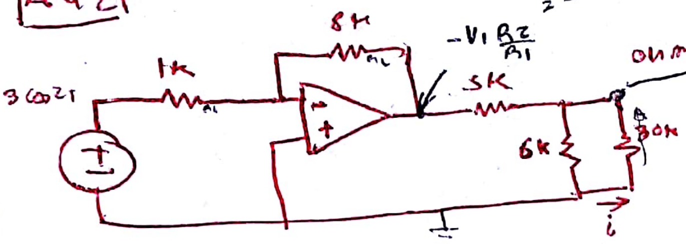
Se comporta como una fuente de tension

Encontrar V

$V = 3\cos(2T) \cdot \frac{3k}{4k} = 6\cos(2T)$

v = i

A42

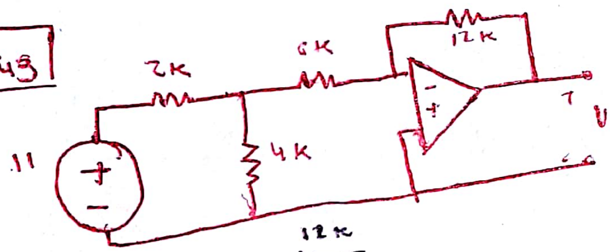


$\frac{24\cos(2T) \cdot 5K}{5K + 6K} =$

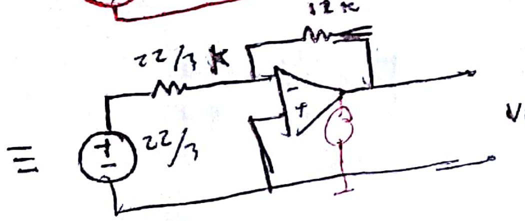
i =

$I = \frac{1/30K}{\frac{1}{30K} + \frac{1}{6K} + \frac{1}{5K}} \cdot \left(\frac{-24}{5}\cos 2T\right) =$

A43



$Av = \frac{R_2}{R_1} = \frac{-12K}{22/3\,K} = -\frac{18}{11}$

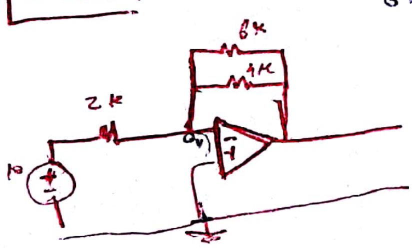


$V_o = Av\,V_i$

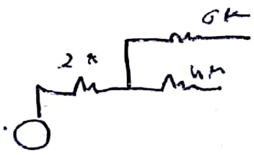
$-\frac{18}{11} \cdot \frac{22}{3} = \boxed{-12}$

A44

$i = -\frac{V_o}{6K}$

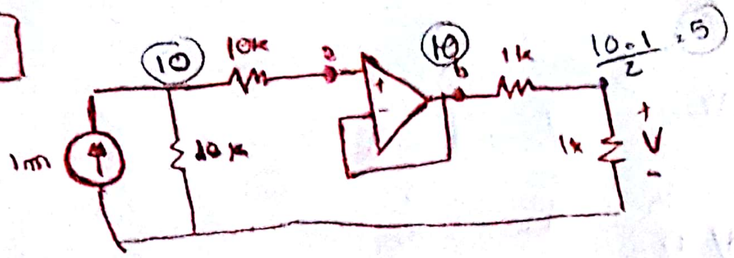


i = ? también t = 0



$i = \frac{5m \cdot 4K}{10K} = 2\,mA$

A46



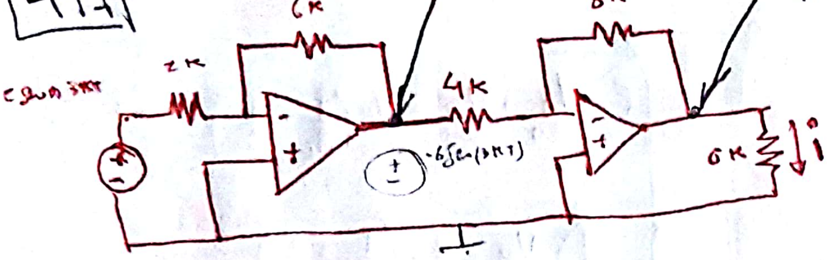
V=5V

$V_L = 10/2$

A47

$-\frac{6k}{2k} \cdot 2\,sen\,3kt$

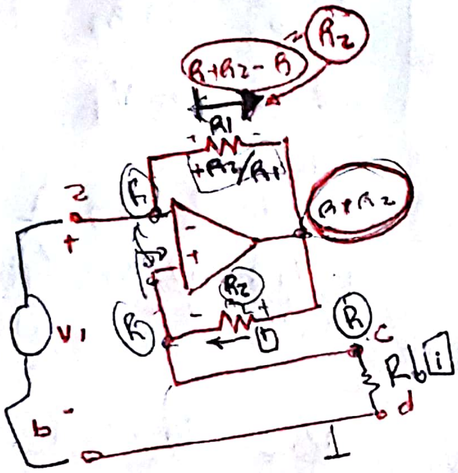
$-\frac{8k}{4k} \cdot -6\,sen(3kt) = 12\,sen(3kt)$



¿i?

$\Rightarrow i = 2\,sen(3000\,t)$

A50

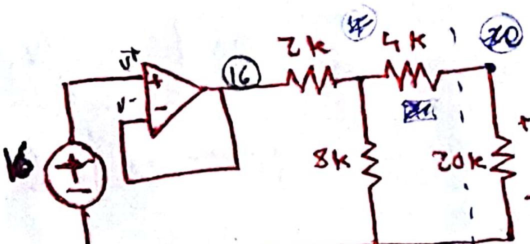


$R_{th} = \frac{V_p}{I_p} = \frac{R}{\frac{R_2}{R_1}} = R \cdot \frac{R_1}{R_2}$

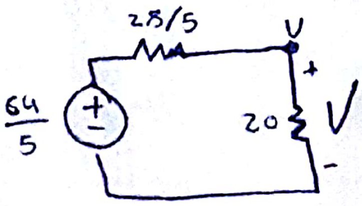
Time to start Solarizatic, cuando arranca la simulación

start external DC supply voltages at 0V = arrancan todos los fuentes en cero.

A45

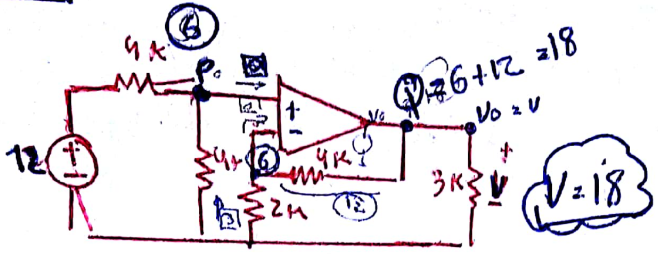


encuentro la tension V.



$\Rightarrow \boxed{V = 10}$

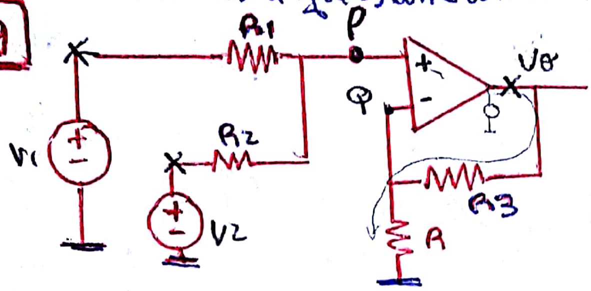
A48 Encontrar V



$\boxed{V = 18}$

$V_P = 12 \cdot \frac{4}{8} = 6$

A49 Demuestre que es un sumador no inversor



x donde no se pueden plantear nodos

Nodos

P) $\frac{V_1}{R_1} + \frac{V_2}{R_2} = V_P\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

Q) $\frac{V_o}{R_3} = V_Q\left(\frac{1}{R_3} + \frac{1}{R}\right)$

Sé que $V_P = V_Q$

* dividir P y Q

$\frac{1}{V_o}\frac{V_1 R_3}{R_1} + \frac{1}{V_o}\frac{V_2 R_3}{R_2} = \frac{\left(\frac{1}{R_1} + \frac{1}{R_2}\right)}{\left(\frac{1}{R_3} + \frac{1}{R}\right)}$

* Encuentre Vo:

$$V_o = \left(\frac{V_1 R_2}{R_1+R_2} + \frac{V_2 R_1}{R_1+R_2}\right)\left(1 + \frac{R_3}{R}\right)$$

"Es un sumador"

~~$\frac{V_o}{V_o} = \frac{\left(\frac{1}{R_3} + \frac{1}{R}\right)}{\left(\frac{1}{R_1} + \frac{1}{R_2}\right)} \cdot \frac{1}{R_3\left(\frac{V_1}{R_1} + \frac{V_2}{R_2}\right)}$~~

~~$V_o = \frac{(R_3 + R)/R_3 R}{\frac{(R_1+R_2)R_3(V_1R_2+V_2R_1)}{R_1 \cdot R_2}}$~~

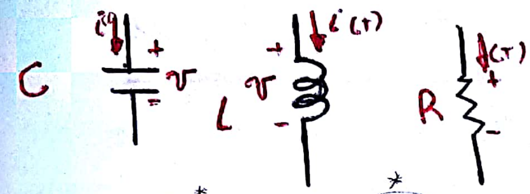
~~$= \frac{R_1 \cdot R_2 (R_3+R)}{\frac{R_3}{R}(R_1+R_2)(V_1R_2+V_2R_1)R_3}$~~

Vo? $V_1 = 3V$, $V_2 = 2V$, $R_1 = 4K$, $R_3 = 6K$ y $R = 1K$, $R_2 = 3K$

$$\Rightarrow V_o = \left(\overset{V_1}{3}\cdot\underbrace{\frac{3}{3+4}}_{7} + \overset{V_2}{2}\underbrace{\frac{4}{4+3}}_{7}\right)\underbrace{\left(1 + \frac{6}{1}\right)}_{7} = 3V_1 + 4V_2$$

$\boxed{V_o = 17}$

Transitorios.



* cuando estoy en rég permanente las derivadas son cero por lo que en capacitores $i = \emptyset$ y inductores $V = \emptyset$.

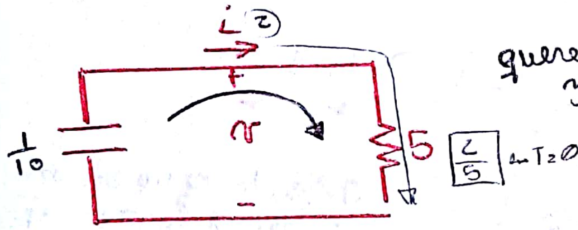
$i(t) = C\frac{dv(t)}{dt}$ * $\quad v(t) = L\frac{di(t)}{dt}$ * $\quad v(t) = i(t) \cdot R$

$v(t) = \frac{1}{C}\int_{-\infty}^{t} i(t)\,dt \qquad i(t) = \frac{1}{L}\int_{-\infty}^{t} v(t)\,dt$

En el circ de la fig 6-6 encuentre para $t > \emptyset$, $i(t)$, $q(t)$, $V(t)$, $W(t)$ y $P_r(t)$ (la pot disip de resist)

Supongo $V(\emptyset) = 2V$

B6



queremos $i(t)$ y $v(t)$

$\frac{1}{2}C(\Delta V)^2 = E$ cap

$\frac{1}{2}L(\quad) = E$ inductor

$V(0) = 2$

mallas ∘ Porque estoy buscando $i(t)$, entonces de ahí lo puedo despejar.

$\Sigma V = 0$

$$\emptyset = i \cdot R + \underbrace{\frac{1}{C}\int_{-\infty} i(t)\,dt}_{V_c(t)}$$

$\tau = RC$, constante de tiempo [S]

derivo m.a.m

$$\emptyset = i' R + \frac{1}{C} i$$

$$\boxed{\emptyset = i' + \frac{1}{RC} i}$$

Propongo
∘ $i(t) = Ae^{\lambda t}$ $\longrightarrow$ $\emptyset = Ae^{\lambda t}\left(-\lambda + \frac{1}{RC}\right) \Rightarrow \boxed{\lambda = \frac{1}{RC}}$

∘ $i(\emptyset) = 2/5$ La corriente está definida al revez ∘ $i(t) = Ae^{-\frac{1}{RC}t}$

$$\Rightarrow \boxed{i(t) = \frac{2}{5}e^{-2t} \cdot \mu(t)}$$ ↳ función heaviside.

∘ ahora quiero la ec diferencial para $v(t)$.

∘ Planteo nodos. Porque ahora quiero saber $V_c(t)$, y de nodos puedo despejarlo.

$\Sigma I = 0$

$$\emptyset = v(t)\frac{1}{R} + C\frac{dv(t)}{dt} \Rightarrow \boxed{\emptyset = v' + \frac{1}{RC}v(t)}$$ ~ Lo mismo $v(t) = Ae^{-\lambda t}$

$\lambda = \frac{1}{RC} \to v(t) = Ae^{-t/RC}$

$v(0) = 2 = A$

$$\Rightarrow \boxed{v(t) = 2e^{-2t} \cdot \mu(t)}$$

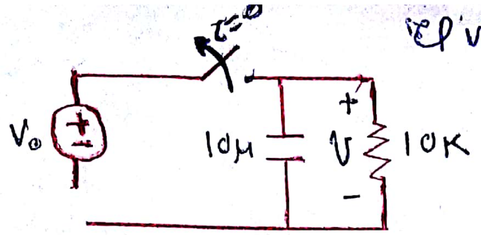
$P_r(t) = i(t)V(t) = \frac{4}{5}e^{-2t}$

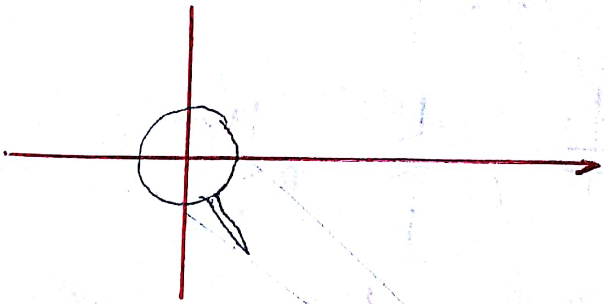
El resto hacerlo yo.

B7

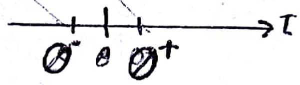
El interruptor se abre en $T = \emptyset$.

$i(t) = C \frac{dV(t)}{dt}$

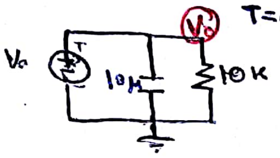




Encuentre V_0 tal $V(0{,}5 seg) = \frac{3V}{10}$

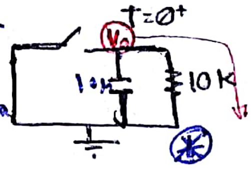


veamos el circuito en $T=\emptyset^-$



una vez abro el interruptor la tensión en $T=0^-$ y $T=\emptyset$ es la misma

no puede haber saltos de tensión en un cap.



$\emptyset = i \cdot R + \frac{1}{C}\int i\, dt \Rightarrow \emptyset = i' + \frac{1}{RC} i$, Propongo soluciones $i = Ae^{-\lambda T}$

tensiones

$\Rightarrow \emptyset = Ae^{-\lambda T}\left(-\lambda + \frac{1}{RC}\right) = \emptyset \Rightarrow \lambda = \frac{1}{RC}$

¡menos lo q'! piole

$\Rightarrow i(T) = Ae^{-T/RC}$

(*) miremos este circuito

necesito que en mi ecuación aparezca corrientes, para despejar la tensión

Planteamos Nodos $\Sigma I = \emptyset$

$$\emptyset = V\frac{1}{R} + CV'$$

$$\emptyset = V' + \frac{1}{RC}V$$

Propongo $V = Ae^{-\lambda T} \rightarrow \lambda = 1/RC = \frac{1}{10K\,10\mu m} = \frac{1}{0{,}1} = 10\,[1/s]$

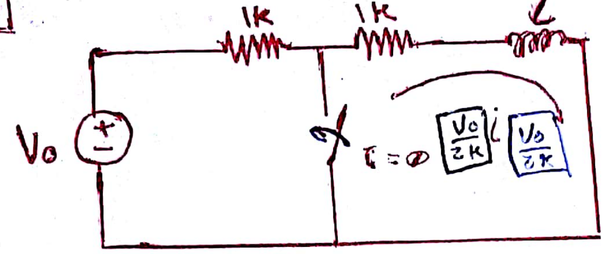
CI = $V(\frac{1}{2}) = \frac{3}{10} = Ae^{-5} \Rightarrow \boxed{A = \frac{3}{10} \cdot e^{+5}}$

$$\Rightarrow V(T) = \frac{3}{10} e^{5} e^{-10T}$$

$$\boxed{V(\emptyset) = V_0 = \frac{3}{10} e^{5}}$$

B8

el interruptor cierra en $t=0$.



$i(3m) = 1mA$.

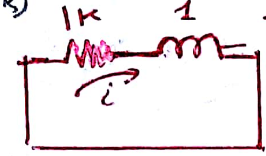
$t=0^-$ inductor, ...

$t=0^+$

$V_{(t)} = L\, i'_{t}$

$V_0 - i(2k)$

$0 - iR - Li' = 0$



$t>0$ mallas

$0 = iR + Li'$

$0 = i' + \frac{R}{L} i$

$\boxed{\tau = L/R}$

Propongo solución:

$\left.\begin{array}{l} i_{(t)} = Ae^{-\lambda t} \\ \lambda = \frac{R}{L} = \frac{1}{\tau} \end{array}\right\}$ $i_{(t)} = Ae^{-\frac{R}{L}t}$

$i(t) = Ae^{-1000t}\,\mu(t)$

$i(0) = A = \frac{V_0}{2k}$

$\Rightarrow i(t) = \frac{V_0}{2k} e^{-1000t} \mu(t)$

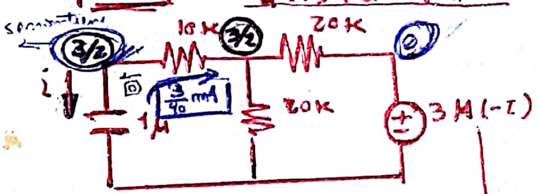
$i(3m) = 1m = \frac{V_0}{2k} e^{-3}$

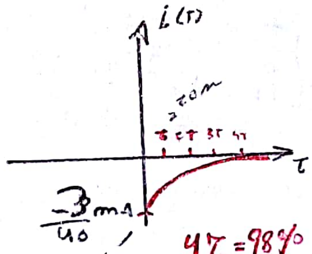
$\boxed{2e^{+3} = V_0}$

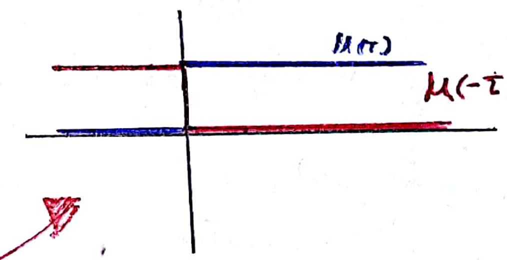
$i(t) = C\frac{dv(t)}{dt}$

B9

$i_{(t)}$ para $t>0$)







$\tau = 0^-$ $\boxed{t = 0^+}$

$i = \frac{3}{40}$ mA

$\tau = R_C = 1 \cdot 20k$
$= 20m$

$4\tau = 98\%$ del valor final

$5\tau = 99{,}3\%$ del valor final

mirando el gráfico.

$i(t) = -\frac{3}{40} m\, e^{-t/20m}\, \mu(t)$

Busco la ec. dif.

$0 = 20k\, i + \frac{1}{C}\int i$

$0 = 20i' + \frac{1}{C} i$

$\boxed{0 = i' + \frac{1}{RC} i}$

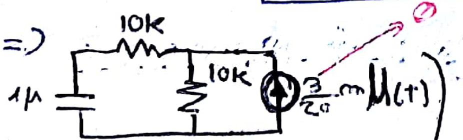
OTRO metodo, Laplace $F(S) = \int_{0^-}^{\infty} f(t) e^{-St} dt$ (cuando hay llaves, no usarlas)

$f'(t) = SF(s) - f(0^-)$

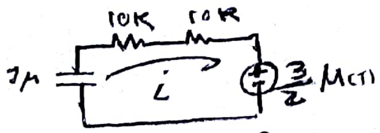
↳ rol es agrega el que desaparece

delta de dirac $\delta(t) \left\{ \begin{array}{l} 0\ \forall t \neq 0 \\ \int_{-\infty}^{\infty} \delta(t)\, dt = 1 \end{array}\right.$

$\Rightarrow$



$\mu(-t) = 1 -$



$\rightarrow -\frac{3}{2}\mu(-t) = i(R) + \frac{1}{C}\int i\, dt$

$-(\frac{-3}{2})\,\delta(t) = i'R + \frac{1}{C} i$

Luego considero la fuente.

$-\left(\frac{-3}{2}\right)\frac{1}{R}\,\delta(t) = i' + \frac{1}{RC}\,i$

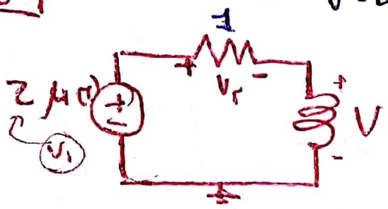
$\frac{3}{2}\frac{1}{R} = I(s)s - i_{(0^-)} + \frac{1}{RC}I(s)$

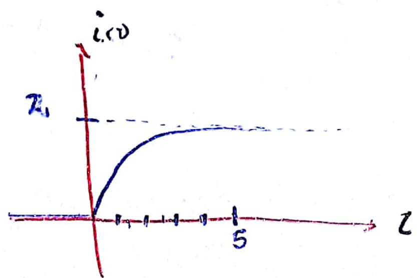
$I(s) = \frac{3}{40}m \cdot \frac{1}{s+\frac{1}{RC}} \Rightarrow i(t) = \frac{3}{40}m \cdot e^{-t/RC}\,\mu(t)$

$\boxed{i(t) = \frac{-3}{40}m\,e^{-t/RC}\,\mu(t)}$ Concuerda con el gráfico.

$\boxed{B_{10}}$

$V = Li'$





mallas. $2\mu(t) = i(R) + Li'$

$\frac{2\mu(t)}{L} = i' + i\frac{R}{L} \rightarrow \frac{2}{L} = i' + i\frac{R}{L}$

$i(t) = i_H + i_P$

$\Rightarrow \boxed{t = 0^+}$ $i = 0$; $V_r = 0$; $V = 2$

$\boxed{t = 0^-} \rightarrow$ V es cero $\quad 0 = i_H' + i_H\frac{R}{L} \rightarrow \boxed{i_H = Ae^{-t\frac{R}{L}}}$

$i_P \Rightarrow \frac{2}{L} = i' + i\frac{R}{L}$, Propongo i = cte $\Longrightarrow \frac{2}{L} = i\frac{R}{L} \Rightarrow \boxed{i_P = \frac{2}{R}}$

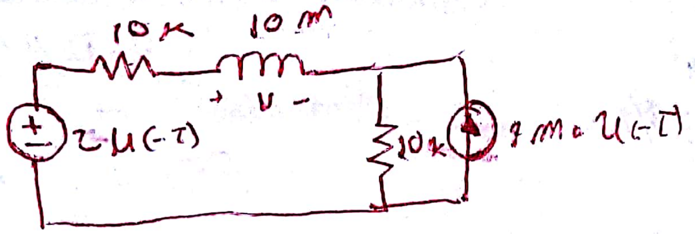
$\boxed{i(t) = \frac{2}{R} + Ae^{-tR/L}}$ $\Rightarrow -2 = Ae^{-\frac{tR}{L}}\Big|_{t=0^+} \rightarrow \boxed{-2 = A}$

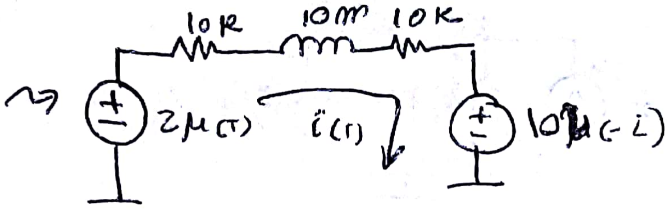
$i(t) = \frac{2}{R} - 2e^{-\frac{tR}{L}} = 2(1 - e^{-t}) = V_r$

$\Rightarrow V_r = Li' = 2 - V_r$ (V_1 → fuente)

B11

10 de Septiembre





$2\mu(-t) - 10u(-t) = i(t)(10k+10k) + 10m\,i'(t) + v(t)$

$10m\,i'(t) = v(t)$

$i(t) = \frac{1}{10m}\int v(t)$

$u(-t) = 1 - u(t)$

$-8u(-t) = \frac{1}{10m}\int v(t)(20k) + v(t)$

$-8 \quad 8u(t) = \frac{1}{10m}\int v(t)(20k) + v(t)$

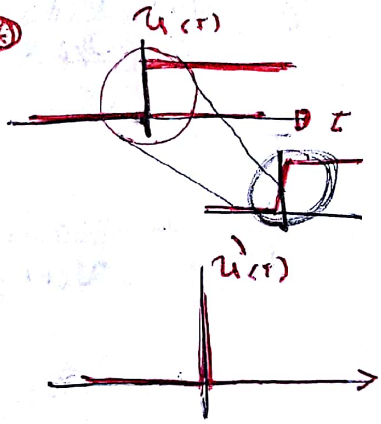
$-8 + 8u(t) = 2M\int v(t) + v(t)$

derivo

$\emptyset + 8\delta(t) = 2M\, v(t) + v'(t)$ (**)

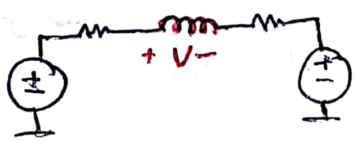
(*)

megan



$\mathcal{L} \rightarrow$ Para resolver neces. las cond iniciales

$[-\infty; 0^-]$ tiempo



$v(0^-) = 0$

↳ en 0^+ es distinto de cero.

(**)

$\exists\ 8.1 = 2M\,V(s) + sV(s) - v(0^-)$

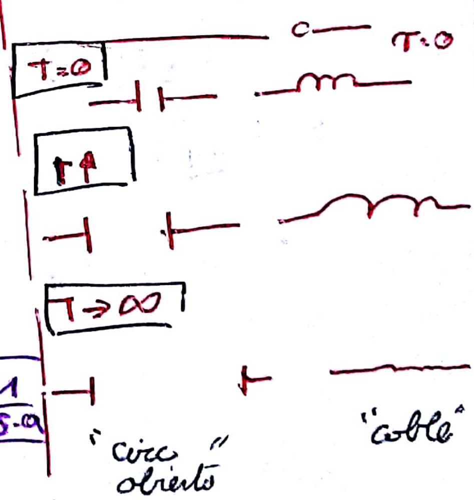
$\emptyset$ cond inicial

$V(s) = \frac{8}{2M+s}$

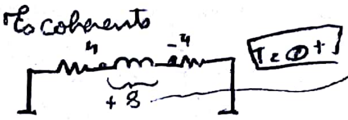
$b\,e^{-at}u(t) = \frac{1\cdot b}{s+a}$

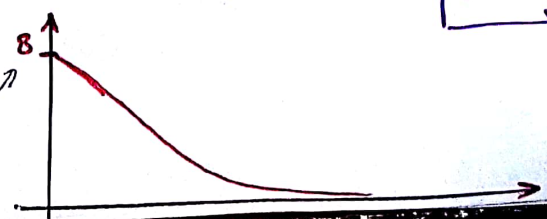
$\hookrightarrow \boxed{v(t) = 8e^{-2Mt}u(t)}$

$\boxed{e^{-at} \sqsupset \frac{1}{s+a}}$



Es coherente

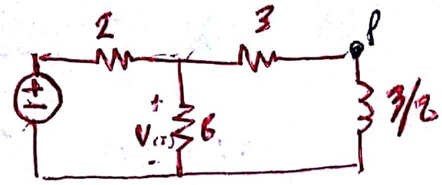




Encuentra lema $V(t)$ para todo t

si: $V_g = 12\mu(t)$.

|B 13|

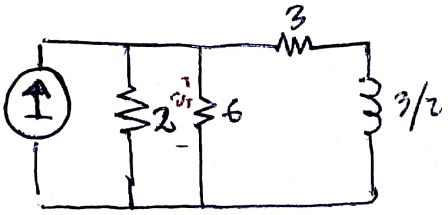


$v(0^-) = \cancel{BAT(t)}$

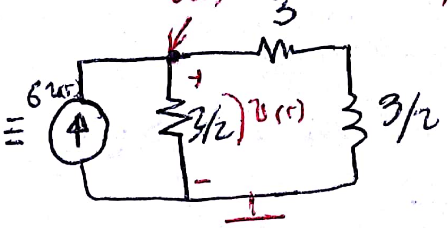
$v(0^-) = \emptyset$

↳ el escalón nunca se levantó

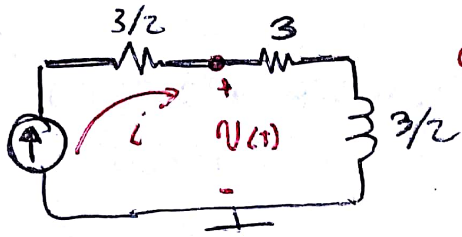
$v(t) = L\, i'$



≡



≡ $9\cdot\mu(t)$



mallas:

$$9u(t) = i\left(\tfrac{3}{2}+3\right) + i'\tfrac{3}{2}$$

$$v(t) = 9u(t) - \tfrac{3}{2}i$$

↳ $i(t) = \underline{-v(t) + 9\mu(t)}\cdot\frac{2}{3}$

$$9u(t) = \tfrac{1}{2}\left(-\tfrac{2}{3}v + 6u(t)\right) + \tfrac{3}{2}\left(\tfrac{2}{3}v' + 6\delta(t)\right) \qquad = -\tfrac{2}{3}v + 6u(t)$$

$$-9\delta(t)(9-27)\mu(t) = -3v - v' \rightarrow \boxed{18u(t) + 9\delta(t) = v' + 3v}$$

$$\tau^{-1} = \frac{R}{L} = \frac{3/2+3}{3/2}$$

$$18S^{-1} + 9 = SV(s) - v(0^-) + 3V(s)$$

con corriente con Nodos

$$\frac{12\mu(t)}{2} = v(t)\left(\tfrac{1}{2}+\tfrac{1}{6}+\tfrac{1}{3}\right) - v_p\tfrac{1}{3} \rightarrow v_p = 3v - 18\mu(t)$$

↳ $v_p' = 3v' - 18\delta(t)$

$$\emptyset = -v\tfrac{1}{3} + v_p\tfrac{1}{3} + \tfrac{1}{2}\int_{-\infty}^{\infty} v_p$$

↳ $\emptyset = -v'\frac{1}{3} + v'_p\frac{1}{3} + \frac{2}{3}v_p$

$$\emptyset = -v'\tfrac{1}{3} + v' - 6\delta(t) + 2v - 12\mu(t)$$

$$12\mu(t) + 6\delta(t) = 2v + v'\tfrac{2}{3} \quad \cancel{\ldots 3v}$$

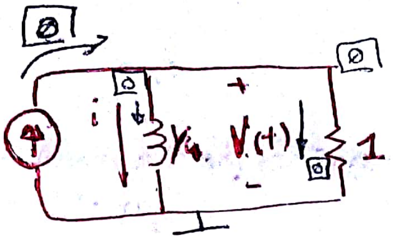
↳ $\boxed{18u(t) + 9\delta(t) = v' + 3v}$

Llegué a la misma ecuación diferencial.

B14

$10\,Sen\,2t\,u(t)$

$t=0$



$i(0^+) = i(0^-)$ porq' es un inductor

$V(t)$ para $t>0$ si $i(0)=0$

Planteo nodos xq' tengo un nodo

$$10\,Sen(2t)\,u(t) = V\frac{1}{1} + 4\int$$

deriva

$\rightarrow \int f(t)\,\delta(t) = F(0)$

Esto va a ser cero

$$20\,Cos(2t)\,u(t) + 10\,Sen(2t)\,\delta(t) = V' + 4V \Rightarrow 20\,Cos(2t)\,u(t) + 10\,Sen(2t)\,\underbrace{\delta(t)}_{} = V' + 4V$$

$t>0$
$\delta(t>0)=0$

Para $t>0$

$$20\,Cos(2t) = V' + 4V$$

$$V(t) = V_h(t) + V_p(t)$$

Homogenea

$$0 = V_h' + 4V$$

$$V_h(t) = A e^{-4t}$$

Particular

$$V_p(t) = B\,Sen(2t) + C\,Cos(2t) \quad \text{evaluo}$$

$$20\,Cos(2t) = 2B\,Cos(2t) - 2C\,Sen(2t) + 4B\,Sen(2t) + 4C\,Cos(2t)$$

igualo

$$\begin{cases} 20 = 2B + 4C = 2B + 8B = 10B \rightarrow \boxed{B=2} \\ 0 = -2C + 4B \rightarrow C = 2B \rightarrow \boxed{C=4} \end{cases}$$

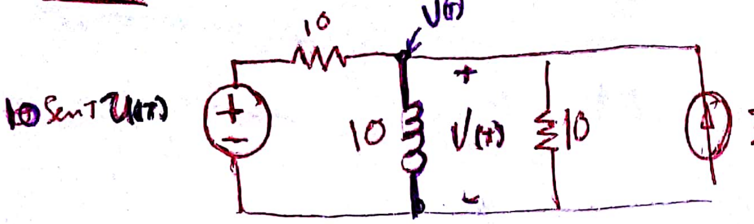
$$\Rightarrow V(t) = Ae^{-4t} + 2\,Sen(2t) + 4\,Cos(2t)$$

aplico cond inicial

$$V(0) = 0 = A + 4 \rightarrow \boxed{A=-4}$$

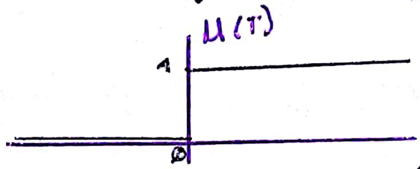
$$\Rightarrow V(t) = -4e^{-4t} + 2\,Sen(2t) + 4\,Cos(2t)$$

B15



$V(t)$?, $t>0$

antes no hay nada de energía



$v(0^-)=0$ hagamos nodos.

$$3U(t) + \frac{10\,sen(t)U(t) - v}{10\,\Omega} = v(t)\left(\frac{1}{10}+\frac{1}{10}\right) + \frac{1}{10}\int v(t)$$

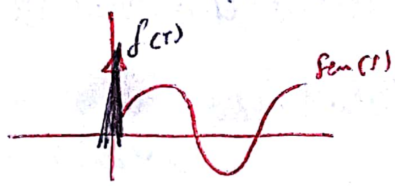
(inductor)

derivo

vale cero para $t>0$

$$3\delta(t) + \cos(t)U(t) + sen(t)\,\delta(t) = v'(t)\frac{1}{5} + \frac{v(t)}{10}$$

↳ si hago laplace me quedan convoluciones.



$$\begin{cases} sen(0)=0 \\ \delta(t>0)=0 \end{cases}$$

$$3\delta(t) + \cos(t)U(t) = v'(t)\frac{1}{5} + \frac{v(t)}{10}$$

$$3 + \frac{s}{s^2+1} = \frac{sV(s)}{5} - \frac{v(0)}{5} + \frac{V(s)}{10}$$

$$V(s)\left(\frac{s}{5}+\frac{1}{10}\right) = 3 + \frac{s}{s^2+1}$$

$$V(s) = \frac{3 + s/(s^2+1)}{\left(\frac{s}{5}+\frac{1}{10}\right)} = \frac{3}{\frac{10s+5}{50}} + \frac{\frac{s}{s^2+1}}{\frac{10s+5}{50}} = \frac{150}{10s+5} + \frac{50s}{(s^2+1)(10s+5)}$$

Simplifico

$$= \frac{15}{s+1/2} + \frac{50s}{(s^2+1)(10s+5)}$$

fracciones simples

$$= (\quad) + \frac{-20}{10s+5} + \frac{As+B}{s^2+1} \overset{*}{=} (\quad) + \frac{50s}{(s^2+1)(10s+s)}$$

CA

$$-20(s^2+1) + (10s+5)(As+B) = 50s \Rightarrow -20s^2 - 20 + 10As^2 + 10sB + 5As + 5B = 50s$$

$$\begin{cases} -20 + 10A = 0 \\ 10B + 5A = 50 \\ -20 + 5B = 0 \end{cases}$$

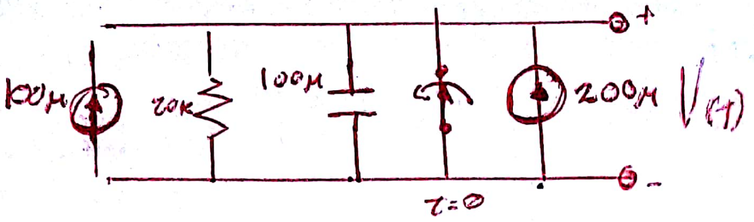
$\boxed{A=2}$ $\boxed{B=4}$

$$\Rightarrow \overset{*}{=} \frac{15}{s+1/2} + \frac{2s}{s^2+1} + \frac{4}{s^2+1}$$

$$v(t) = \left(15e^{-1/2\,t} - 2e^{-t/2} + 2\cos(t) + 4\,sen(t)\right]U(t)$$

$$\boxed{v(t) = \left(13e^{-t/2} + 2\cos(t) + 4\,sen(t)\right)U(t)}$$

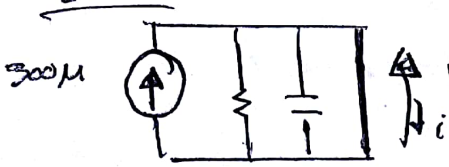
B16



$V(t),\ t>0$

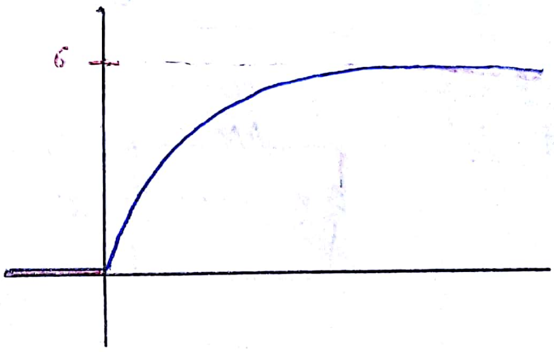
$$\begin{cases} V_A'C - V_B'C \\ -V_A'C + V_B'S \end{cases}$$

$t=0^-$

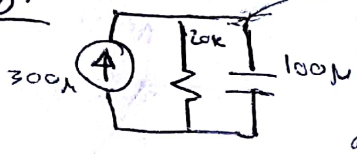


T(0⁻) ó t<0

$\tau = RC = 2$



$t=0^+$



también va a ser V=0 porq' el capacitor mantiene la tensión. no acepta cambios bruscos.

$\Sigma I_{ent} = \Sigma I_{sal}$

$$300\mu = V\left(\frac{1}{20k}\right) + 100\mu V' \Rightarrow \frac{300\mu \, 3}{100\mu} = V' + V\left(\frac{1}{20k \cdot 100\mu}\right) \quad \frac{1}{\tau} = \frac{1}{2}$$

$V_p = cte$ $\quad 3 = 0 + V_p \Rightarrow V_p = 6$

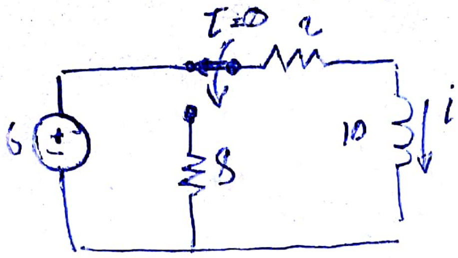
$V_H = Ae^{-t/2}$

$$\Rightarrow V = 6 + Ae^{-t/2}$$

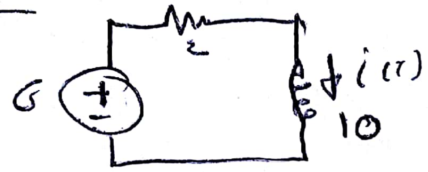
$$0 = 6 + Ae^0 \Longrightarrow A = -6$$

$$\boxed{V(t) = 6 - 6e^{-t/2}}$$

B1.7



$t < 0^-$

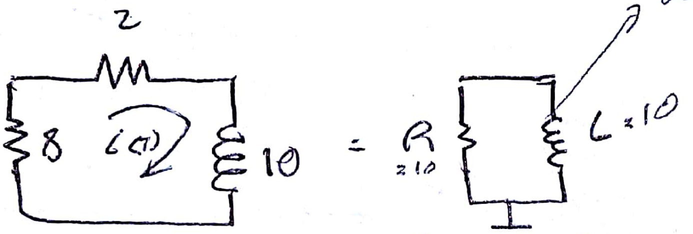


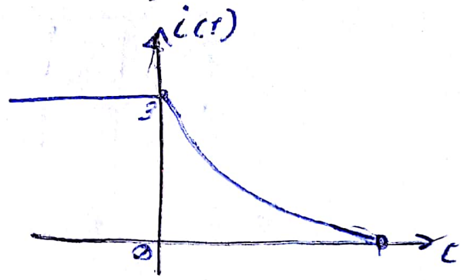
$i(0^-) = 3 = i(0^+)$

↳ Por ser un inductor

$t = 0^+$

almacena energía como campo magnético.





El inductor se descarga

$i(t) = Ae^{-t/\tau}$, $\tau = \frac{L}{R} = 1$

$i(\infty) = 0$ $\Rightarrow$ $\boxed{i(t) = 3e^{-t/1}}$

Planteemos las ecuaciones para verificar

$0 = i(t)\,(8+2) + 10\,i'(t)$

$0 = i'(t) + i(t)\frac{R}{L}$

$i(t) = i_h(t)$

$\boxed{i_h(t) = Ae^{-\lambda t}}$ $\underline{A \neq 0}$

$1)\ 0 = -\lambda A e^{-\lambda t} + Ae^{-\lambda t}\frac{R}{L}$ $\neq 0$ $\neq 0$

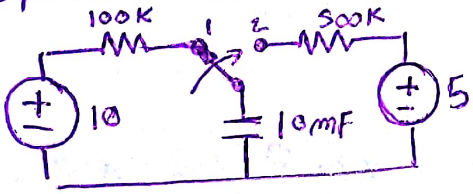
$\Leftrightarrow \lambda = \frac{R}{L}$

$\Rightarrow \boxed{i_h(t) = Ae^{-t/(L/R)}}$ $\to \tau$

datos $i(0^+) = 3 = Ae^{-\frac{0}{\tau}} \Rightarrow \boxed{A = 3}$

$\boxed{i(t) = 3e^{-t}}$ nos dio lo mismo

B1 El circuito q' se muestra en la fig 6-1 ha llegado a la cond de estado estable (la corriente en el capacitor es cero) con el interruptor en la pos 1. Si el interruptor se somete a la posición 2 y el circuito nuevamente la cond de estado estable encuentre el valor de la energía total q' se disipa durante todo el tiempo de intervención del circuito de la derecha (compuesto por un resistor de 500 kOhm y una fuente de 5V).



$i_{(T)} = C \frac{dV_{(T)}}{dt}$

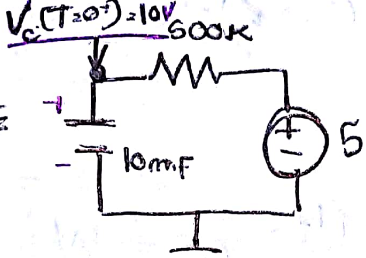
↳ Estable ... $V_{(T)} = cte$

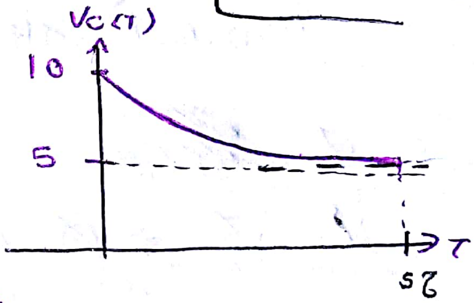
$\Rightarrow \frac{dV_{(T)}}{dt} = \emptyset$

$\Rightarrow \boxed{i_{(T)} = \emptyset}$

Cuando pasa al Switch 2, el capacitor ya está ba cargado con 10V

$\Rightarrow \boxed{t = \emptyset^+}$ =





• $i(\emptyset^+) = \frac{10-5}{500K} = 10\mu$

$\boxed{U_c(\emptyset) = \frac{1}{2} C V_c^2(\emptyset) = \frac{1}{2} \cdot 10m \cdot (10V)^2 = \boxed{\emptyset,5\ J}}$

$\boxed{U_c(+\infty) = \frac{1}{2} C V_c^2(+\infty) = \frac{1}{2} \cdot 10m \cdot (5V)^2 = \emptyset,125 J}$

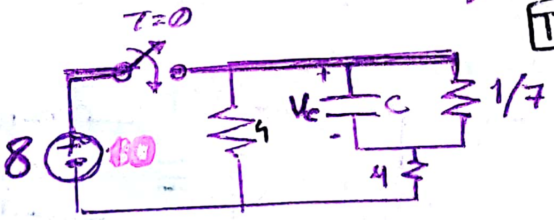
$\Rightarrow$ Energía disipada $\Delta U_c = U_c(+\infty) - U_c(\emptyset^+) = 0,125 - 0,5$

$\boxed{\Delta U_c = -\emptyset,375\ J}$

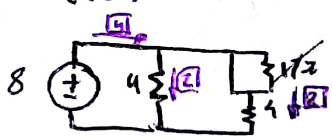
↳ Energía disipada.

B2 El interruptor en el circuito q' se muestra se cierra en $t=\emptyset$. Se encuentra que $V_c(\emptyset^+) = \emptyset$ y que $\left.\frac{dV_c}{dt}\right|_{\emptyset^+} = 10$ ¿Cuál es el valor de C?

$\boxed{T = \emptyset^+}$



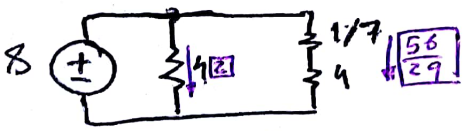
En $V_c(\emptyset^+) = \emptyset$ es un corto



$i_c(\emptyset^+) = 2$

$\boxed{T = +\infty}$ → se acabaron los transitorios → $\frac{dV_{(T)}}{dt} = \emptyset$

$\boxed{i = \emptyset}$ → Esto es circ. abierto.



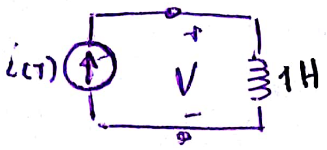
$i_c(+\infty) = \frac{56}{29} \simeq 0,931\ldots$

$i = C V_c'$

en $\boxed{T = \emptyset^+}$ → $2A = C\, 10V \Rightarrow \boxed{C = \frac{2}{10} = 5^{-1} F}$

B-3 La corriente $i(t)$ en el circuito q' se muestra en la figura b-3 tiene la variación indicada encuentre:

a = $q(10)$
b = $V(10)$
c = $\Phi(10)$



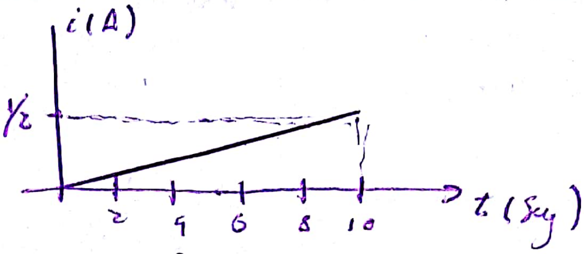


fig b-3

a $i(t) = \frac{\partial q(t)}{\partial t}$

$\hookrightarrow q(t) = \int i(t)\,dt = \frac{i^2}{2}\Big|_0^{10} = \frac{i(10)^2}{2} - 0 = \left(\frac{1}{2}\right)^2 \cdot \frac{1}{2} = \boxed{\frac{1}{8}}$

$i_c = C\frac{dv}{dt}$

$v(t) = L\frac{di}{dt}$

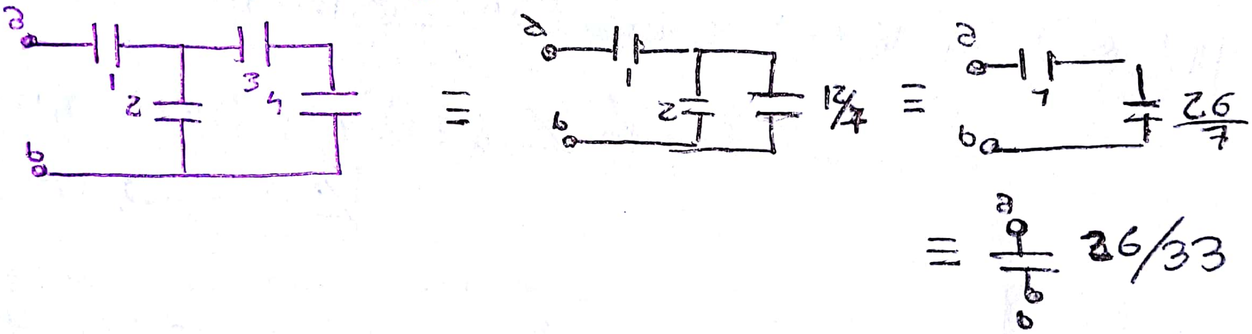
b - Como es un inductor la ecuación es

$v(t) = L \cdot i' = 1H \cdot \frac{1/2}{10} = (20)^{-1}\,V$ $\boxed{v(t) = \frac{1}{20}\,V}$

c ~~Φ = flujo~~

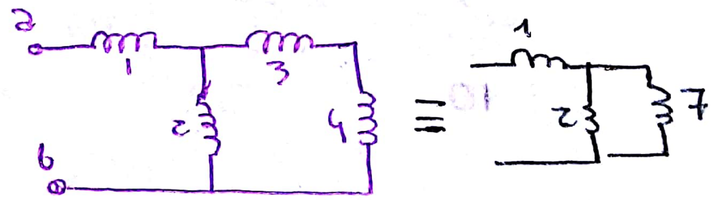
$\boxed{L(10) = \frac{\Phi}{i}} \Rightarrow \Phi = L\,i(10) = 1H \cdot \frac{1}{2} = \boxed{\frac{1}{2}\,W}$

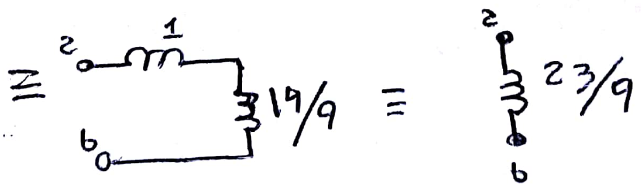
B4 capacitores descargados ¿Ceq?



B5 inductores descargados

¿Leq?



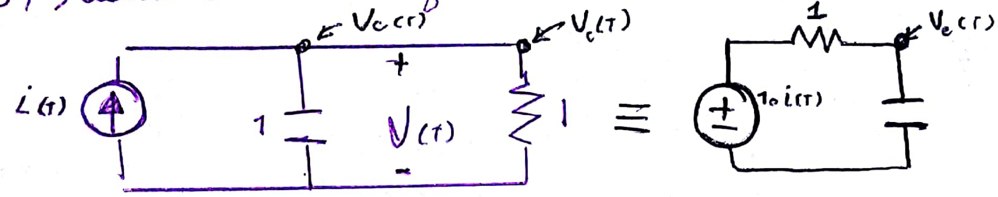


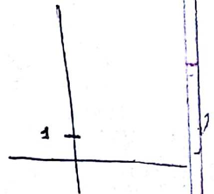
B12 Encuentre $V(t)$ para $t>0$ si $V(0)=1$ e $i(t)=1+t+t^2$, después encuentre $V(t)$ para los 3 casos

a- $i(t)=1$
b- $i(t)=t$
c- $i(t)=t^2$

¿Es la suma de las últimas 3 sciones igual a la 1ª scion?

¿La suma de las sciones particulares correspondientes a los 3 últimos casos es igual a la scion particular del 1º caso?





Rayo modos

$$i(t) = V_C(t)\cdot\frac{1}{R \to 1} + C\,\frac{dv(t)}{dt}$$

$i_C(t) = C\,\frac{dv(t)}{dt}$

$v(t) = \frac{1}{C}\int i_C(t)\,dt$

tengo $v(t) = v_h(t) + v_p(t)$

Homogenea

$\circ\ C v' + \frac{1}{R} v = 0 \quad v' + \frac{1}{RC} v = 0$

Propongo $v = A e^{-\alpha t} \Rightarrow \left(\alpha + \frac{1}{RC}\right) 0$

$\Rightarrow \boxed{\alpha = \frac{1}{RC}}$

$$\boxed{v_h(t) = A e^{-\frac{1}{RC} t} \cdot \mu(t)}$$

Particular:

como $i(t) = 1 + t + t^2$

$\Rightarrow$ Propongo: $a t^2 + b t + c = i(t)$

$: 2at + b = i'(t)$

① $v' + \frac{v}{RC} = \frac{1}{C}$ $\quad \| v = Ae^{-\alpha t} \Rightarrow v = A\alpha 0$

$\Rightarrow S\,V(s) - v(0) + \frac{1}{R} V(s) = \frac{1}{C}\frac{1}{s} \Rightarrow V(s)\left[S + \frac{1}{R}\right] = \frac{1}{C}\frac{1}{s} + 1$

$\Rightarrow V(s) = \left(\frac{1}{C}\frac{1}{s} + 1\right)\frac{1}{\left(s + \frac{1}{R}\right)}$

$= \frac{1}{C}\left[\frac{1}{s^2 + \frac{s}{R}}\right] + \frac{1}{s + \frac{1}{R}}$

② $C v' + \frac{1}{R} v = t \Rightarrow C\left(S V(s) - v(0)\right) + \frac{1}{R} V(s) = \frac{1}{s^2}$

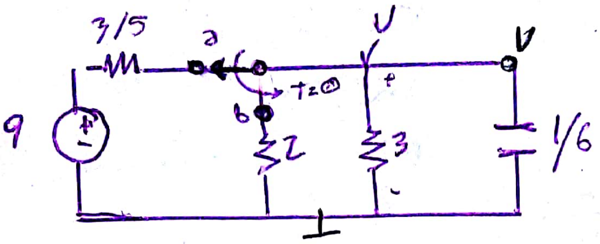
NOTA: Si la condición inicial es distinta de cero, no se cumple la condición de superposición.

$$\mathcal{L}\{f^{n}(t)\} = S^{n}F(s) - s^{n-1}f(0) - s^{n-2}f'(0) - \dots - f^{n-1}(0)$$

$$\mathcal{L}[f'(t)] = SF(s) - f(0)$$

$\boxed{B18}$

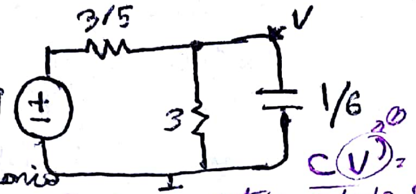
12 - Septiembre



ohma Encuentro la Solución completa. (antes y después de t=0).

$\boxed{T=0^-}$

$(-\infty\ ;0^-)$



estoy en estado estacionario

$V_c(0^-) = \dfrac{9 \cdot 3}{\frac{3}{5}+3} = 15/2$

$\tau = \frac{3}{5} \parallel 3 \cdot 1/6$

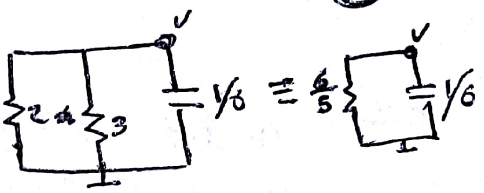
$\boxed{i = C\,V'}$

$C\,\overset{=0}{(V')} = i$

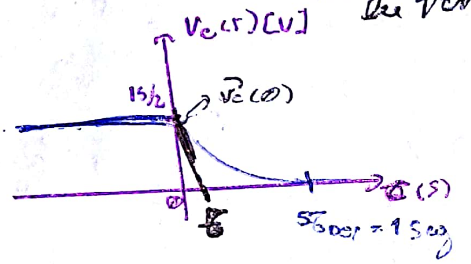
Con $V'=0$ como está en estado estacionario $i_c = 0$.

$\boxed{T=0^+}$

$V_c(0^+) = 15/2$, tiene q' mantener la tensión



$\Rightarrow$



(Estamos con llaves $\Rightarrow$ NO USAR laplace)

$\tau_{\text{descarga}} = \frac{1}{5}(s^{-1})$

La ecuación diferencial es = rango modos

$0 = V \cdot \overbrace{\left(\frac{1}{2}+\frac{1}{3}\right)}^{5/6} + \underbrace{\frac{1}{6} V_c'}_{i_c}$

$\Rightarrow V_c' + 5 V_c = 0$

Planteo: $V_c = A\, e^{-T/\tau}$, $V_F = 0$, $V(0^+) = \frac{15}{2}$

$\Rightarrow V(0^+) = A e^{-0/\tau} = \frac{15}{2} \Rightarrow \boxed{A = \frac{15}{2} = 7{,}5}$

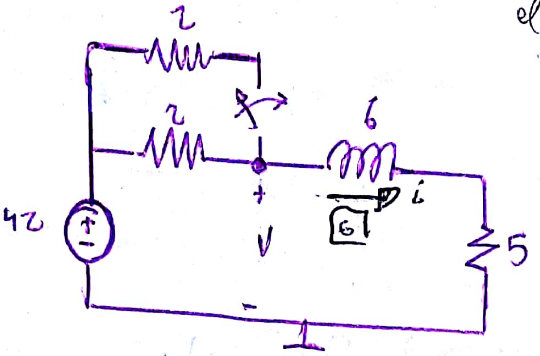
$\Rightarrow V_c' = \dfrac{-A}{\tau}\, e^{-T/\tau} = -\frac{15}{2} \cdot 5 \cdot e^{0} = -\frac{75}{2}$

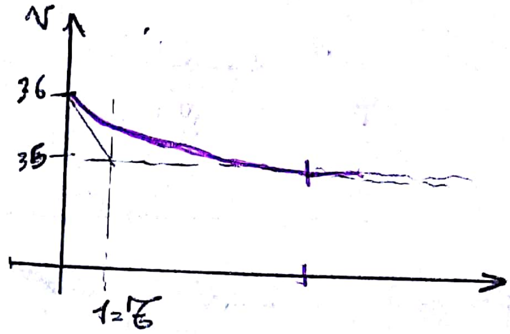
"En τ se intersecan la recta con pendiente V_c' en el punto $V(0)$!!"

$\boxed{B_{19}}$ $i(t)$? $v(t)$? $t>0$

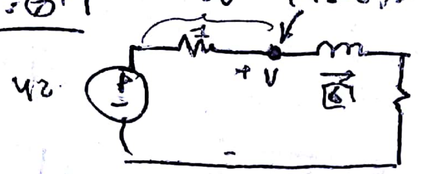
$t=0$ se cierra el interruptor

$v = L\, i'$





$\boxed{t=0^+}$



<u>mallas</u>

$v = 42 - i \cdot 1$ (miro por izq.) $\Rightarrow i = 42 - v$

$v = 5i + 6i'$ (miro por derecha) $\quad i' = -v'$

<u>Reemplazo</u>

$v = 5 \cdot 42 - 5v - 6v'$

$6v' + 6v = 5 \cdot 42$

$v' + v = \frac{5 \cdot 42}{6} = 35$

$v(0^-) = 42 \frac{5}{7}$

$i(0^-) = 6 = i(0^+)$

induc.

$v(0^+) = 36$

¿$i(\infty)$ = cte? inductor un cable

$v(\infty) = 42 \cdot \frac{5}{5+1}$

la v de la $R=5$

$\tau = \frac{L}{R} = \frac{6}{6} = 1$

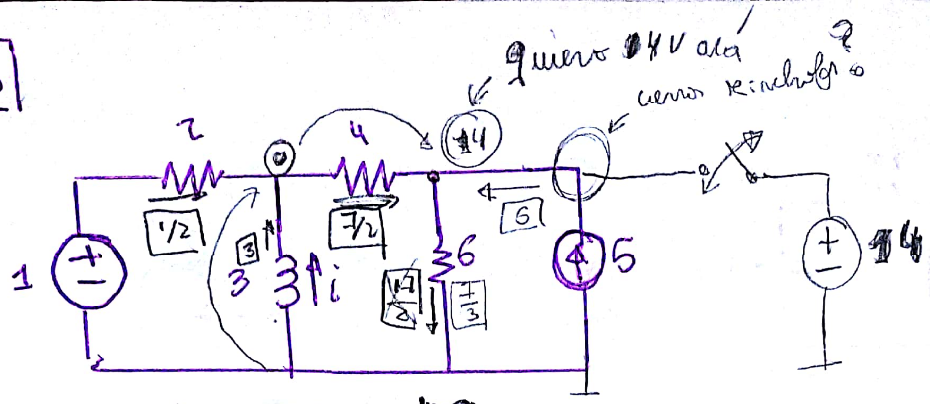
$v_h(t) = Ae^{-t}\mu(t)$

$v_p = K \xrightarrow{\text{lo meto en la ec}} K = 35 \Rightarrow v(t) = (A \cdot e^{-t} + 35)\mu(t)$

$v(0^+) = (A + 35) = 36$

$\Rightarrow \boxed{A = 1} \Rightarrow v(t) = (e^{-t} + 35)\mu(t)$

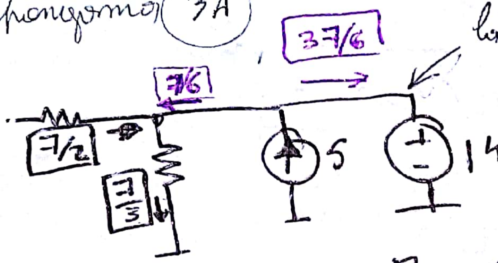
B20



$i(0) = 3A$ $t > 0$

(a) Dibujar un nuevo circ agregando interruptores y fuentes de valor cte como sea necesario para establecer las cond inicial.

Supongamos 3A



la fuente impone la corriente necesaria para tener 14 en el nodo.

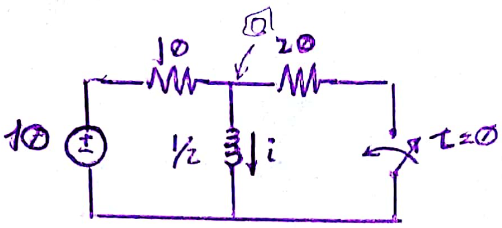
$$7/2 + 5 = \frac{7}{3} + X \Rightarrow \frac{17}{2} - \frac{7}{3} = X = \frac{37}{6}$$

(b) lo mismo pero con $u(t)$ y $u(-t)$

$u(-t)$

B21

$t<0$



$V = L\, i'$

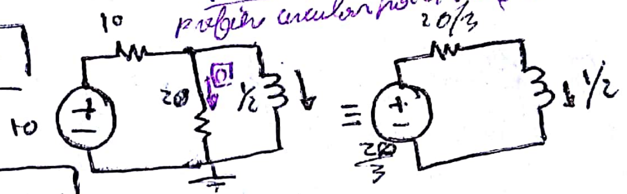
$i(t)?\ / t>0$

$\boxed{t=0^-}$ $i = \frac{V}{R} = \frac{10}{10} = 1$

$\boxed{i(0^-) = 1}$

$\boxed{t=0^+}$

$t>0$ prefiere circular por el cable (conductor).



$\boxed{i(0^+) = 1}$

$\boxed{i(\infty) = 1}$

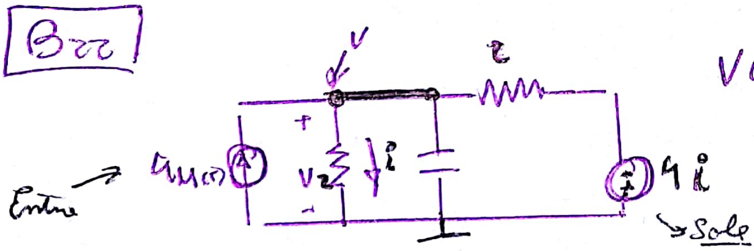
Si yo no quiero transitorio → lo único q' tengo que hacer es poner la condición inicial como cond final

⇒ Si la sción es una exp entonces no hay manera q' me de lo mismo al inicio q' al final a menos q' la sción sea una cte.

B22

$v(t)$ para $t>0$, supo cond es cero.

(CIN) cap descargados, Ind descargados



$\boxed{T=0^-}$

$v(0^-) = 0.$

$v(0^+) = 0.$

Planteo nodo

$$\begin{cases} 4u(t) - \frac{4i}{2} = V\left(\frac{1}{2}+\frac{1}{2}\right) + 1\,V' \\ i = V/2 \end{cases}$$

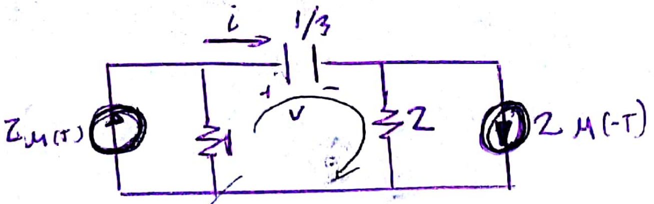
$\Rightarrow 4u(t) - v = v + v' \Rightarrow \boxed{v' + 2v = 4u(t)}$

$v(t) = A e^{-2t} + 4$

$v(t) = 4(1 - e^{-2t})\,u(t)$

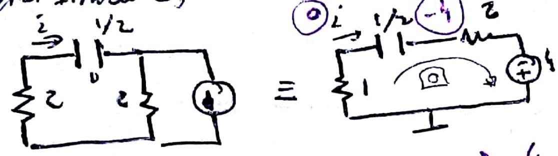
Nota: con fuente controlada $-R$ ← entonces $\tau < 0$ $\Rightarrow e^{-\frac{t}{\tau}}$ diverge

B 23 Encuentre $V_{(t)}$ y $i_{(t)}$ / $t>0$



Busquemos Cond Iniciales

$V(0^-)$

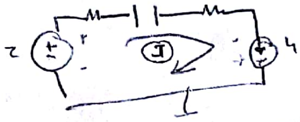


Estoy en estado estacionario

$i_c = C \frac{\partial v}{\partial t}$

$V(0^-)=4$

↳ Planteo una malla q' me conviene más.



(I) $2u(t)+4u(-t) = \overbrace{i_c(t)}^{C v'}(1+2) + \underbrace{\frac{1}{C}\int_{-\infty}^{t} i(t)\,dt}_{v}$

~~de~~ : quiero q' la variable sea de $v(t)$

$\Rightarrow (\quad) = \frac{1}{3}v'(1+2) + v' \Rightarrow \boxed{2u(t)+4u(-t) = v' + v}$

$\boxed{u(t) \sqsupset \frac{1}{s}}$

$2\frac{1}{s} + 4\underbrace{\left(\frac{1}{s}-\frac{1}{s}\right)}_{0} = sV(s) - \overbrace{v(0^+)}^{4} + V(s)$

$\boxed{u(-t) = 1-u(t) \Rightarrow 1-u(t) \sqsupset \frac{1}{s}-\frac{1}{s}}$

$2\frac{1}{s} = sV(s)+V(s)-4 = V(s)(s+1)-4$

$\boxed{V(s) = \left(\frac{2}{s}+4\right)/(s+1)}$

$V(s) = \frac{2}{s^2+s} + \frac{4}{s+1}$ $\rightarrow 4e^{-t}$

$e^{\pm at} \sqsupset \frac{1}{s \mp a}$

$u(t) \sqsupset 1/s$

$t \sqsupset \frac{1}{s^2}$

↳ fracciones simples

$\frac{A}{s} + \frac{B}{s+1} = \frac{2}{s(s+1)}$ $\Rightarrow \boxed{A=2}$ $\boxed{B=-2}$ $\Leftarrow A(s+1)+Bs=2$ $\boxed{\begin{matrix} s=1 \\ s=0 \end{matrix}}$

$\Rightarrow \frac{2}{s} + \frac{-2}{s+1} \sqsupset 2\cdot u(t) - 2e^{-t}$

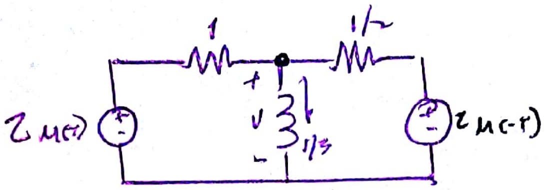
$\Rightarrow V(s) = \frac{2}{s^2+s} + \frac{4}{s+1} \sqsupset \frac{2}{s} - \frac{2}{s+1} + \frac{4}{s+1} \sqsupset 2\mu(t) - 2e^{-t}_{\mu(t)} + 4e^{-t}_{\mu(t)}$

$\Rightarrow v(t) = \left[2+2e^{-t}\right]u(t)$

Si quiero la corriente, uso la relación.

B24

$i(t)$ y $V(t)$ / $t > 0$

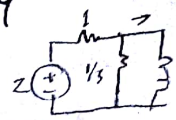


$\boxed{t < 0^-}$ Estado estacionario (inductor)

$V = L\,i' = 0$

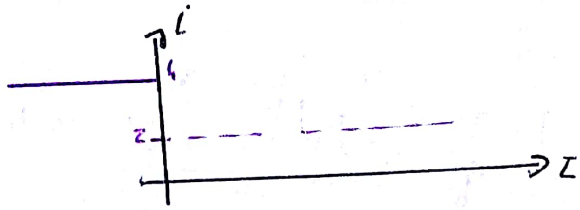
$\boxed{i(0^-) = \frac{2}{1/2} = 4}$ $\quad i(0^+) = 4$

$V(0^+) = \frac{2}{3}$

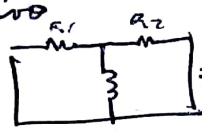


$\boxed{t \to \infty}$

$i_L(t \to \infty) = 2$



Req?
Pasivo



$\Rightarrow R_{eq} = R_1 // R_2$

$1 // 1/2$

desaparece en Laplace

Lo dejamos en tensiones

Planteo nodo

$$\frac{2u(t)}{1} + \frac{2u(-t)}{1/2} = V\left(\frac{1}{1} + \frac{1}{1/2}\right) + \frac{1}{L}\int V_L$$

$$\int_0^t f(\tau)\,d\tau = \frac{1}{s} F(s)$$

$$\Rightarrow 2\frac{1}{s} + 0 = 3V(s) + 3\frac{V(s)}{s} \quad (3\,i_L(0^-))$$

$\Rightarrow R_{eq}$

$$2\frac{1}{s} = \left(3 + \frac{3}{s}\right)V(s) \Rightarrow V(s) = \frac{2}{3}\frac{1}{s}\frac{1}{\left(1 + \frac{1}{s}\right)}$$

$$= \frac{2}{3}\frac{1}{(s+1)} \quad \frac{2}{3} e^{-t} u(t)$$

tabla

$$\boxed{V(t) = \frac{2}{3} e^{-t} u(t)}$$

con $V = L\,i' \Rightarrow i = \frac{1}{L}\int V \Rightarrow i(t) = \frac{C - \frac{2}{3}e^{-t}}{1/3} = 4 - 2e^{-t}$

$i(0) = 4 = 3C + \frac{0}{3} \Rightarrow \boxed{C = \frac{14}{9}}$

$i(t) = \frac{14}{3} - 2e^{-t}$

(*) $2\delta(t) - 4\delta(t) = 3V' + 3V$

$-\frac{2}{3}\delta(t) = V' + V$

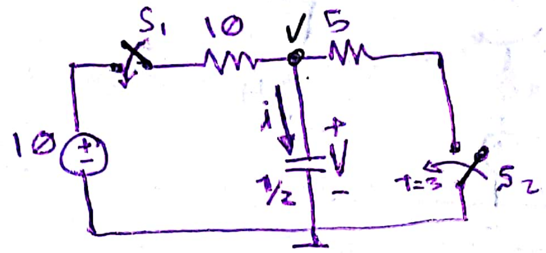
$\boxed{B_{25}}$ S_1 se cierra en $t=\emptyset$

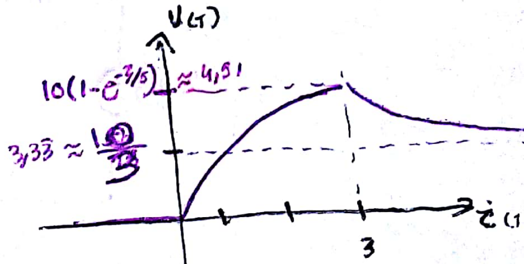
S_2 se abre en $t=3s$

$v(t)$ e $i(t)$ para $t\geq\emptyset$, suponga $v(\emptyset)=\emptyset$

(tarea 8)

$i = Cv'$



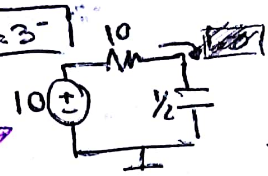


$\boxed{t=\emptyset^-}$ $v(\emptyset^-)=\emptyset$

$\boxed{t=\emptyset^+}$ $v(\emptyset^+)=\emptyset$

$\boxed{\emptyset < t < 3}$

$\boxed{t=3^-}$



$\Rightarrow$ en $\boxed{t=3^-}$ no está todo cargado.

$\tau_{carga} = RC = 10 \cdot \frac{1}{2} = 5s$

$\Rightarrow 5\tau = 25s$

• modo

$\frac{10}{10} = v\left(\frac{1}{10}\right) + \overset{1/2}{C}v'$

$\boxed{v' + \frac{1}{5}v = 2}$ $v = Ae^{-\alpha t}$

$Ae^{-\alpha t}\left(\alpha + \frac{1}{5}\right) = \emptyset$

• $v_n = Ae^{-\frac{1}{5}t}$

$v_p = K \Rightarrow \frac{K}{5} = 2$

$\Rightarrow \boxed{K=10}$

$\Rightarrow v_c(t \leq 3^-) = 10 + Ae^{-t/5}$

$v_c(0) = \emptyset = 10 + A$

$\Rightarrow \boxed{A=-10}$

$\Rightarrow v_c(t\leq 3^-) = 10\left(1-e^{-t/5}\right)$

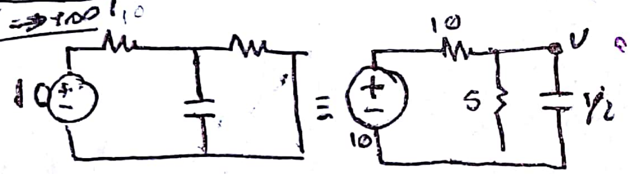
$\Rightarrow \boxed{v_c(3^-) = 10\left(1-e^{-3/5}\right) \simeq 4{,}51}$ $v_c(3^-) = 4{,}51$

$\boxed{t \geq 3^+}$

$\boxed{t = 3^+}$

$\boxed{v_c(3^+) = 10(1-e^{-3/5})}$

$\boxed{t \to +\infty}$



$i = C(v')\to\emptyset$ $\Rightarrow i(+\infty) = \emptyset$

$\boxed{v(t\to+\infty) = \frac{50}{15}} \approx 3{,}33 = 10/3$

$\tau_{desc} = \frac{50}{15} \cdot \frac{1}{2} = \frac{25}{15} \approx 1{,}67 \Rightarrow 5\tau \approx 8{,}33$

$\Rightarrow 3 + 8{,}33 \simeq \underline{16{,}33}$ seg se descarga en los 16,33 aprox.

Preguntar.

$\Rightarrow$ ~~v_{desc} … $\frac{10}{50/15}$ …~~ (desc) $\Rightarrow \frac{10}{10} = v\left(\frac{1}{10} + \frac{1}{5}\right) + \frac{1}{2}v'$

$\Rightarrow 2 = v' + v\frac{3}{5}$

$\boxed{v(t) = \frac{10}{3} + Ae^{-\frac{3}{5}t}}$

forma 1: $v(3) = 4{,}51 \Rightarrow A = 7{,}12$

• $v(t) = \begin{cases} 10(1-e^{-t/3}) & 0<t<3 \\ \frac{10}{3} + 7{,}12e^{-\frac{3}{5}(t)} & t>3 \end{cases}$

forma 2

$v(\emptyset) = 4{,}51$, $\frac{10}{3} + Ae^{-\frac{3}{5}(t-3)}$

$A = 1{,}17$

$v(t) = \frac{10}{3} + 1{,}17e^{-\frac{3}{5}t}$

$\emptyset \to 3$ $v(t) = \frac{10}{3} + 1{,}17e^{-\frac{3}{5}(t-3)}$

$\Rightarrow v_d(t) = 10e^{-3/5} \cdot e^{-\frac{t-3}{25/15}}$

no cumple en infinito

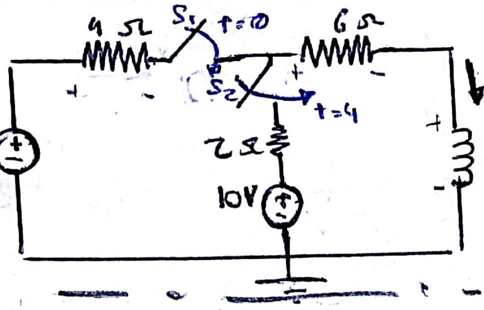
• $v(t)$ $\begin{cases} 10(1-e^{-t/3}), & 0<t<3 \\ \frac{10}{3} + 4{,}17e^{-\frac{3}{5}(t-3)}, & t>3 \end{cases}$

ó también – forma 2 bis

• $v(t) = (10 - 10e^{-t/3})(\mu(t) - \mu(t-3)) + \left(\frac{10}{3} + 1{,}17e^{-\frac{3}{5}(t-3)}\right)\mu(t-3)$

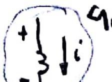
Sadiku: Ejemplo 2.13: En $t=0$, el interruptor 1 en la figura, se cierra, y el interruptor 2 se cierra 4 s después. Halle $i(t)$ para $t>0$. Calcule i para $t=2$ seg y $t=5$ s.

$0\ t\le 0$ ∘ $0\le t\le 4$ ∘ $t\ge 4$



$V = L\,i'$

$i = \frac{1}{L}\int v(\tau)$

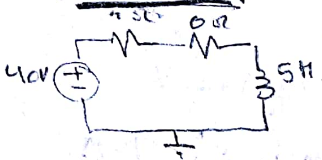


∘ $\boxed{t<0}: (-\infty; 0^-)$

no hay energía

$\Rightarrow \underline{i(0^-) = 0}$.

∘ $\boxed{0\le t\le 4}$



inductor como cable (Suponiendo q' interrumpo S_1 cerrado para siempre).

$i(\infty) = \frac{V}{R} = \frac{40V}{(6+4)\Omega} = \underline{4A}$

$i(0^+) = i(0^-) = 0$

$\Rightarrow$ Planteo mallas $40V - i(10\Omega) + L\,i' = 0$

$i' + \frac{i10}{5} = \frac{40}{5} \Rightarrow \boxed{i' + 2i = 8}$

$i = Ae^{-\lambda t}$ $\quad i_h: -\lambda + 2 = 0$ $\quad \boxed{\lambda = 2}$

$i_p: k \Rightarrow 2k = 8 \Rightarrow \boxed{k=4}$

$i(0) = 4 + Ae^{-2\cdot 0} = 0$

$\boxed{A=-4}$

$\boxed{i(t) = 4(1-e^{-2t})}$ (*)

* entonces para $t=4^-$

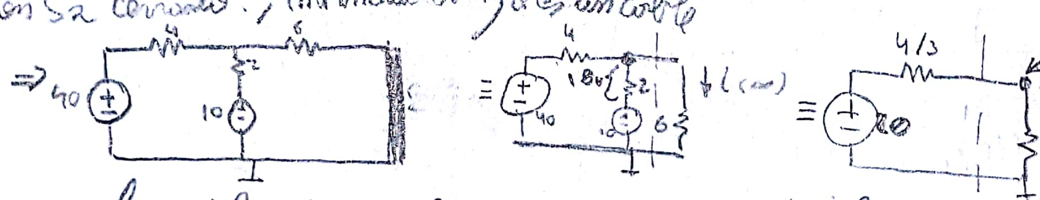
$\underline{i(4^-)} = 4(1-e^{-2\cdot 4}) \simeq 4$

$\approx 0{,}9997$ $\quad i(4^-) = 4(1-e^{-8})$

∘ $\boxed{t\ge 4}$

$\rightarrow \underline{t=4^+} \rightarrow i(4^+) = 4(1-e^{-8}) \simeq 4$

$t\to\infty$, con S_2 cerrado, mi inductor ya es un cable



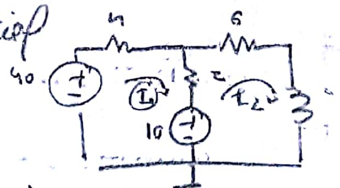
$V_x = \frac{20\cdot 6}{4/3+6} = \frac{180}{11}$

$V = iR$

$i(\infty) = \frac{V(\infty)}{R}$

$\boxed{i(\infty) = \frac{180/11}{6}} = 30/11 \simeq 2{,}727$

$\Rightarrow$ Planteo la ec. diferencial



$$\begin{cases} 30 = i_1(4+2) - i_2(2) & \text{I} \\ 10 = -i_1(2) + i_2(6+2) + L\,i_2' & \text{II} \end{cases}$$

despejo i_1 de (I) $\Rightarrow \boxed{i_1 = \frac{i_2}{3} + 5}$, Remplazo en (II).

$\Rightarrow$ (I) y (II): $10 = -2\left(\frac{i_2}{3}+5\right) + i_2(8) + 5\,i_2' \Rightarrow 5i_2' + \frac{22}{3}i_2 = 20$

$\Rightarrow \boxed{i_2' + \frac{22}{15}i_2 = 4}$

$\Rightarrow i_h: Ae^{-\lambda t} \Rightarrow \boxed{i_h(t) = Ae^{-\frac{22}{15}t}}$

$i_p: k \Rightarrow \frac{22}{15}\cdot k = 4 \Rightarrow \boxed{k = \frac{30}{11}}$

$\Rightarrow i(t) = \frac{30}{11} + Ae^{-\frac{22}{15}(t-4)}$

$\Rightarrow i(4) = \frac{30}{11} + A = 4(1-e^{-8}) \Rightarrow A = \frac{30}{11} - 4 + e^{-8} \Rightarrow \boxed{A = \frac{14}{11} - 4e^{-8}}$

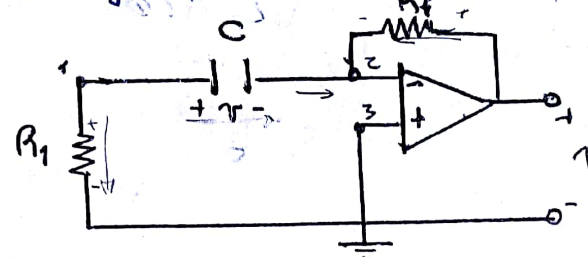
≈ 4

$\boxed{A \approx 4 - \frac{30}{11}} \approx 1{,}2727$

$\boxed{i(t) = \frac{30}{11} + \left(\frac{14}{11} - 4e^{-8}\right)e^{-\frac{22}{15}t}}$

$$\Rightarrow i(t) = \begin{cases} t\le 0 & \text{---------} 0. \\ 0\le t\le 4 & \text{---------} 4(1-e^{-2t}) \\ t\ge 4 & \text{---------} \left(\frac{14}{11} - 4e^{-8}\right)e^{-\frac{22}{15}t} \end{cases}$$

Sadiku Ejemplo 7.14 En referencia al circuito del amplificador operac. de la figura 7.55 a), halle v_o para $t>0$, dado que $v(0)=3V$. Sean $R_f = 80k\Omega$, $R_1 = 20k\Omega$, y $C = 5\mu F$



7.55 (a)

$R_1C = 20k \cdot 5\mu$ ($\times 10^3$, $\times 10^{-6}$) $= 100mS$ $\Rightarrow \tau = 0{,}1$ Seg

Metodo 1 solución al nodo $\Sigma i_e - \Sigma i_s = 0$

nodo 1: $0 = \frac{-v_1}{R_1} + Cv'$ $\Rightarrow \left| v' + \frac{v_1}{R_1C} = 0 \right|$ $\Rightarrow \left| v(t) = Ae^{-\frac{1}{R_1C}t} \right|$, $\boxed{\tau = R_1C}$

Dado q' $v_2 = v_3 = 0$

$| v(0) = 3V$ cond. inicial

$\Rightarrow v(0) = Ae^{0} = A = 3$ $\Rightarrow \boxed{v(t) = 3e^{-\frac{t}{\tau}}}$

nodo 2

$C\frac{dv}{dt} + \frac{(v_o - v_2)}{R_f} = 0$

$\Rightarrow v' = \frac{-v_o}{R_f.C}$ $\Rightarrow v' = \frac{-v_o}{R_fC}$ $\Rightarrow \boxed{v_o = -R_fC\frac{dv}{dt}}$

$v'(t) = -3 \cdot \frac{1}{\tau} = e^{-t/\tau}$

$v'(t) = -30e^{-t/10}$

$-R_f \cdot C = 80k\Omega \cdot 5\mu 6$ $= 400mS$ $= 0{,}4 S$

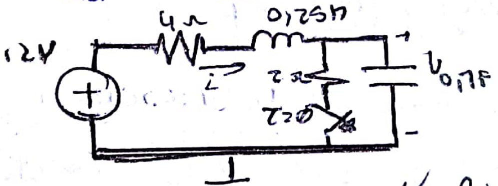
$\Rightarrow v_o = (-0{,}4) \cdot -30e^{-t/10}$

$\boxed{v_o(t) = 12e^{-t/10} \; [V]}$ $t>0$

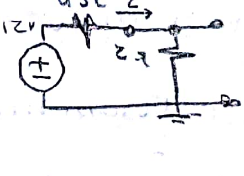
Sadiku: Circ de 2° orden: obtención de val. iniciales.

8.1. El interruptor en la figura ha estado cerrado mucho tiempo. Se abre en $t=0$. Halle: a) $i(0^+)$, $v(0^+)$

b) $\frac{di(0^+)}{dt}$, $\frac{dv(0^+)}{dt}$, c) $i(\infty)$, $v(\infty)$



a):

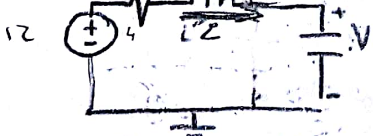


$i(0^-) = i(0^+)$

$\Rightarrow \left[i = \frac{12V}{(4+2)\Omega} = 2A \right]$ ⓪

$\boxed{v(0^-) = v(0^+) = 4V}$ ⓪

b) En $t=0^+$, el interruptor está abierto



$\Rightarrow i_L = i_c = i$ $\Rightarrow v' = \frac{i_{c,L}}{C}$ $\Rightarrow \boxed{v'(0^+) = \frac{i(0^+)}{C} = \frac{2A}{0.1} = 20\,V/s}$ ⓪

$i_c = C\frac{dv}{dt}$

análogamente $v_L = L\,i'$ $\Rightarrow \boxed{i'(0) = \frac{v_L(0^+)}{L} = \frac{0}{L} = 0}$ ⓪

$12 - i_1 \cdot 4 - v_L - v_c = 0$

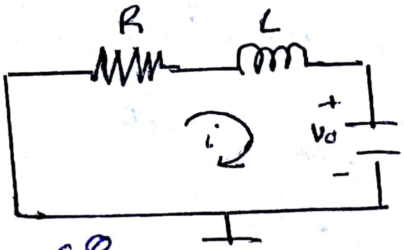
$| v_L = 12 - 8 - 4 = 0 |$ (*)

c) $i(\infty)$, $v(\infty)$?

$\boxed{v(\infty) = 12}$ ⓪

$\boxed{i(\infty) = 0}$ ⓪

8.3 CIRCUITO RLC Serie (Sin fuente)



con cond. iniciales
$$\begin{cases} V_0 = V(0) \\ i_0 = I(0) \end{cases}$$

$$\begin{cases} i_C = C\,v' \\ v_L = L\,i' \end{cases}$$

$$\begin{cases} v(0) = \frac{1}{C}\int_{-\infty}^{0} i\,dt = V_0 \\ i(0) = I_0 \end{cases}$$

apliquemos mallas: ~~LKV~~ $v_R + v_L + v_C = 0$

$$\Rightarrow Ri + Li' + \frac{1}{C}\int_{-\infty}^{t} i\,dt = 0 \quad (1)$$

derivo:

$$Ri' + Li'' + \frac{1}{C}i = 0 \Rightarrow \boxed{i'' + \frac{i'R}{L} + \frac{i}{CL} = 0} \quad (2)$$

$\Rightarrow$ Si uso las cond iniciales en (1)

Tengo: $R(i_0) + Li'_0 + V_0 = 0$ ó sea $\Rightarrow \boxed{i'_0 = -\frac{1}{L}(Ri_0 + V_0)}$

Gracias puedo resolverlo

$\Rightarrow$ Propongo $\boxed{i = Ae^{st}}$

$\Rightarrow$ Reemplazo en (2) $\underbrace{Ae^{st}}_{\neq 0}\underbrace{\left(s^2 + s\frac{R}{L} + \frac{1}{CL}\right)}_{=0} = 0$ (*)

$$\Rightarrow s^2 + \left(\frac{R}{L}\right)s + \left(\frac{1}{CL}\right) \qquad s_{1,2} = \frac{-\left(\frac{R}{L}\right) \pm \sqrt{\left(\frac{R}{L}\right)^2 - 4\cdot\left(\frac{1}{CL}\right)}}{2} = \underbrace{-\left(\frac{R}{2L}\right)}_{\alpha} \pm \sqrt{\underbrace{\left(\frac{R}{2L}\right)^2}_{\alpha^2} - \underbrace{\left(\frac{1}{CL}\right)}_{\omega_0^2}}$$

$$\Rightarrow \boxed{s_{1,2} = -\alpha \pm \sqrt{\alpha^2 - \omega_0^2}} \Rightarrow \alpha = \frac{R}{2L}, \quad \omega_0 = \sqrt{\frac{1}{CL}}$$

s_1, s_2: "frecuencias naturales". $[Np/s] = \left[\frac{nepers}{seg}\right]$

ω_0: "frecuencia resonante" ó "frecuencia natural no amortiguada" $\left[\frac{Rad}{s}\right]$

α: "frecuencia neperiana" ó "factor de amortiguamiento" $\left[\frac{Np}{s}\right]$

(*) $\Rightarrow s^2 + 2\alpha s + \omega_0^2 = 0$

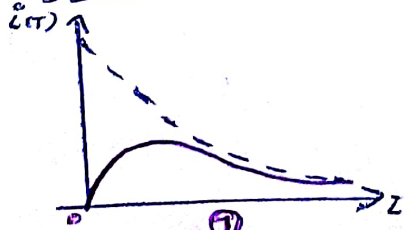
- De $s_{1,2}$, se puede ver q' hay 3 tipos de soluciones.

1- si $\alpha > \omega_0$ se tiene el caso Sobreamortiguado.

2- si $\alpha = \omega_0$ se tiene el caso Críticamente amortiguado.

3- si $\alpha < \omega_0$ se tiene el caso Subamortiguado.

(1) $i(t) = A_1e^{s_1t} + A_2e^{s_2t}$



(2) $s_1 = s_2 = -\alpha = -\frac{R}{2L}$

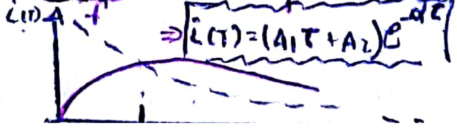
$\Rightarrow A_3 = A_1 + A_2 \Rightarrow i(t) = A_3e^{-\alpha t}$

(no cumple cond iniciales)

$\Rightarrow \alpha^2 = \omega_0^2 \Rightarrow i'' + 2\alpha i' + \alpha^2 i = 0$

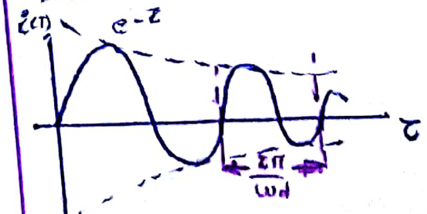
$\underbrace{(i' + \alpha i)}_{f}' + \alpha\underbrace{(i' + \alpha i)}_{f} = 0$

$\Rightarrow \boxed{i(t) = (A_1t + A_2)e^{-\alpha t}}$



(3) $\omega_d = \sqrt{\omega_0^2 - \alpha^2}$

$i(t) = e^{-\alpha t}(B_1\cos\omega_d t + B_2\sin\omega_d t)$

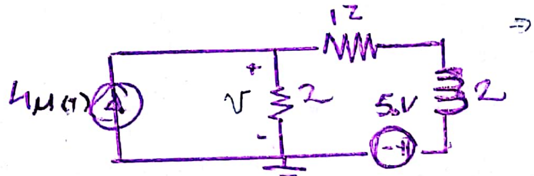


17 - Sep - 19

Repaso:

$i = C v'$	$v = L i'$
$v = \frac{1}{C}\int i\,dt$	$i = \frac{1}{L}\int v\,dt$
(Puede crear picos de corriente, pero no de tensión)	(Puede crear picos de tensión, pero no picos de corriente)
· mantiene tensión	· mantiene corriente

$\boxed{B_{26}}$ $v(t)$? $t > 0$, $E(0) = 0$

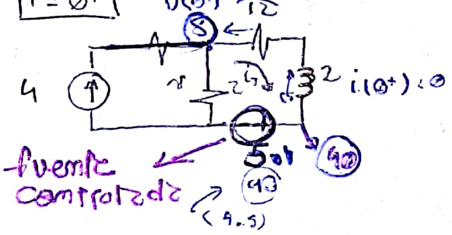


$\boxed{T = 0^-}$

$\Rightarrow i_L(0^-) = 0 = i(0^+)$

$v_{R}(0^-) = 0 = v_R(0^+)$

$\boxed{T = 0^+}$

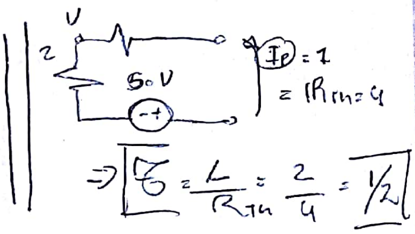


fuente controlada (4.5)

$v(0^+) = 8$

$v_L(0^+) = 40 + 8 = -32$

$i_c(0^+) = 0$



$I_p = 1$

$= R_{th} = 4$

$\Rightarrow \boxed{\tau = \frac{L}{R_{th}} = \frac{2}{4} = 1/2}$

Tenemos para hacer 1 una malla o 2 nodos. → Porque la 1er malla ya sé cuanto vale, xq tengo la fuente de corriente.

$-5 \cdot V = i(12+2) + 2i' - 4 \cdot u(t) \cdot 2$ (→ fuente de corriente), y además sé q: $V = 2(4u(t) - i)$

$\hookrightarrow \boxed{i = \frac{V - 8u(t)}{-2}}$ *

*

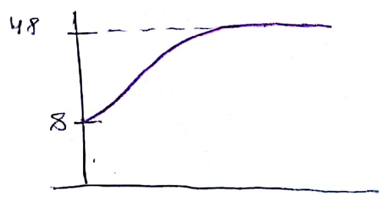
$\Rightarrow -5V = \left(-\frac{V}{2} + 4u(t)\right)(14) + 2 \cdot \left(-\frac{V'}{2} + 4\delta(t)\right) - 8u(t)$

$0 = -V' + 2V + 56u(t) - 8u(t) + 8\delta(t)$

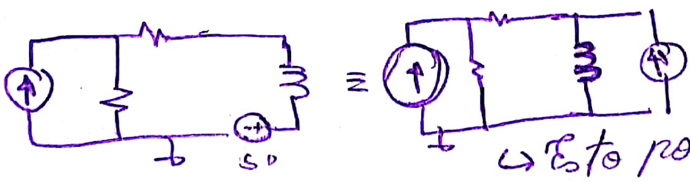
$\Rightarrow V' + 2V + 48u(t) + 8\delta(t)$

$\boxed{V' + 2V = 48u(t) + 8\delta(t)}$

$v(t) = (48 - 40e^{-2t})u(t)$

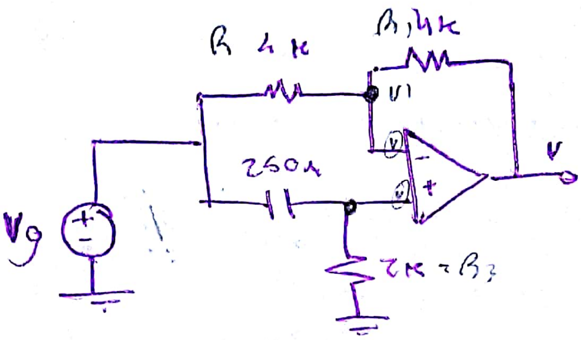


Nota:



↳ Esto por nodos sale mucho más fácil.

B 28 $V(t)$? , $t>0$ / $V_g(t) = 2\mu(t)$ y $V_c(0) = 0$



nodo V_1
$$\begin{cases} 0 = \dfrac{V_1 - V}{R} + \dfrac{V_1 - V_g}{R} \\ 0 = \dfrac{V_1}{R_3} + C(V_1' - V_g') \end{cases}$$
nodo V_{A2}

$$\begin{cases} \cancel{0 = \frac{2V_1}{R_3} + C(V_1' - V_g')} \\ 0 = 2V_1 - V - V_g \\ 0 = \dfrac{V_1}{R_3} + CV_1' - CV_g' \end{cases}$$

$\frac{V_g}{s}$ 2.

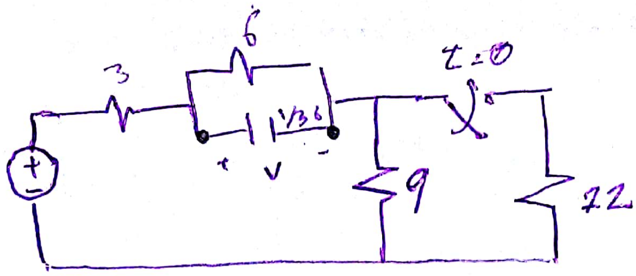
Laplace
$$\begin{cases} 0 = 2V_1 - V - \frac{2}{s} \\ 0 = \frac{V_1}{R_3} + sC\left(V_1 - \frac{2}{s}\right) \end{cases}$$

Reemplazando

$$\rightarrow V = \frac{4}{s+2} - \frac{2}{s}$$

$$\Rightarrow V(t) = 4e^{-2t} - 2\mu(t)$$

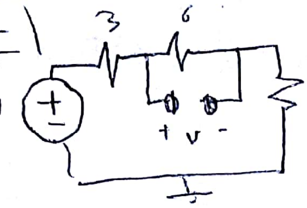
B27



$V(t)?,\ t>0$

T=0
Reg Permanente

$\boxed{t=0^-}$

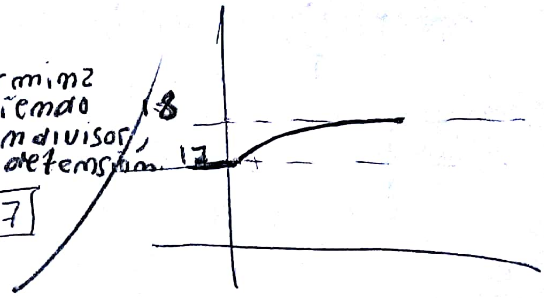


$i = \frac{51}{3+6+9} = \frac{51}{18}$

termina siendo un divisor de tension

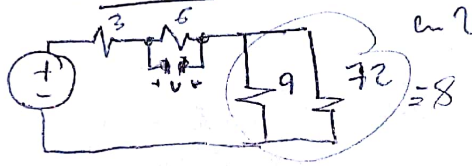
$\boxed{V = 6 \cdot i = \frac{6 \cdot 51}{18} = 17}$

$\boxed{V(0^-) = 17}$



$V(t=0^+) = 17$

$\Rightarrow \boxed{t>0}?$



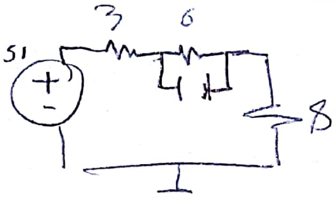
$=8$

$V(t \to \infty)$

$i(\infty) = \frac{51}{3+6+8} = 3$

$\Rightarrow \boxed{V(t\to\infty) = 6 \cdot 3 = 18}$

$\Rightarrow$



$V(0) = 17 = 18 + A \Rightarrow$

$A = -1$

$\boxed{V(t) = 18 + (-1\, e^{-t/\tau})}$

ó $\boxed{V(t) = 18 - e^{-\frac{102\,t}{11}}}$

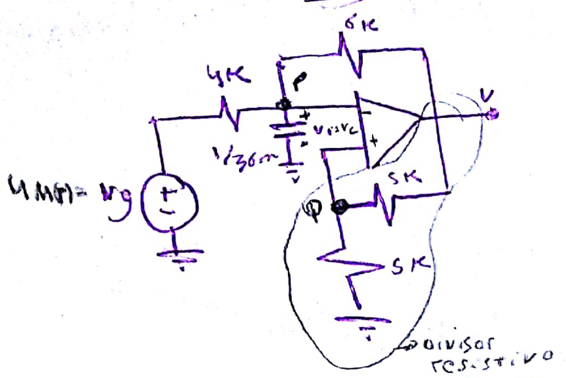
$\cancel{\quad} \frac{\quad}{30} = 4,8$

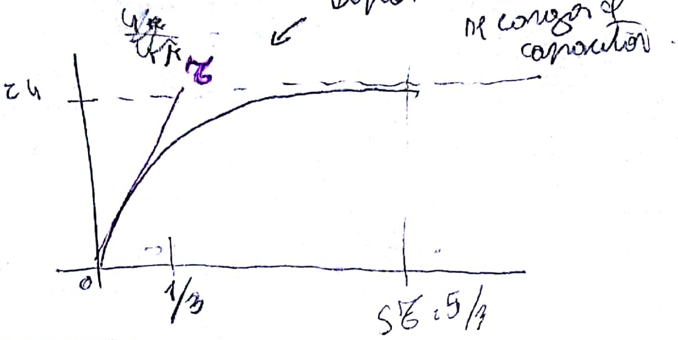
$R_{eq} = \frac{66}{17}$

$\boxed{\tau = \frac{66}{17} \cdot \frac{1}{36} = \frac{11}{102}}$

Si quiero plantear la ec dif, tengo q' plantear 2 nodos.

$\boxed{B29}$ $v(T)$; $T>0$ si $V_c(0)=0$ y $v_g = 4u(T)$





$\Rightarrow \boxed{v_\varphi = \frac{V}{2}}$

$\Rightarrow \boxed{v_p = \frac{V}{2} = v_{capacitor}}$

$\boxed{T = 0^-}$

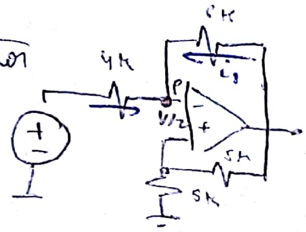
$v_c(0^-) = 0 = v_c(0^+)$

$\Rightarrow v(0^+) = 0$

$\boxed{T \to +\infty}$

↳ vuela el capacitor

RC, si tacho el (K) ⇒ tacho los (m)



$i_? = (v - \frac{v}{2})\frac{1}{6K} = \frac{v}{12K}$

$(4 - \frac{v}{2})\frac{1}{4K} = -\frac{v}{12K}$

$12 - \frac{3}{2}v = -v \Rightarrow 12 = \frac{v}{2}$

$\Rightarrow \boxed{v(t \to \infty) = 24}$

P) $\frac{4u(T)}{4K} + \frac{v(T)}{6} = \overbrace{v_p}^{v(T)/2}\left(\frac{1}{4}+\frac{1}{6}\right) + C\overbrace{v_p'}^{v'(T)/2}$

("el medio v_q ya lo usamos es lo q' medio $v_q = \frac{V}{2}$")

$u(T) = \frac{v(T)}{24} + \frac{1}{72}v'(T) \Rightarrow \boxed{v'(T) + 3v(T) = 72u(T)}$ $\boxed{\tau = 1/3}$

Cond iniciales $v(0^+) = 0$

$\Rightarrow v'(T) + 3v(T) = 72$

↳ $v(T) = v_h(T) + v_p(T)$

$v_h = Ae^{-3T}$

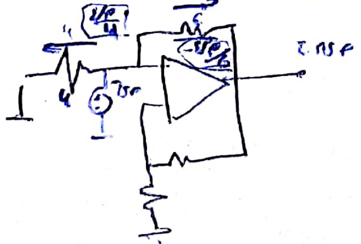
$v_p = K \Rightarrow \boxed{K = 24}$

$\Rightarrow v(T) = Ae^{-3T} + 24$

$v(0) = A + 24 = 0 \Rightarrow \boxed{A = -24}$

$\Rightarrow \boxed{v(T) = 24(1 - e^{-3T})}$

Si quiero sacar τ sin hacer dif?

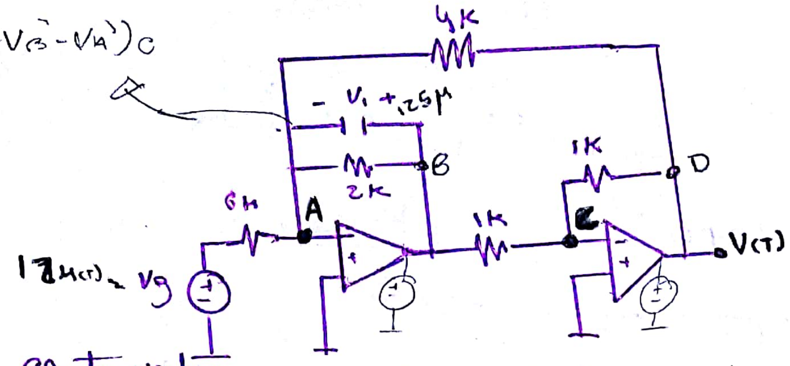


$R_{eq} = \frac{v_e}{\frac{v_e}{4} - \frac{v_e}{6}} = R_{eq} = 4 // -6 = 12$

$\boxed{\tau = R_C = 12 \cdot \frac{1}{36} = \frac{1}{3}}$

B30 $V(t)$, $t>0$ si $V_1(0)=0$ y $V_g = 12\mu(t)$

$(V_B - V_A)_C$

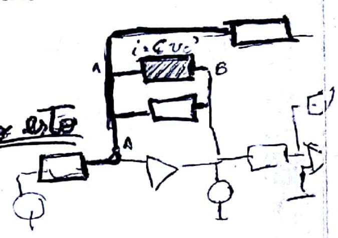


$\forall_{C_x}(t<0) = 0$

$V(t=0^-) = V(t=0^+) = 0$

en $t=0$ todas las I se van por el capacitor.

si veo esto



Planteo Nodos

A) $\frac{12\mu(t)}{6K} + \frac{V_B}{2K} + \frac{V_D}{4K} + V_B \cdot 125\mu = \cancel{V_A\left(\frac{1}{6K} + \frac{1}{2K} + \frac{1}{4K}\right) + V_A\, 125\mu}$ - ◯

ΣI_E de los elementos — ΣI_E (nodos compuestos)

Estoy en guerra

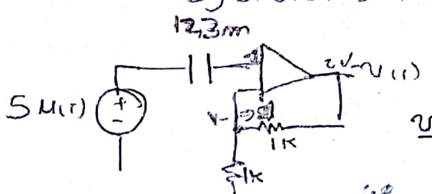
C) $\frac{V_D}{1K} + \frac{V_B}{1K} = \cancel{V_C}\left(\frac{1}{1K} + \frac{1}{1K}\right)$ y $V_C = 0$ son siempre cero   y $V_A = 0$ son siempre cero.

$\hookrightarrow \boxed{V_D = -V_B}$ inversor ganancia 1

$\boxed{V_D = V_{DH} + V_{DP}}$ $\to V_{DP} = 8/3$

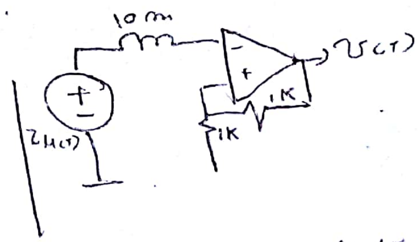
$\to -\frac{8}{3}e^{-t}$

Ejercicios para Bondi.

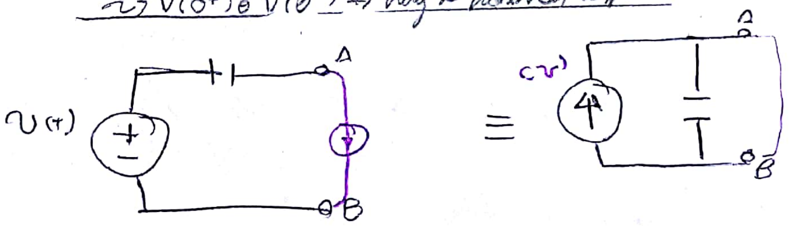


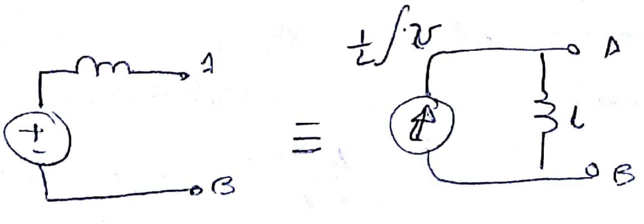
$v(0)=2$ $0 \geq t 0$

$\Rightarrow V_C(t) = cte$ si $i=0$



$\rightsquigarrow V(0^+)$ ó $V(0^-) \Rightarrow$ hay 2 posibles respuestas, serían 2 circuitos distintos





Circuitos de 2do orden.

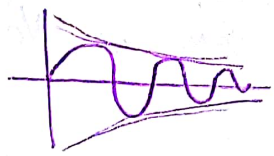
$D = v'' + Av' + Bv$

$r^2 + Ar + B = 0$

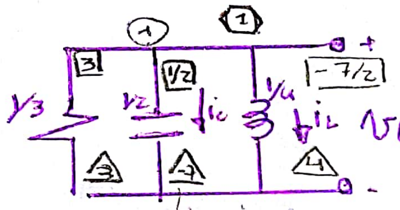
esto podría dar 3 soluciones distintas

raíces
- → Reales (≠) Sobreamortiguado $Ae^{r_1 t} + Be^{r_2 t}$ 
- → Reales (=) Crítico $(At+B)e^{+r_1 t}$ 
- → Complejos conjugados → Subamortiguado.

$[A \operatorname{sen}(|\operatorname{Im}(r_1)| t) + B \cos(|\operatorname{Im}(r_1)| t)] e^{Re(r_1 t)}$



$\boxed{B_{31}}$



↳ Kirchoff

$v(0) = 1 \cdot v(0^+) = v(0^-)$

$v'(0) = 1 = v(0^+) = v(0^-)$

$i_c = v' \cdot c = 1 \cdot \frac{1}{2} = 1/2$

$\boxed{v_L = L\, i'}$

$i_L' = \frac{v_L}{L} = \frac{1}{1/4} = 4$

$v^* = L\, i'$

v' = notación

$\Delta (i)$ = notación^{-1}

- calculamos la ec de v.

nodos

$0 = v\frac{1}{R} + Cv' + \frac{1}{L}\int v$

$v = iR$

$v' = i_c' R$

$1 = i_c' \cdot 1/3$

$\boxed{3 = i_c'}$

$\sqrt{6^2 - 4 \cdot 8} = 36 - 32$

$0 = Cv'' + \frac{1}{R}v' + \frac{1}{L}v$

$(*)\ \boxed{0 = v'' + \frac{1}{RL}v' + \frac{1}{LC}v} = v'' + 6v' + 8v$ Planteo pol característico

$\left[\frac{V}{s^2}\right] \quad \left[\frac{1}{s}\frac{V}{s}\right] \quad \left[\frac{1}{s^2}V\right]$

$\left.\begin{matrix} -2 \\ -4 \end{matrix}\right\}$ Raíces reales y distintos, caso sobreamortiguado

$\Rightarrow Ae^{-2t} + Be^{-4t} = v(t)$

$v'(t) = -2Ae^{-2t} - 4Be^{-4t}$

Sumo: $3 = -2B$ → $\boxed{B = -3/2}$

$\Rightarrow \boxed{A = 5/2}$

$\begin{cases} v(0) = 1 = A + B \Rightarrow 2 = 2A + 2B \\ v'(0) = 1 = -2A - 4B \quad 1 = -2A + 4B \end{cases}$

$\boxed{v(t) = \left[\frac{5}{2}e^{-2t} - \frac{3}{2}e^{-4t}\right] u(t)}$

ahora si quiero ec dif por $i(t)$

$i_L = \frac{1}{L}\int v \qquad / v = L\, i'$

$v'' = L\, i_L''$

reemplazo (*)

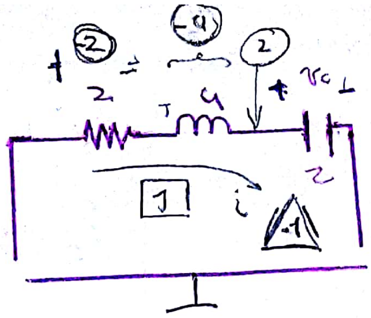
(*) ⇒ $0 = i_L'' + i_L' \frac{1}{RL} + \frac{i_L}{LC}$

reemplazo

$\boxed{0 = i'' + 6i' + 8i_L}$

vemos q' tiene los mismos coeficientes, la misma ecuación característica, "El ADN del circuito".

B32



$v(0) = 2 = v(0^+) = v(0^-)$

$i(0) = 1 = i(0^+) = i(0^-)$

$\square(0^+)$ para Laplace

hacemos mallas: $0 = iR + \overbrace{Li'}^{V_L} + \overbrace{\frac{1}{C}\int i\,dt}^{V_C}$

$i_C = C V_C'$

$V_L = L i_L'$

$0 = i'R + L i'' + \frac{1}{C} i$

$\boxed{0 = i'' + i'\frac{R}{L} + i\frac{1}{LC}} = 0 = i'' + \frac{1}{2}i' + \frac{1}{8}i$

$\hookrightarrow -\frac{1}{4} + \frac{1}{4}j = \lambda_1$

$\hookrightarrow -\frac{1}{4} - \frac{1}{4}j = \lambda_2$

$i(T) = \left[A\,\mathrm{Sen}\left(\frac{1}{4}T\right) + B\cos\left(\frac{1}{4}T\right)\right]e^{-\frac{1}{4}T}$

$i'(T) = \left[A\cos\left(\frac{1}{4}T\right)\frac{1}{4} + B\,\mathrm{Sen}\left(\frac{1}{4}T\right)\frac{1}{4}\right]e^{-\frac{1}{4}t} + [\quad]\frac{1}{4}e^{-\frac{1}{4}T}$

$\begin{cases} i(0) = 1 = B \\ i'(0) = -1 = \frac{1}{4}A + B\left(-\frac{1}{4}\right) \end{cases} \Rightarrow$

$-\frac{3}{4} = \frac{1}{4}A \to \boxed{A = -3}$

$\Rightarrow \quad i(T) = \left[-3\,\mathrm{sen}\left(\frac{1}{4}T\right) + \cos\left(\frac{1}{4}T\right)\right]e^{-T/4}\,\mu(t)$

$\underbrace{\sqrt{3^2+1^2}}_{\simeq 3{,}16}\cos\left(\frac{1}{4}T + (1{,}24)\right)e^{-T/4}\,\mu T$

$\mathcal{L}$ Arctg $\frac{A}{B}$

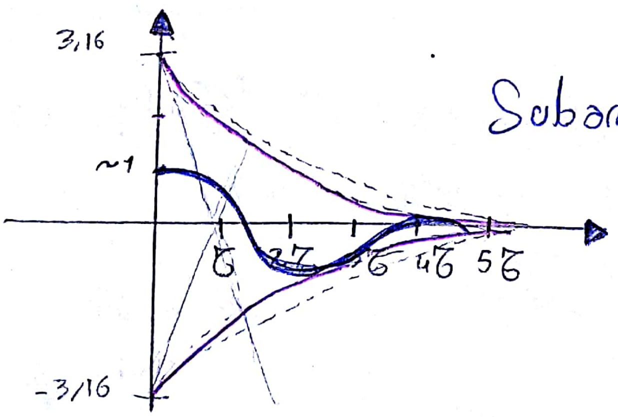
$\omega = \frac{1}{4} \Rightarrow$

$f = \frac{1}{8\pi} \simeq 0{,}039$

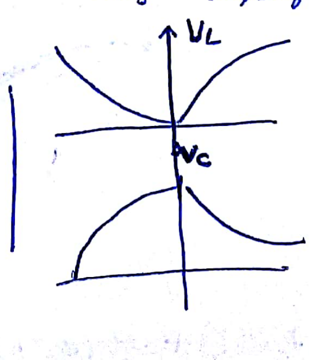
$T = \frac{1}{f} \simeq 25{,}3$

$\tau = 4$

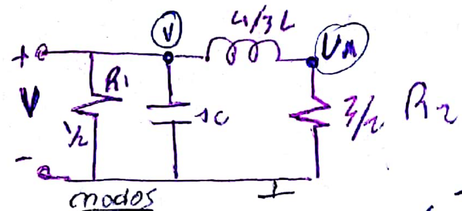
Subamortiguado.



carg   abscarga



$\boxed{B_{33}}$ $V(0)=1$, $V'(0)=0$, $V(t)$ para $t>0$



$v_L = L\, i_L'$

$i_C = C\, v_C'$

$$\begin{cases} V)\quad 0 = \dfrac{V}{R_1} + \underbrace{V'C}_{i_C} + \overbrace{\left(\dfrac{1}{L}\int V\,dt - \dfrac{1}{L}\int V_A\,dt\right)}^{i_L} \\ A)\quad 0 = \dfrac{V_A}{R_2} + \dfrac{1}{L}\int V_A\,dt - \dfrac{1}{L}\int V\,dt \end{cases}$$

menos la del nodo adyacente

derivo ambas

$A')\quad 0 = \dfrac{V_A'}{R_2} + \dfrac{V_A}{L} - \dfrac{V}{L}$ | $V')\quad 0 = \dfrac{V'}{R_1} + V''C + \dfrac{V}{L} - \dfrac{V_A}{L}$

Sumo (V) (A)

Reemplazo

$0 = \dfrac{V}{R_1} + V'C + \dfrac{V_A}{R_2} \Rightarrow -V_A = V\cdot\dfrac{R_2}{R_1} + V'\cdot CR_2$

$\Rightarrow V') \Rightarrow 0 = \dfrac{V'}{R_1} + V''C + \dfrac{V}{L} + V\dfrac{R_2}{R_1}\dfrac{1}{L} + V'\dfrac{C}{L}R_2$

$\Rightarrow 0 = V'' + V'\left(\dfrac{1}{R_1} + \dfrac{C}{L}R_2\right) + V\left(\dfrac{1}{L}\dfrac{R_2}{R_1}\dfrac{1}{L}\right)$

$\Rightarrow \boxed{V'' + \dfrac{25}{8}V' + 3V = 0}$

$\hookrightarrow \begin{cases} -\dfrac{25}{16} + 0{,}747j \\ -\dfrac{25}{16} - 0{,}747j \end{cases}$ Sería ~~sobre~~ Sub-amortiguada

$V(t) = \left[(A\,\mathrm{Sen}(0{,}75t) + B\cos(0{,}75t))\right]e^{-\frac{25}{16}} + u(t)$

$V(0) = 1 = B$

$V'(0) = 0 = 0{,}75A - \dfrac{25}{16} \Rightarrow \boxed{A = 2{,}88}$

$\tau = \dfrac{16}{25} \approx 0{,}65$

$5\tau \approx 3{,}2$

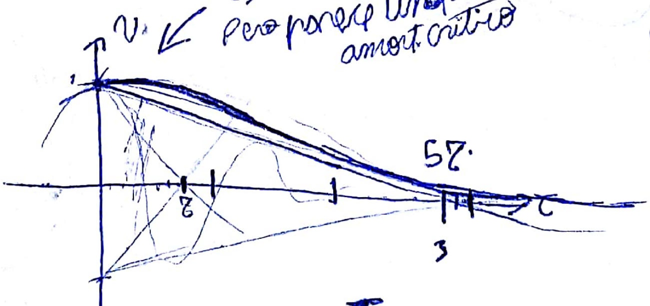
$\omega = 0{,}75$

$= 2\pi f = \dfrac{2\pi}{T}$

$T = \dfrac{2\pi}{0{,}75} = \underline{\underline{8{,}37}}$

$\Rightarrow$ Graficar

Es sub-amortiguada pero parece una amort. crítica

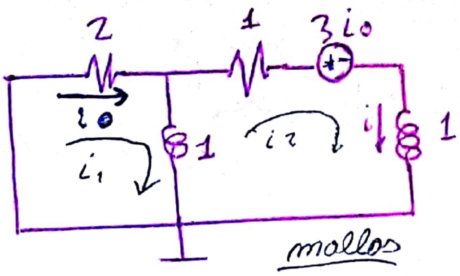


$v(t) = \left[2{,}88\,\mathrm{Sen}(0{,}75t) + \cos(0{,}75t)\right]e^{-\frac{t}{0{,}65}} \cdot u(t)$

$V = V_C + V_A$

$V_A = V - V_L = V - L i_L'$

$I_{(t)}$?



$i = \frac{1}{L}\int v\,dt$

dongo la otra malla

$i_1 = i_o$
$i_2 = i$

$$\begin{cases} 1)\ \emptyset = i_o 2 + 1 i_o' - 1 i' \\ 2)\ 3 i_o = i1 + 2i' - 1 i_o' \end{cases}$$

Suma de inductores.

$\mathcal{L}\{f''\} = s^2 f(s) - s f(0^-) - f'(0)$.

$\mathrm{sen}(\omega t) \sqsupset \frac{\omega}{(s^2+\omega^2)}$

$\cos(\omega t) \sqsupset \frac{s}{s^2+\omega^2}$

ó $e^{-at}\,\mathrm{sen}(\omega t) \sqsupset \frac{\omega}{(s+a)^2+\omega^2}$

$(1)+(2) \Rightarrow 3 i_o = i_o.2 + i + i'$

$i_o = i + i'$ | Remplazo en (2)

$\Rightarrow (3)\quad 3i + 3i' = 1 + 2i' - i - i''$

$2i + 2i' + i'' = \emptyset$ $\quad \begin{matrix} -1+i \\ -1-i \end{matrix}$

Esto me dió subamort. iguales / Pero no hay capacitores para intercambio de energía.

En este caso la fuente controlada actua como capacitor

$\sqsupset\ 2I + 2\, S I(s) - 2\underbrace{i(0^-)}_{1} + s^2 I(s) - s\underbrace{i(0^-)}_{1} - \underbrace{i'(0)}_{1} = 0$

$2I(s) + 2 s I(s) - 2 + s^2 I(s) - s - 1 = 0$

$I(s)\underbrace{[1s^2 + 2s + 2]}_{\text{notemos son los mismos coeficientes}} = 3 + s.$

$\Rightarrow \boxed{I(s) = \frac{3+s}{s^2+2s+2}}$

Completar cuadrados

$X^2 + BX + C$

$(X + \frac{B}{2})^2 - (\frac{B}{2})^2 + C$

$= \frac{3+s}{(s+1)^2 - 1^2 + 2}$ $\quad 1+1+1$

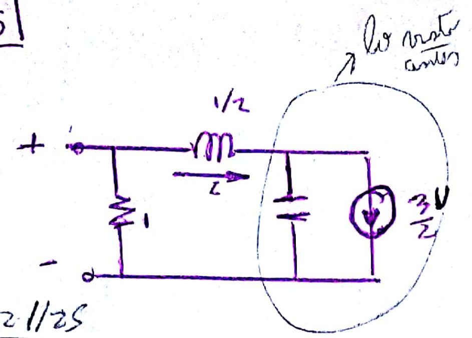
$$I(s) = \frac{3}{(s+1)^2+1} + \frac{s}{(s+1)^2+1} = \frac{2}{(s+1)^2+1} + \frac{s+1}{(s+1)^2+1}$$

$$I(s) \sqsubset \boxed{2\,\mathrm{sen}(\sqrt{1})e^{-1t} + \cos(\sqrt{1})e^{-t})u(t) = i(t)}$$

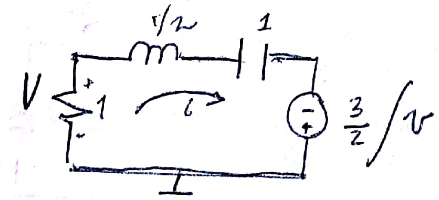
B 35

$i(t)$?

$i(0) = 1$
$i'(0) = 2$



$\equiv$



m2 //25

- $\frac{3}{2}\int v\,dt = i\,1 + i'\,\frac{1}{2} + \frac{1}{1}\int i\,dt$

- $v = -iR = -i \cdot 1$

Reemplazo $-\frac{3}{2}\int i = i \cdot 1 + i'\frac{1}{2} + \int i \overset{\text{derivo}}{\Longrightarrow} -\frac{3}{2} i = i' + i''\frac{1}{2} + i$

$\Longrightarrow 0 = i'' + 2i' + 5i = 0 \to \begin{cases} -1+2j \\ -1-2j \end{cases}$ sub_amort.

Laplace:

$\Longrightarrow s^2 I(s) - s\overset{1}{\overbrace{i(0^-)}} - \overset{2}{\overbrace{i'(0^-)}} + 2sI(s) - 2\overset{1}{\overbrace{i(0^-)}} + 5I(s) = 0$

$s^2 I(s) - s - 2 + 2sI(s) - 2 + 5I(s) = 0$

$I(s)\cdot[s^2 + 2s + 5] = 4 + s$

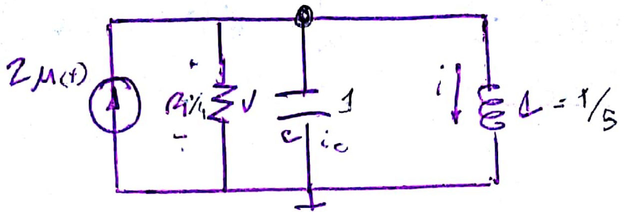
$I(s) = \frac{4+s}{(s+1)^2+4} = \frac{3+(s+1)}{(s+1)^2+4}$

$I = \frac{3}{(s+1)^2+4} + \frac{s+1}{(s+1)^2+4} = I = \frac{3}{2}\frac{2}{(s+1)^2+4} + \frac{s+1}{(s+1)^2+4}$

$\Longrightarrow i(t) = \left[\frac{3}{2}\operatorname{sen}(2t) + \cos(2t)\right] e^{-t}\mu(t)$

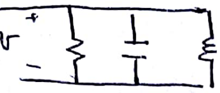
|B 36|

$v(0)=0$
$i(0)=0$



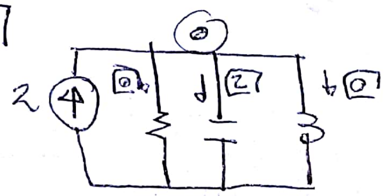
con Laplace se hace en (0^-) → vamos a ver cual nos conviene hacer:
con ec. dif con (0^+)

$\Rightarrow \boxed{t=0^-}$



como no hay mode
⇒ todo vale cero $V(0^-), V'(0^-), i(0^-)=0$
− no hay energía
$i'(0^+)=0$

$\boxed{t=0^+}$



$i_L(0^+) = 2 = C v'_{c(t)}$

$\Rightarrow v'(0^+)=2$

Entonces necesitamos dos condiciones para ec. dif.

• Vamos con Laplace:
⇒ modos

$$2\mu(t) = \frac{v(t)}{R} + \overbrace{C v'_{(t)}}^{i_c} + \overbrace{\frac{1}{L}\int_{-\infty}^{t} v(\tau)\,d\tau}^{i_L}$$

deriva ⇒ $2\delta(t) = \frac{1}{R} v'_{(t)} + C v''_{(t)} + \frac{1}{L} v(t)$

$$\Rightarrow \boxed{v'' + \frac{1}{RC} v' + \frac{1}{LC} v(t) = \frac{2}{C}\delta(t)}$$ → igual al 31 pero no homogénea.

$$\sqsupset \quad \frac{2}{C} = s^2 V(s) - s\underbrace{v(0^-)}_{0} - \underbrace{v'(0^-)}_{=0} + \frac{s V(s) - \overset{0^-}{v(0^-)}}{RC} + \frac{V(s)}{LC}$$

⇒ Reemplazo ctes.

$$2 = s^2 V(s) + 4 s V(s) + 5 V(s)$$

$$2 = V(s).(s^2+4s+5) \rightarrow \lambda^2 + 4\lambda + 5 = 0 \begin{cases} -2+j \\ -2-j \end{cases}$$

El circuito deforma sub amortiguada.

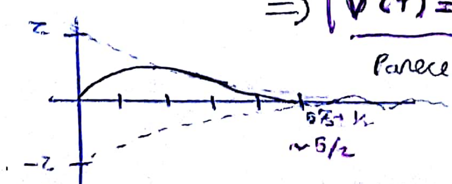
$$V(s) = \frac{2}{s^2+4s+5} = \frac{2}{(s+2)^2+1} = 2 \cdot \frac{1}{(s+2)^2+1}$$

$$= 2\,\frac{1}{(s+2)^2+1} \sqsupset 2\cdot \operatorname{sen}(1\cdot t)\, e^{-2t}\, u(t)$$

$$\Rightarrow \boxed{v(t) = 2e^{-2t}\cdot \operatorname{sen}(t)\, u(t)}, \ \tau = \frac{1}{2}$$

$\cos at \sqsupset \frac{s}{s^2+a^2}$

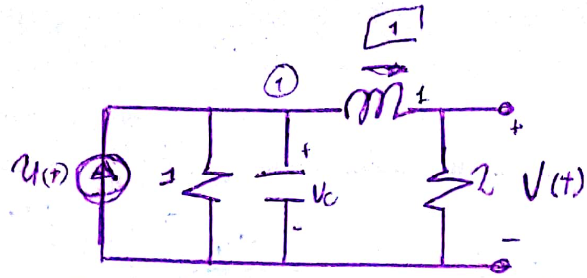
$\operatorname{sen} bt \sqsupset \frac{b}{s^2+b^2}$



Parece un crítico, pero no es así.

$\omega = \frac{2\pi}{T} \Rightarrow T = \frac{2\pi}{\omega}$ 1

$\boxed{B_{37}}$



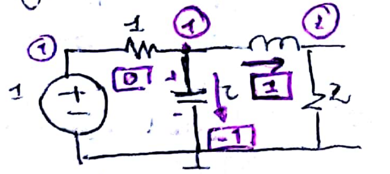
$V_c(0^-) = 1$

$, i_2(0^-)$

$\underline{V_1(t)?, t>0}$

Hago por ec dif:

$\boxed{t = 0^+}$



$V_L = i'_L \cdot L$

$\boxed{-1 = i'_L(0)}$

$\boxed{i_L(t \to \infty) = 1/3}$

⇒ 2 mallas

$i_1) \quad 1 = i_1 + \frac{1}{C}\int i_1\,dt - \frac{1}{C}\int i_2\,dt$

$i_2) \quad 0 = i_2 \cdot 2 + \frac{1}{C}\int i_2 - \frac{1}{C}\int i_1\,dt$

$i_L = i_2$

$$\begin{cases} i_1 = i''_2\, LC + R_2 C\, i'_2 + i_2 \\ 1 = i''_2 \cdot 2 + i'_2\, 5 + i_2\, 3 \end{cases} \Rightarrow \frac{1}{2} = i''_2 + i'_2\,\frac{5}{2} + i_2 \cdot \frac{3}{2} \quad / \; i = i_H + i_P$$

$\boxed{\lambda_1 = -1} \quad \boxed{\lambda_2 = -3/2}$

$$\Rightarrow \begin{cases} i_H = A e^{-t} + B e^{-\frac{3}{2}t} \\ i_P = 1/3 \end{cases}$$

$$\left.\begin{aligned} i(0) &= \frac{1}{3} + A + B = 1 \\ i'(0) &= -A - \frac{3}{2}B = -1 \end{aligned}\right\} \begin{aligned} A &= 0 \\ B &= 2/3 \end{aligned}$$

⇒ Es de 2do orden pero parece de 1er orden por las cond. iniciales

$$\Rightarrow \boxed{i(t) = \frac{1}{3} + \frac{2}{3} e^{-\frac{3t}{2}}}$$

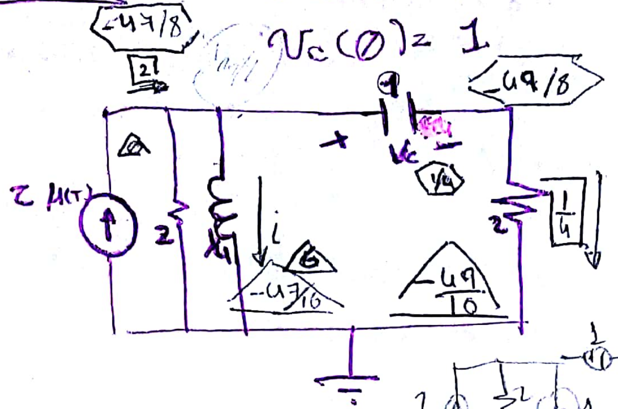
B38 $i(0) = 1$

$V_c(0) = 1$

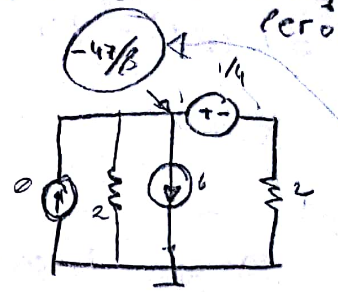
2.4 - septiembre

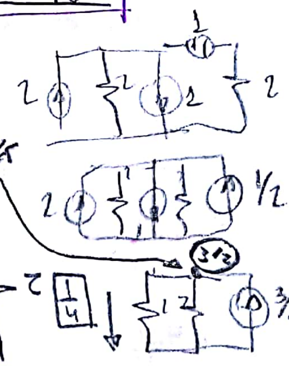
determine $i(t)$ i cond # inicial

$v' = \frac{1}{C}$



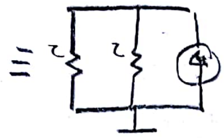
hago lo mismo q' antes pero todo derivado





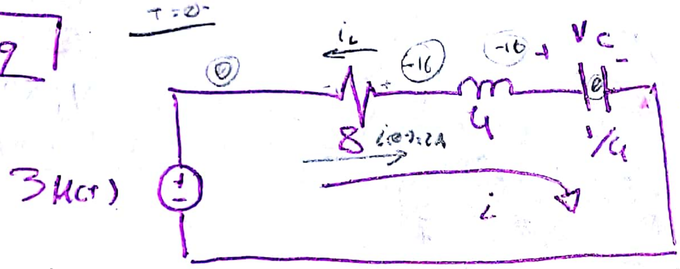
En t = 0+

Pregunta



$-6 + 1/8 = \frac{-47}{8}$

B39



$i' = \frac{-v_L}{L} = -4$

cond iniciales.

$i(0) = 2A$

$Vc(0) = 0$

$i(t)$ y $Vc(t)$ / $t \geq 0$

$i_c = C v_c' \quad || \quad v_L = L i_L'$

mallas:

derivo

$$(*)\ 3\mu(t) = i.8. + 4 i' + \frac{1}{1/4}\int i\, dt \Rightarrow 3\delta(t) = 8i' + 4i'' + 4i$$

$$\Rightarrow \boxed{i'' + 2i' + 1i = \frac{3}{4}\delta(t)} \quad || \quad \boxed{i = v'c} \ \text{* reemplazo}$$

resolvemos esto

• La ecuación característica semejante

$$3\mu(t) = 8.\tfrac{1}{4}v' + 4v''.\tfrac{1}{4} + 4.\tfrac{1}{4}.v_c$$

$$\boxed{1v'' + 2v' + 1v_c = 3\mu(t)}$$

$$\sqsupset\ \frac{3}{4} = s^2 I(s) - s\,i(0^-) - i'(0^-) + \ldots$$

$$\ldots + 2sI_{(s)} - 2i(0^-) + I(s).$$

$$\frac{3}{4} = I(s^2 + 2s + 1) - 2s\ \cancel{+1-4}$$

$$\boxed{I = \left(\frac{3}{4} + 2s\right).\frac{1}{(s^2+2s+1)}}$$

completo cuadrados

$\frac{3}{4}.t\,e^{-t}$ $\quad 2(s+1-1)$

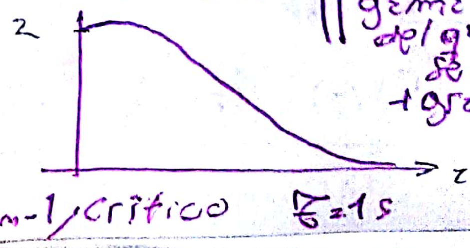
$$\Rightarrow I = \frac{3/4}{(s+1)^2 + 1 - 1^2} + \frac{2s}{(s+1)^2 + 1 - 1^2} = \bigcirc + 2\left[\frac{(s+1)}{(s+1)^2} - \frac{1}{(s+1)^2}\right]$$

$e^{-t}\mu(t)$ $\quad e^{-t}.t$

$$\sqsubset\ \frac{3}{4}e^{-1.t}.t + 2e^{-t}u(t) - 2e^{-t}t$$

saco

$$= e^{-1t}\left(\frac{-5}{4}t + 2\right)u(t)$$



El tau gana el de q' sea + grande

está Bien / las Raíces son -1 y -1 / crítico $\quad \tau = 1s$

$$\frac{3}{4}\int_{0^-}^{0^+}\delta(t) = \int_{0^-}^{0^+} i'' + \int_{0^-}^{0^+} 2i' + \int_{0^-}^{0^+} i$$

, el delta lo puedo integrar de $-\infty$ a $+\infty$ y es redundante mas q' solo cambia en un instante ⇒ integro a 0^- a 0^+.

lo calculamos

$$\frac{3}{4} = i(0^+) - i(0^-) + 0 + 0 \quad \boxed{-4}$$

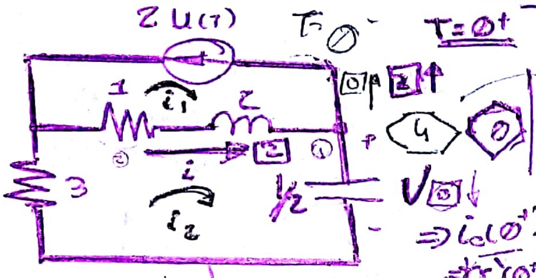
$$= i'(0^+) - i'(0^-) = \frac{3}{4} = i'(0^+) + 4$$

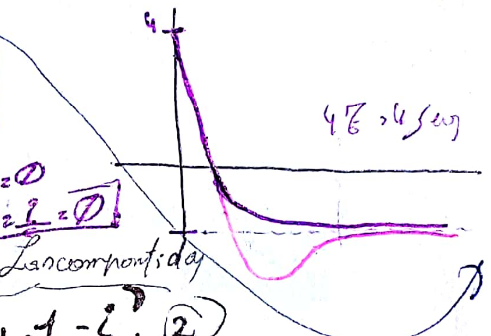
$$\frac{3}{4} - 4 = \boxed{i'(0^+) = -13/4}$$

→ Esto quiere decir q' mi grafico es mas asi:

ademas sirve para chequear cond iniciales.

B4.





$i = C v'$

$v_L = L\, i_L'$

Datos:

$V(0) = 4V$

$i(0) = 2A$

$T = 0^-$ $\quad$ $T = 0^+$

$\Rightarrow i_C(0^+) = 0$

$\Rightarrow v'(0^+) = \frac{i}{C} = 0$

mallas

$$\begin{cases} M_1:\ 0 = i_2(3+1) + i_2' \frac{2}{2} + \frac{1/C}{2}\int i_2 - i_1 \cdot 1 - i_1' \frac{2}{2} \\ M_2:\ 0 = i_1 = -2\mu(t) \end{cases}$$

$$\Rightarrow 0 = 4 i_2 + 2 i_2' + 2\int i_2 + 2\mu(t) + 4\delta(t)$$

antes de derivar pienso q' quiero tension.

$\boxed{v = 2\int i_2}$ reemplazo $\Rightarrow \boxed{\frac{1}{2}v' = i_2}$ Reemplazo. $\boxed{\frac{1}{2}v'' = i_2'}$

$$-2\mu(t) - 4\delta(t) = 4\tfrac{1}{2}v' + 2\tfrac{1}{2}v'' + v$$

$$-2\mu(t) - 4\delta(t) = v'' + 2v' + v \quad \text{Ec dif}$$

critico Raices $\begin{cases}-1\\-1\end{cases}$

NOTA: que tiene el mismo ADN que la anterior pero son distintos circuitos

$$\Rightarrow v_h = (At+B)e^{-t}$$

Para iza el $\delta(t)$ no molesta

$$\Rightarrow v_p = K \Rightarrow -2 = K'' + 2K' + K \Rightarrow \boxed{K = -2}$$

$$\boxed{v(t) = (At+B)e^{-t} + K}$$

a cond Iniciales: $v(0^+) = 4 = B - 2 \Rightarrow \boxed{B = 6}$

$$v'(t) = Ae^{-t} + (At+B)(-e^{-t})$$

$$v'(0) = 0 = A - B \Rightarrow A = B = 6$$

$$\boxed{v(t) = (6t+6)e^{-t} - 2}$$

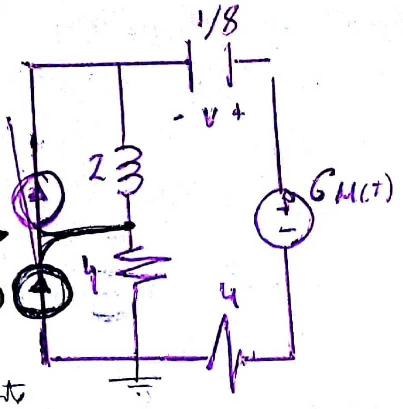
verifico cond iniciales

$$\int -2\mu(t) - 4\int\delta(t) = \int v'' + \int 2v' + \int v$$

$$0 - 4 = v(0^+) - v(0^-) + 0 + 0$$

$$= \underset{0}{\underbrace{}} \Rightarrow \boxed{v(0^-) = 4}$$

$\boxed{B_{42}}$ $\boxed{CIN}$ $v(t>0)$?

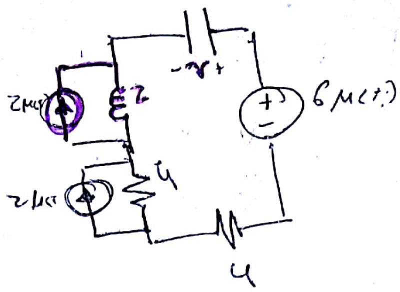


Vamos a hacer locura

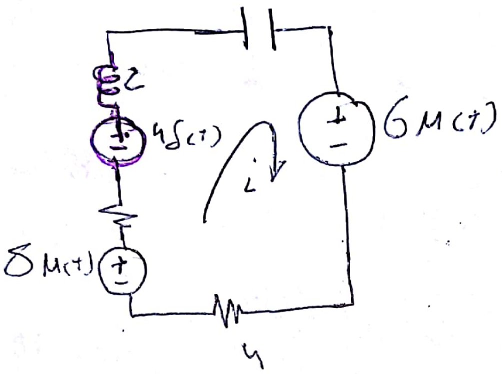
me invento una fuente.

Planteo mallas.

$v_L = L\, i'$



$\Rightarrow$ Llevo todo a una malla.



$$8\mu(t) + 4\delta(t) - 6\mu(t) = i(4+4) + 2i' + 8\int i$$

$$-v = 8\int i \Rightarrow \begin{cases} i = \frac{1}{8} v' \\ i' = -\frac{1}{8} v'' \end{cases}$$

$$2\mu(t) + 4\delta(t) = -\frac{8}{8} v' - \frac{2}{8} v'' - v$$

$$-8\mu(t) - 16\delta(t) = v'' + 4v' + 4v \sqsupset -\frac{8}{s} - 16 = V s^2 - s\,\cancel{v(0^-)} - \cancel{v'(0^-)} + 4sV(s) - 4\cancel{v(0^-)} + 4V(s)$$

↳ $-2, -2$ / práctico

$$-\frac{8}{s} - 16 = V(s^2 + 4s + 4) \Rightarrow \frac{-8 - 16s}{s(s^2+4s+4)} = V = \frac{-8-16s}{s(s+2)^2}$$

$-16te^{-2t}$

$$= \frac{-8}{s(s+2)^2} \quad \frac{-16}{(s+2)^2} = -\frac{2}{s} + \frac{8}{(s+2)^2} + \frac{2s}{(s+2)^2}$$

$$\frac{-8}{s(s+2)^2} = \frac{A}{s} + \frac{Bs+C}{(s+2)^2}$$

$$= \frac{-2(s+2)^2 + Bs + Cs^2}{s(s+2)^2}$$

$$-8 = \overset{A}{-2}(s+2)^2 + Bs + Cs^2$$

$\boxed{s \neq -2}$ $s = 1$

$-8 = -B2 + C4$

$-8 = -18 + B + C$

$\boxed{10 = B + C}$

$\boxed{C = 2}$

$\boxed{B = 8}$

$$\sqsupset -2\mu(t) + 8te^{-2t} - 4te^{-2t} + 2e^{-2t} - 16te^{-2t}$$

$$\Rightarrow v(t) = \{[t(-16+8-4)+2]e^{-2t} - 2\}\mu(t)$$

$$\boxed{v(t) = [(-12t+2)e^{-2t} - 2]\,\mu(t)}$$

$\boxed{B44}$

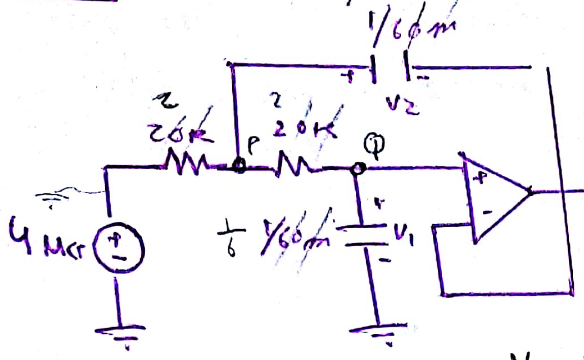
$V(t>0)$?

$V_1(0)=0$

$V_2(0)=2V$

Laplace

$\Rightarrow \boxed{t=0^-}$



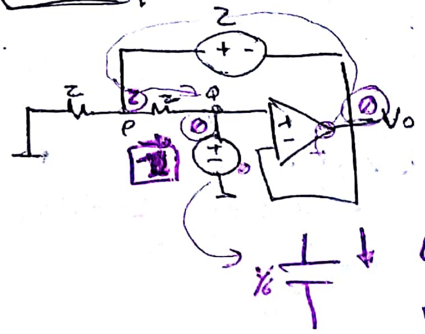
$\Rightarrow V_0(0)=0$

$V_0 = V_1$

$V_0' = V_1'$

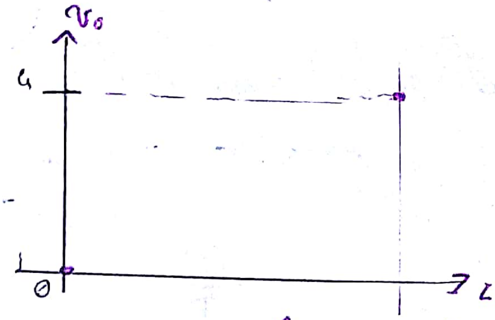
$V_0'(0)=6$

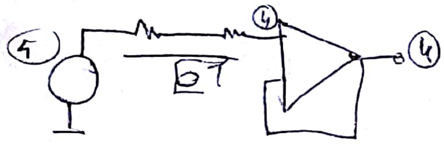
$\boxed{T=0^-}$



$i_c = C V'$

$V'(0) = \dfrac{i_c}{C} = 6$





Planteo nodos.

P) $\dfrac{4u(t)}{4} + \dfrac{1}{6} v_0' = V_P\left(\dfrac{1}{2}+\dfrac{1}{2}\right) + \dfrac{1}{6} V_P' - V_0 \dfrac{1}{2}$

Q) $0 = V_Q\left(\dfrac{1}{2}\right) + \dfrac{1}{6} V_Q' - V_P (1/2)$

$\boxed{V_P = V_Q + \frac{1}{3} V_Q'}$ Reemplazo en P.

$\Rightarrow P:\ 2u(t) + \dfrac{1}{6} v_0' = v_Q + \dfrac{1}{3} v_Q' + \dfrac{1}{6}\left(v_Q' + \dfrac{1}{3} v_Q''\right) - \dfrac{V_0}{2}$

$\dots\ 2u(t) = \dfrac{V_0}{2} + \dfrac{V_0'}{3} + \dfrac{V_0''}{18} \Rightarrow \boxed{36u(t) = V_0'' + V_0'.6 + 9V_0}$

raíz doble $\begin{cases}-3\\-3\end{cases}$

crítico

$\mathcal{L}$: $36.\dfrac{1}{s} = s^2 V(s) - s v(0^-) - v'(0^-)$
$+ 6\left[sV(s) - v(0^-)\right] + 9V(s)$

$\Rightarrow 36.\dfrac{1}{s} = V(s)\left[s^2+6s+9\right] - 6. \Rightarrow V(s) = \dfrac{36+6s}{s(s^2+6s+9)}$

$\Rightarrow \dfrac{36}{s(s+3)^2} + \dfrac{6}{(s+3)^2} = \dfrac{4}{s} - \dfrac{12}{(s+3)^2} - \dfrac{4}{s+3} + \dfrac{6}{(s+3)^2} \Rightarrow v(t) = \left[(-6t-4)e^{-3t} + 4\right]u(t)$

($6te^{-3t}$, 4, $-12te^{-3t}$, $-4e^{-3t}$)

* Fracciones Simples

* Fracciones Simples

$\dfrac{36}{s(s+3)^2} = \dfrac{A}{s} + \dfrac{B}{(s+3)^2} + \dfrac{C}{(s+3)}$

$36 = A(s+3)^2 + Bs + Cs(s+3)$

$\boxed{s=-3}$
$36 = -3B \Rightarrow \boxed{B=-12}$

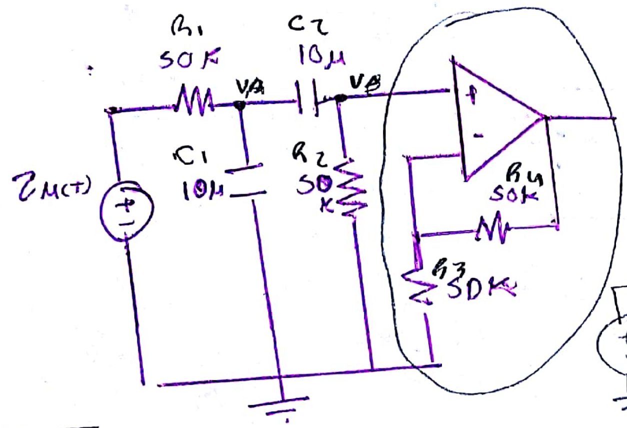
$\boxed{s=0}$
$36 = 9A \Rightarrow \boxed{A=4}$

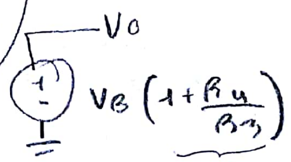
$\boxed{s=1}$
$36 = 16 - 12 + C(4)$

$\boxed{C=-4}$

$\boxed{B45}$ $V(T>0)$ $\boxed{CIN}$

Variaci
$i_c = C v_c'$



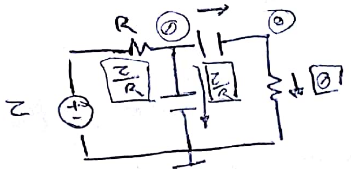


$V_B\left(1+\frac{R_4}{R_3}\right)$ — $\underbrace{}_{2}$

$\boxed{T = 0^+}$

$i_{c_2} = 0 \longrightarrow i_{c_2} = 0 = v_{c_2}' \cdot C = 0$
$= v_{c_2}' = 0$ → dado q' $i_{c_2} = 0 = V_{c_2}' = V_A' - V_B'$

$V_A'(0^+) = V_B'(0^+)$

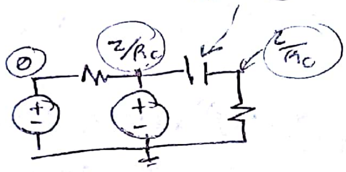


$V_{C_1}' = \frac{Z}{RC} = \frac{I}{C}$ $\boxed{Z/R}$

$T \to +\infty$

$V_B = 0 \Rightarrow \underline{V_0 = 0}$

$\hookrightarrow \frac{d}{dt}$



A) $\frac{Z}{R_1} = \frac{V_A}{R_1} + V_A' C_1 + V_A' C_2 - V_B' C_2$

= comportido

B) $0 = -V_A' C_2 + V_B' C_2 + \frac{V_B}{R_2}$

$\hookrightarrow V_A' = V_B' + \frac{V_B}{R_2 C_2}$

$V_A'' = V_B'' + \frac{V_B'}{R_2 C_2}$

$0 = \frac{V_A'}{R_1} + V_A''(C_1 + C_2) - V_B'' C_2$

$0 = \frac{V_B'}{R_1} - \frac{V_B}{R_1 R_2 C_2} + V_B''(C_1 + \cancel{C_2}) - V_B'' \cancel{C_2}$
$+ V_B' \frac{\cancel{2C}}{(C_1 + C_2)}$ / $R_2 C_2 \cancel{C}$

$0 = V_B'' + V_B' \frac{3}{RC} + \frac{V_B}{R^2 C^2}$

$RC = 50K \cdot 10\mu$
$= 500m = \frac{1}{2}$

$$\boxed{0 = V_B'' + 6 V_B' + 4 V_B} \Rightarrow V_B = A e^{(\overbrace{-3+\sqrt{5}}^{r_1})T} + B e^{(\overbrace{-3-\sqrt{5}}^{r_2})T}$$

⇒ aplico cond iniciales

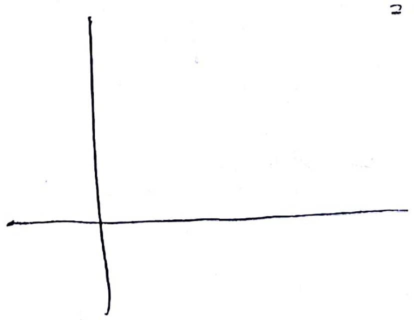
$0 = A + B \Rightarrow \underline{A = -B}$

$4 = A \cdot r_1 + B r_2$
$= -B r_1 + B r_2 = +B(\cancel{+3} - \sqrt{5} \cancel{+3} - \sqrt{5})$

$4 = +B \cdot -2\sqrt{5} \Rightarrow B = -1/2\sqrt{5} = \frac{-\sqrt{5}}{2\sqrt{5}\sqrt{5}} = \frac{-\sqrt{5}}{10}$

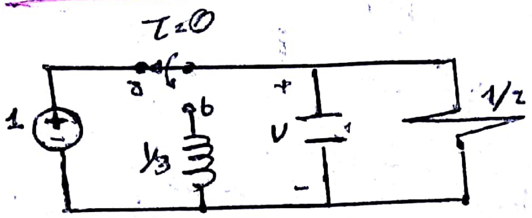
$\boxed{B = -\sqrt{5}/10}$

$A = +\sqrt{5}/10$



[@40] el interruptor se mueve de la posición "a" a la "b" en $t=0$. Para $t<0$ se encuentra en estado estable.

$V(t),\ t\geq 0$?



$i_c = C\,v_c'$ $\quad V{:}1R$

$v_L = L\,i_L'$

$T=0^-$

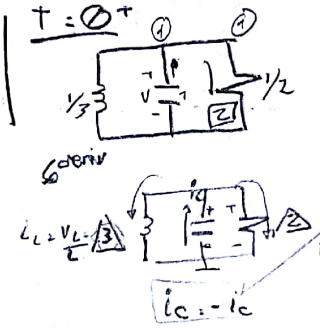
$v_c(t=0^-)=1 \quad v_c' = \frac{i_c}{C}=0$

$v_c'(t=0^-)=0$

$v_L(t=0^-)=0$

$i_L(t=0^-)=0,\ i_L'(0^-)=0$

$t=0^+$



$v_c(t=0^+)=1 \qquad I_L(t=0^+)=0$

$i_c(t=0^+) = \frac{1/2}{R} = \frac{1}{1/2} = \boxed{2}$

$v_c' = \cancel{2}$

$\boxed{v_c' = -2}$ por como está definida

$V = V_L = V_C$

$t>0$? modos

$$0 = \frac{V\cdot 1}{1/2} + \frac{1}{L}\int v_L + C\,v_c' \overset{\text{deriva}}{\Rightarrow} C\,v_c'' + 2v' + \frac{3}{1}v_L = 0$$

$$\Rightarrow v'' + 2v' + 3v = 0 \Rightarrow$$

$\hookrightarrow \begin{cases}-1-\sqrt{2}\,j\\ -1+\sqrt{2}\,j\end{cases}$ ~~amorti~~ amortiguado

- Como es subamortiguado ~~[illegible]~~

Planteo sol. ~~[illegible]~~

$(A\cos(\sqrt{2}\,t) + B\,\mathrm{sen}(\sqrt{2}\,t))e^{-t} \Rightarrow [A\cos(\sqrt{2}\,t) + B\,\mathrm{sen}(\sqrt{2}\,t)]e^{-t} = v(t)$

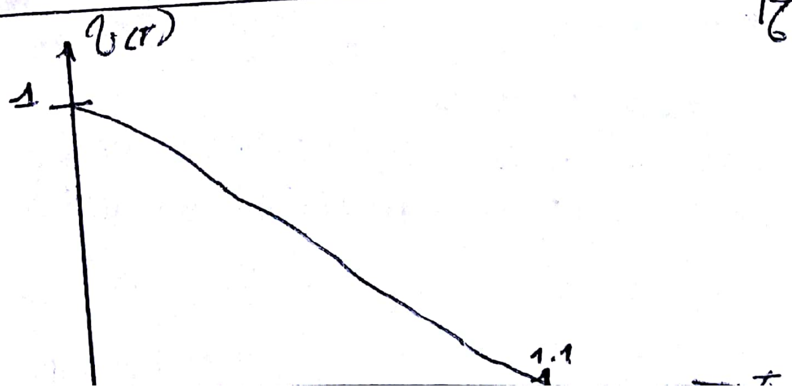
- aplico condiciones iniciales (en $t=0^+$ para estas)

$\Rightarrow v_c(t=0^+) = 1 = A\cos(0) + 0 \Rightarrow \boxed{A=1}$

$v_c'(t=0^+) = -2 = [-A\sqrt{2}\,\mathrm{sen}(\sqrt{2}\,t) + B\sqrt{2}\cos(\sqrt{2}\,t)]e^{-t} + [A\cos\sqrt{2}\,t + B\,\mathrm{sen}\sqrt{2}\,t]\cdot(-e^{-t})$

$-2 = 0 + B\sqrt{2} - 1 \Rightarrow -2 = B\sqrt{2} - 1 \Rightarrow \boxed{B = -\frac{1}{\sqrt{2}} = -\frac{\sqrt{2}}{2}}$

$$\Rightarrow \boxed{v(t) = e^{-t}\left[\cos(\sqrt{2}\,t) - \frac{\sqrt{2}}{2}\,\mathrm{sen}(\sqrt{2}\,t)\right]}$$



$\tau = 1$

comprobemos,

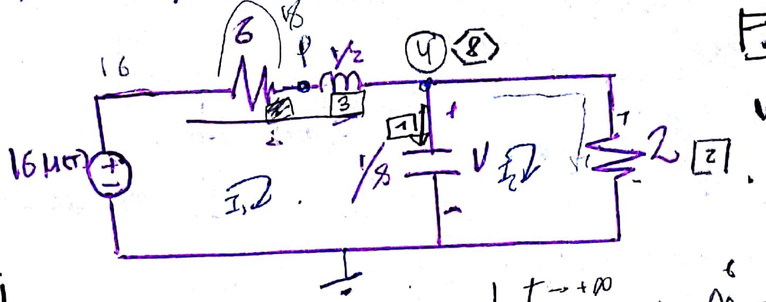
$\int_{0^-}^{0^+} v'' + 2\int_{0^-}^{0^+} v' + \int_{0^-}^{0^+} v = 0$

$(v'(0^+) - v'(0^-)) +$

a mi idea preguntar

$\boxed{B_{13}}$ $V(t>0)$? / $V(0) = 4V$ e $i(0) = 3A$

$v_L = L \cdot i'$
$i_c = C \cdot v_c'$



$\boxed{t = 0^-}$

$V(0^-) = 4V$ $\quad i(0^-) = 3A$

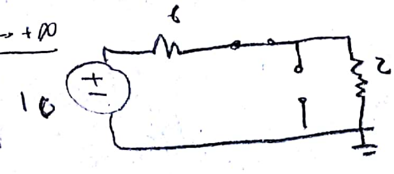
$\boxed{t = 0^+}$

$\boxed{V(0^+) = 4}$

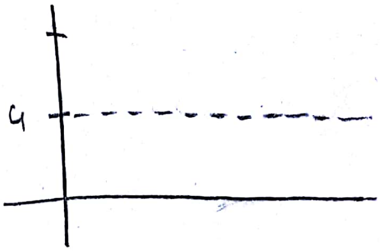
$i_L(0^+) = 3$

$i_c(0^+) = +1 \Rightarrow \boxed{v_c'} = \frac{i_c}{c} = \frac{+1}{1/8} = \boxed{+8}$

$t \to +\infty$



$\Rightarrow \boxed{V_c(t \to \infty) = 4}$



como $V = V_c = 8 \int i_2 \, dt$

$v_c' = 8 i_2 \Rightarrow i_2 = \frac{v_c'}{8}$

mallas

V ~~[illegible]~~

$$\begin{cases} 16 = i \cdot 6 + \frac{1}{2} \cdot i' + \frac{8}{1} \int i \, dt - 8 \int i_2 \, dt \\ 0 = -8 \int i \, dt + i_2 2. \end{cases}$$

derivo.

~~$16 = \ldots$~~ derivo todo

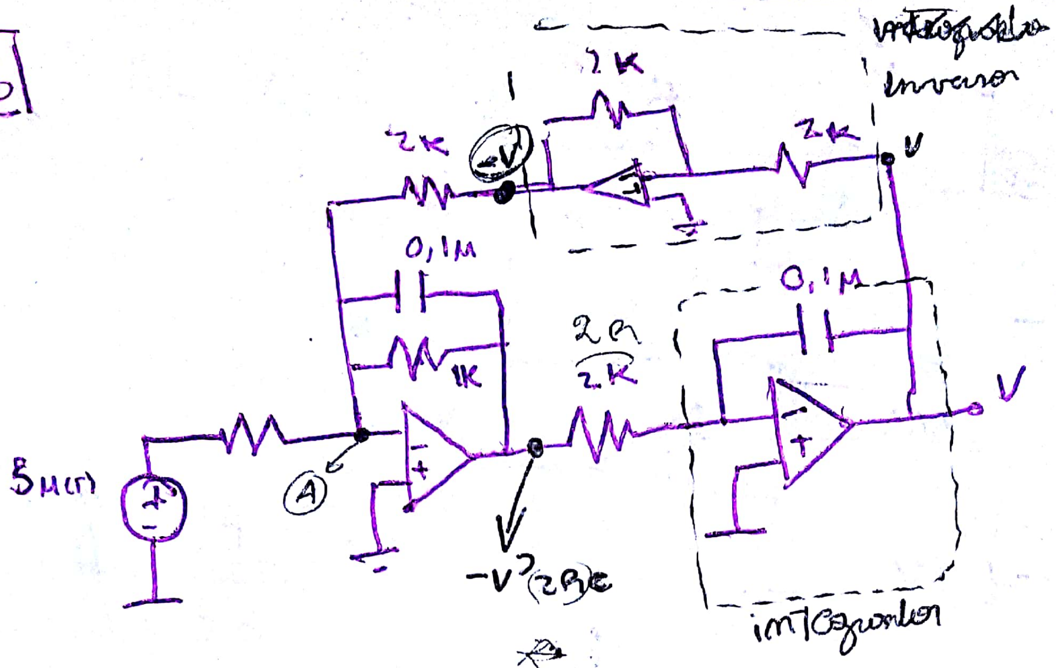
$$\begin{cases} 0 = i' 6 + \frac{1}{2} i'' + 8 i - 8 i_2 \\ 0 = -8 i + i_2 2 \end{cases}$$

$\Rightarrow \quad 0 = i' 6 + \frac{1}{2} i'' + 8i - 8 \frac{8}{2} i \Rightarrow i'' \ldots$

~~[illegible]~~

B46

$V(t), t>0$?



$$A: \quad \frac{5u(t)}{R} - \frac{V}{2R} - \frac{V' 2RC}{R} - v'' 2RC^2 = \cancel{V_A}\left(\frac{1}{R}+\frac{1}{R}+\frac{1}{2R}\right)$$

$V_A = 0$

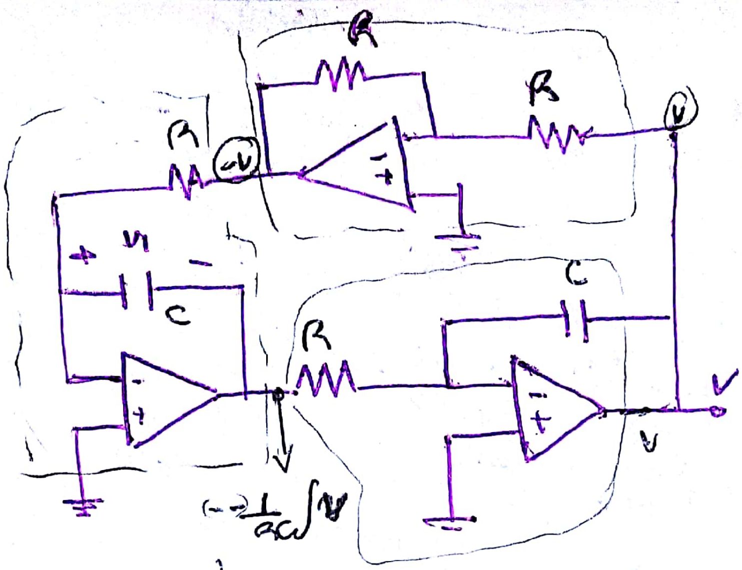
$$\frac{5u(t)}{R} - \frac{V}{2R} - V' 2C - v'' 2RC^2 = 0$$

$$\frac{+5u(t)}{2R^2C^2} = v'' + \frac{v'}{RC} + \frac{v}{4R^2C^2}$$

⇒ Resolver

$$\Rightarrow v(t) = 10\left(1 - e^{-5kt}(1+5kt)\right)$$

$\boxed{B47}$



$$V = \frac{-1}{R^2C^2}\iint V$$

$$V'' = \frac{-1}{R^2C^2} V$$

$$\boxed{V'' + \frac{1}{R^2C^2} V = 0}$$

(*) mo hay V'

a - $V_1(0) = 4V$, $V(0) = 0$ | c - $V_1(0) = 4V$ / $V(0) = 2V$
b - $V_1(0) = 0V$, $V(0) = 2V$

(*) $r^2 + \left(\frac{1}{RC}\right)^2 = 0$

$$r = \pm j\frac{1}{RC}$$

$\rightarrow A \operatorname{sen}\left(\frac{1}{RC}t\right) + B\cos\left(\frac{1}{RC}t\right)$ → un oscilador

como pongo condición inicial?

~~solo teniendo~~ así aparece

Ruido de johnson ó termico

R

→ $V_{RMS} = \sqrt{4kT\,\underbrace{AB}\,R}$ → [ohms]

Boltzman [K] ↗

→ ancho de banda (BW)

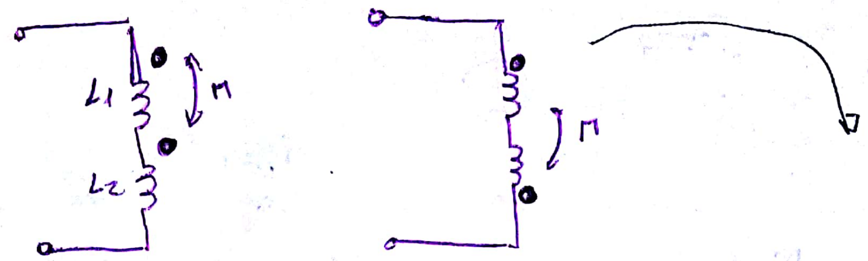
que hace q' llegue a mi ec. final.

Por esto es que tratamos de no usar resistencias muy grandes.

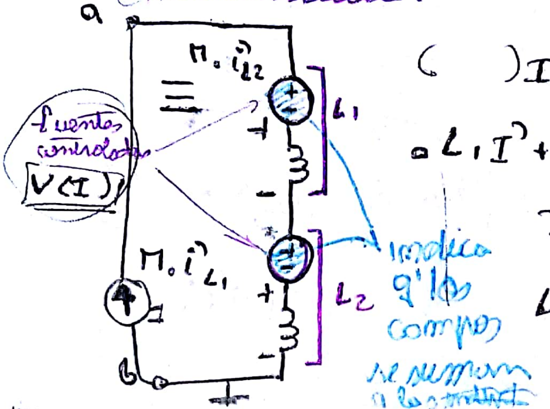
$\boxed{\text{Terminar}}$

B49

$v_L = L \cdot i'_L$ — M autoinductancia



$$M = K\sqrt{L_1 L_2} \qquad K \in [0,1]$$



fuentes controladas $V(I)$

indica q' los campos se suman a los anteriores

impongo una fuente así para ver sentido

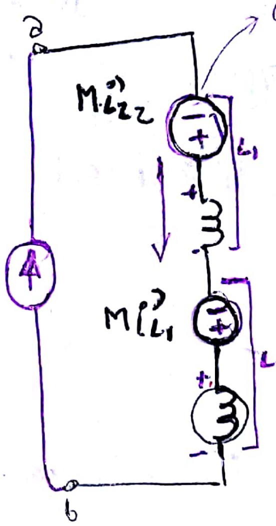
La fuente remplazan los bornes homólogos ~ la concatenación del campo

$$(\quad) I' = v$$

$$= L_1 I' + L_2 I' + M I' + M I' = v$$

$$I'(L_1 + L_2 + 2M) = v$$

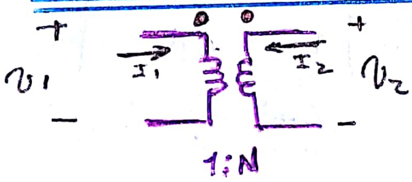
$$L_{eq}(L_1 + L_2 + 2M)$$



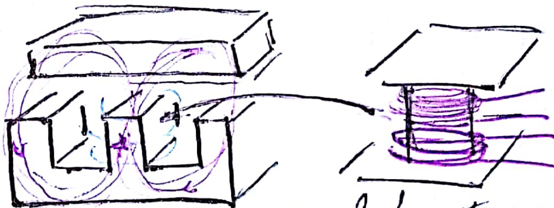
con sus distintos bornes homólogos el flujo se fiere q' disminuye el V ... q' restarse a los V_L los flujos se restan

$$L_{eq} = L_1 + L_2 - 2M$$

Transformador ideal (lineal)



Pensemos q' el acople es el máximo ~ $K=1$



un plastiquito y en medio.

CI

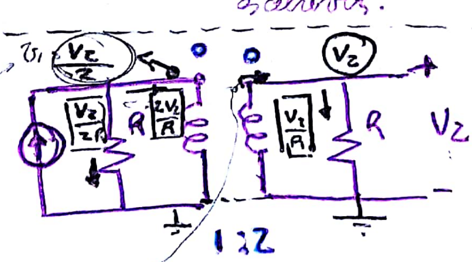
$P_E = P_S$

$$\begin{cases} v_1 \cdot N = v_2 \\ I_1 = -I_2 N \end{cases}$$

para cada una de entrada tengo N veces a la salida

y para q' se mantenga la potencia estos se achican.

B52



$v_1 \cdot 2 = v_2$

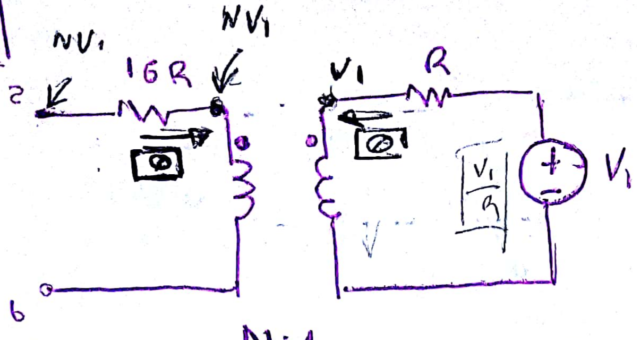
$$\begin{cases} v_1 m = v_2 \\ I_1 = -I_2 m \end{cases} \Rightarrow I_1 = -\frac{V_2}{R} \cdot 2$$

$$\boxed{I_1 = -\frac{2V_2}{R}}$$

$$I = \frac{2V_2}{R} + \frac{V_2}{2R} = \overbrace{\left(\frac{2}{R} + \frac{1}{2R}\right)}^{4+1/2R} V_2$$

$$\boxed{V_2 = I \cdot \frac{2R}{5}}$$

B53



N:1

→ 1 : 1/N

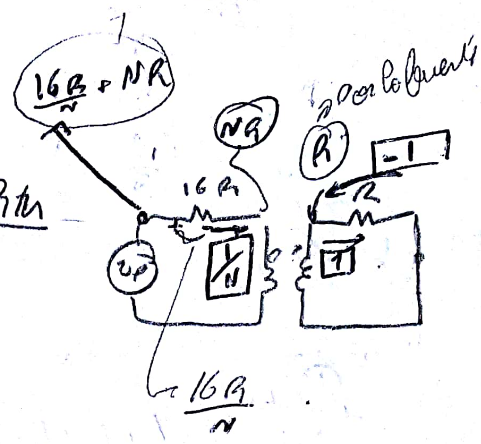
él lo doy vuelta

$$\boxed{V_{th} = N V_1}$$

$$\boxed{R_{Th} = 16R + N^2 R}$$

Buscar eq thevenin

Busco R_{th}

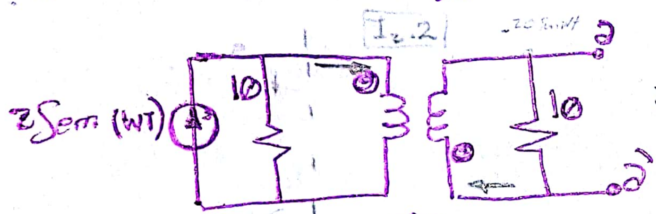


$$\Rightarrow R_{th} = \frac{V_P}{i_P} = \left(\frac{16R}{N} + NR\right) N$$

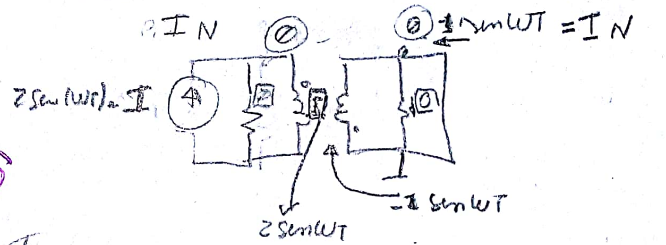
$$R_{Th} = 16R + N^2 R$$

B54

Encontrar eq. Norton

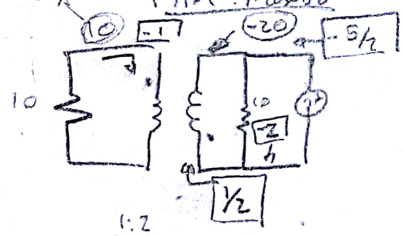


1:2



pongo una fuente 1 al 0 (sin fuentes), luego dejo la fuente

R_{Th} Pasivo



1:2

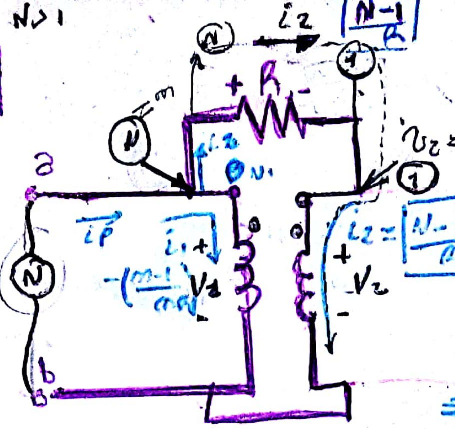
$$R_{th} = \frac{-20}{-5/2} = \frac{40}{5} = \boxed{8}$$

$$\boxed{I_N = \operatorname{Sen}(\omega T)}$$

$$\boxed{R_{Th} = 8}$$

355

Propongo una fuente de tensión V_P



$N > 1$

$i_2 = \boxed{\frac{N-1}{R}}$

$v_2 = \frac{1}{m} \cdot N = 1$

i_P i_1 $-\left(\frac{m-1}{mR}\right)$ V_1 $i_2 = \boxed{\frac{N-1}{R}}$ V_2

$m:1$

En este caso $m:1 \Rightarrow 1:\frac{1}{m}$

$\Rightarrow \begin{cases} V_1 \frac{1}{m} = V_2 \\ i_1 = -\frac{1}{m} i_2 \; (*) \end{cases}$

$1:N$

- $V_1 N = V_2$ para q' $\Sigma P = 0$
- $I_1 = -N I_2$

Cuanto vale i_2?

$i_2? \Rightarrow \boxed{i_2} = i_R = i_{L2} = \boxed{\frac{N-1}{R}}$ V_R

Cuanto vale i_1? $(*)$ $\left[i_1 = -\frac{1}{m} \cdot \frac{N-1}{R} = -\left(\frac{m-1}{mR}\right) \right]$

$\Rightarrow$ del modo V_1, sabemos

$i_P = i_1 + i_2$

$\boxed{i_P = \frac{m-1}{R} - \frac{m-1}{mR}}$

$\Rightarrow$ Entonces es simplemente dividido $R_{TH} = \frac{V_P}{i_P} = \frac{N=m}{\frac{m-1}{R} - \frac{m-1}{mR}}$ $(*)$

$R_{TH} = \frac{mR}{m-1 - \frac{(m-1)}{m}}$

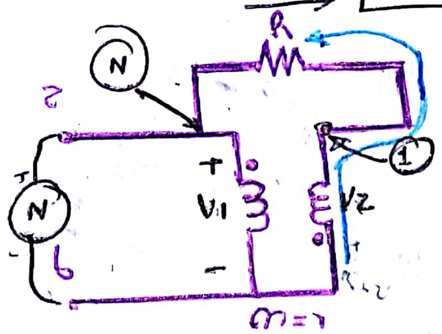
$\boxed{R_{TH} = \frac{m^2 R}{(m+1)^2}}$

encontrar eq. Thevenin

$V_{TH} = 0$ $|V_1| > |V_2|$

X

$i_R = i_1 = \boxed{\frac{N+1}{R}}$



Resolver

$\hookrightarrow R_{TH} = +\frac{m^2 R}{(m+1)^2}$

de forma análoga resolvemos

$\Rightarrow V_2 = \frac{1}{m} V_1 = \frac{1}{m} \cdot N = 1$

$i_1 = -\frac{1}{m} i_2 = -\frac{1}{m} \cdot -\left(\frac{N-1}{R}\right) = \frac{N-1}{mR}$

notar q' es $-i_P$ de la anterior $(*)$

$\Rightarrow i_P = i_1 + i_2 = \boxed{\frac{m-1}{mR} - \frac{m+1}{R} = i_P}$

$(*)$ como es lo único en lo q' cambia

$R_{TH} = \frac{V_P}{i_P} = -\frac{m^2 R}{(m+1)^2}$ negativo

Preguntar

~ Es xq' hay "una f. controlada"

¿?

– Regimen Senoidal permanente — 1-Octubre-

~ Un circuito en el q' paso mucho tiempo y solo queda excitado por un ω único

– Permanente.

– $\omega = 2\pi f$ único.

$V = A\,Sen(\omega t)$

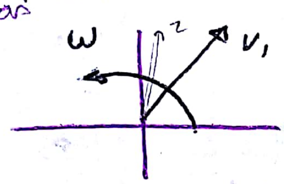
– ~~T~~

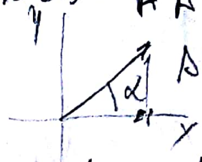
– Impedancias $= V(I)$ ó $I(V)$

⇒ Ahora las tensiones y corrientes se representan como fasores.

$A\ A\,sen\omega t$

$$V = V_1 \boxed{e^{j\omega t}}$$ → se suele simplificar

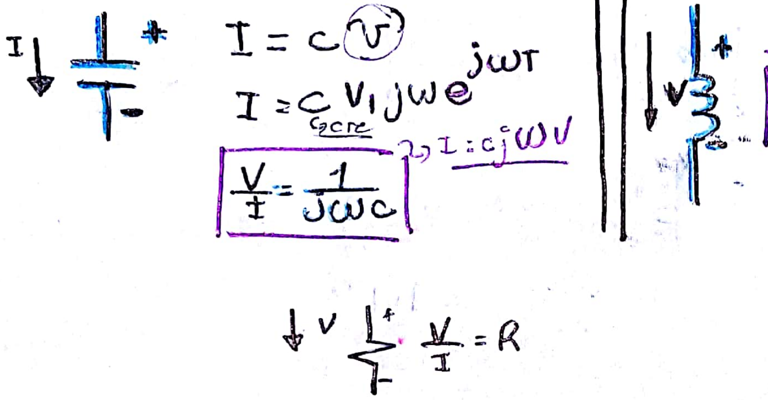




$A \cos\alpha = A\cos\omega t$

$\alpha = \omega t$

deducion de impedancias



$I = C\,\dot{V}$

$I = C\,V_1\,j\omega e^{j\omega t}$

$\boxed{\frac{V}{I} = \frac{1}{j\omega C}}$ → $I = cj\omega V$

analogo

$\boxed{\frac{V}{I} = j\omega L}$

$Z_L = \frac{V}{I} = j\omega L$

$Z_C = \frac{V}{I} = \frac{1}{j\omega C}$

$\frac{V}{I} = R$

$Z_R = \frac{V}{I} = R$

$$Z = \underline{R} + j\underline{X}$$

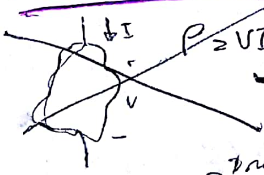
- X → Reactancia: capacitiva (–), inductiva (+)
- R → Resistencia

⇒ si adelanta a I es capacitivo ~ en atraso

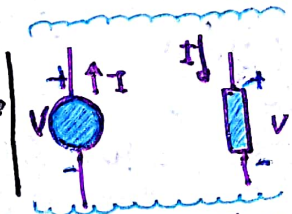
$$Y = \frac{1}{Z} = \underline{G} + j\underline{B}$$

- B → Susceptancia: capacitiva (+), inductiva (–)
- G → Conductancia

Potencia.



$P = VI$ → conversion electrica



la suma de pot no da cero.

trabajo, calor...

Potencia Aparente.

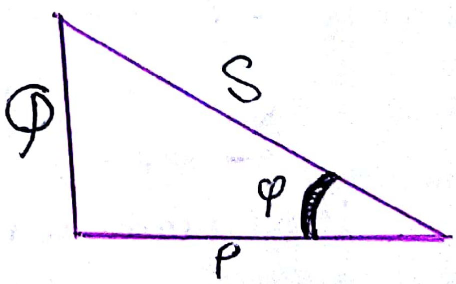
⇒ $\boxed{\vec{S} = V_{ef}\, I_{ef}^{*}}$ → conjugado

$\boxed{\frac{\hat{V}}{\sqrt{2}} = V}$

V_{ef} → V_{RMS}

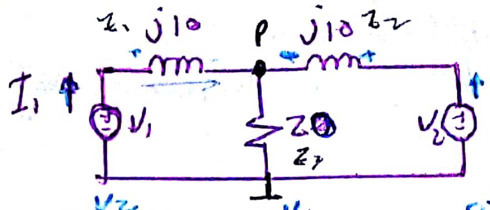
$$\underline{S} = \underline{P} + j\underline{Q}$$

- Q → potencia reactiva [VAR] → lo q' da vueltas entre los ind cap...
- P → Potencia activa [W]
- S → Aparente [VA]



→ Parc. en 3 semanas.

C1) calcular ∀ las potencias.



$V_1 = 100$ Vef

$V_2 = 150$ Vef $(1-j)$

nodos: $\underbrace{\frac{\overbrace{150(1-j)}^{V_2}}{j10}}_{Z_2} + \underbrace{\frac{\overbrace{100}^{V_1}}{j10}}_{Z_1} = V_P\left(\frac{1}{20}+\frac{1}{j10}+\frac{1}{j10}\right)$

$\omega j L$

$\rightarrow -15 - j15 - j10 = V_P \frac{j+2+2}{j20} = V_P \frac{4+j}{j20}$

$-15-25j = V_P\frac{(4+j)}{j20} \Rightarrow 500 - j300 = V_P(4+j)$ (*)

(*) $V_P = \frac{500-j300}{(4+j)} \cdot \frac{4-j}{4-j} = \frac{2000-1200j-j500-300}{16+1}$

$V_1 \rightarrow V_P$

$V_L = (V_1 - V_P)$

$\boxed{V_P = 100 - j100}$

$\boxed{S = V_{ef} I_{ef}^* = V\cdot\left(\frac{V}{R}\right)^* = \frac{|V|^2}{R}}$

$\boxed{S = V_{ef} I^* = V\left(\frac{V}{Z_L}\right)^* = \frac{|V|^2}{Z^*}}$ análogo capacitor

$\boxed{S_{Z_3}} = (V_P - 0)\cdot I_{Z_3} = \frac{|V_P|^2}{20} = \frac{2000}{20} = \boxed{1000}$ $\boxed{P = 1000 \text{ W}}$

$\boxed{S_{Z_1}} = (V_P - V_1)\cdot I_{Z_1}^* = \frac{|-j100|^2}{(j10^*)^*} = \frac{10000}{-j10} = \boxed{j1000}$ $\boxed{QV_{AR} = j1000 \text{ VAR}}$

↳ depende como elija las corrientes

$\boxed{S_{Z_2}} = (V_2 - V_P)\cdot I_{Z_2}^* = \frac{|50-j50|^2}{(j10)^*} = \frac{5000}{-j10} = \boxed{j500}$ VAR

$(V_1 - V_P) = 100 - (100 - j100) = j100 = V_{Z_1}$

Ahora fuentes

$\boxed{S_{V_1} = V_1 \cdot I_1^* = \overbrace{100}^{V_1}\cdot\left(\frac{\overbrace{V_1 - V_P}^{V_{Z_1}}}{\underbrace{j10}_{Z_1}}\right)^* = 100\left(\frac{j100}{j10}\right)^* = 1000}$

$\boxed{S_{V_2}} = V_2 I_2^* = (\underbrace{150 - j150}_{V_2})\cdot\left(\frac{\overbrace{V_2 - V_P}^{V_{Z_2}}}{j10}\right)^* = (150 - j150)\left(\frac{50 - j50}{j10}\right)^*$

$= (150 - j150)(-j5 - 5)^* = (150j - j150)(-5 + j5) =$

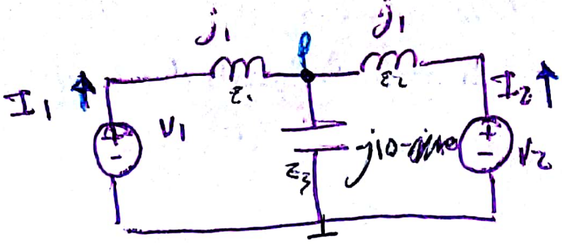
$= -750 + j750 + j750 + 750 = \boxed{j1500}$

ojo si tengo en cuenta los sentidos de las corrientes

$\sum S_F = \sum S_Z$

$1000 + j1500 = 1000 + j1000 + j500$ ✓

Ca 6



$V_1 = 230\,V_{ef}$

$V_2 = 230\,V_{ef} \cdot e^{j30°} =$

$V_2 = 230\,V_{ef} \cdot e^{j\pi/6}$

rect$(230, \pi/6) = V_2$

$V_2 \cong \underbrace{199{,}185}_{200} + j115$

modos

$$\frac{230}{j} + \frac{200+j115}{j} = V_P\left(\frac{1}{j} + \frac{1}{j} - \frac{1}{j10}\right)$$

$$-230j - 200j + 115 = V_P\underbrace{\left(-j - j + j\frac{1}{10}\right)}_{-1{,}9j = -\frac{19}{10}j}$$

$$-430 + 115 = V_P(-1{,}9j)$$

$$V_P = \frac{115 - 430j}{(-1{,}9j)} = \boxed{\frac{4300}{19} + \frac{1150}{19}j = V_P}$$

$$\boxed{S_{Z_3}} = V_P I_C^* = \frac{|V_P|^2}{Z_3^*} = \frac{\left(\frac{4300}{19} + j\frac{1150}{19}\right)}{j10} = \boxed{S_{Z_3} = \frac{54882}{j10} = -5488{,}2j}$$

$$\boxed{S_{Z_1}} = (V_P - V_1)I_1^* = \frac{|V_1 - V_P|^2}{-j} = S_{Z_1} = 3677j$$

$$\boxed{S_{Z_2}} = \underbrace{(V_P - V_2)}_{\text{5 por como lo defino (la convención)}} I_2^* = \frac{|V_2 - V_P|^2}{-j} = \boxed{3660j}$$

Estos signos me confunden, los signos no me cambia el resultado.

aca sí importan los sentidos

$$S_{V_1} = V_1 I_1^* = \overset{V_1}{230}\left(\frac{V_1 - V_P}{j}\right)^* = \boxed{S_{V_1} = 13921 + 847{,}37j}$$

se terminan compensando

$$S_{V_2} = V_2 I_2^* = (\overset{\sim 200}{199{,}1885} + j115) \cdot \left(\frac{V_2 - V_P}{j}\right)^* = \boxed{S_{V_2} = -13921 + 1001j}$$

si no se cumple el balance de potencia

Balance

$\boxed{\mathrm{Re}}$ $13921 - 13921 = 0$ ✓

$\boxed{\mathrm{Im}}$ $-843{,}37j - 1001j = -5488{,}2j + 3677j + 3660j$

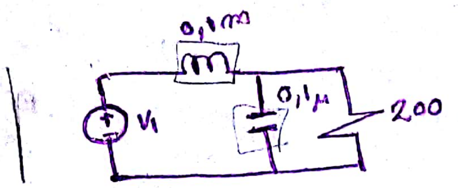
$$\underbrace{+1848{,}37 = 1848{,}8}_{\text{por redondeo}}$$

→ Poner 4 cifras significativas.

C_2

W/ Resonancia

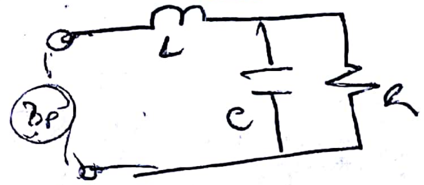
↳ Considerar la fuente V_1 vé una impedancia real.



$Z = R + ($

$\frac{1}{j\omega C} = Z_C$

$Z_L = j\omega L$



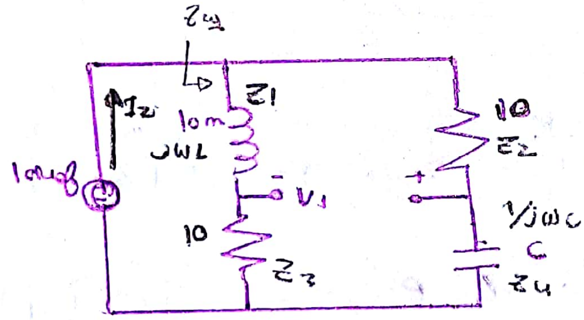
$Z_{eq} = \frac{1}{\frac{1}{R} + \frac{1}{j\omega C}} + j\omega L$

$= \frac{R + j\omega L - \omega^2 RLC \cdot j\omega R^2 C + \dots}{1^2 + (\omega RC)^2}$

$Img(Z_{eq}) = \frac{\omega L - \omega R^2 C + \omega^3 R^2 L C^2}{(\quad)} = \emptyset$

$$\therefore \boxed{\omega = \sqrt{\frac{1}{LC} - \frac{1}{R^2 C^2}}}$$

C_3



$f = 50\,Hz$

$\frac{Z_1}{Z_2} = \frac{Z_3}{Z_4}$

↳ $Z_1 \cdot Z_4 = Z_3 Z_2$ → Para q' esté en equilibrio.

$\Rightarrow j\omega L \cdot \frac{1}{j\omega C} = R^2 \Big\} \Rightarrow \underline{\underline{C}} = L/R^2 = \frac{10\,mH}{100\,\Omega} = \underline{\underline{100\,\mu F}}$

$\frac{L}{C} = R^2$

Pot. E. de la fuente.

$f = 50\,Hz \Rightarrow \omega = 314\,\frac{rad}{seg}$

$P_{V_2} = V_2 I_2^* =$

$P_{V_2} = V_2 \left(\frac{V_2}{Z_{eq}}\right)^* = \frac{10 \cdot 10}{10} = 10$

↳ S_{V_2}

$Z_{eq} \to 10$

$Z_{eq} = (j\omega L + R) /\!/ (R + \frac{1}{j\omega C})$

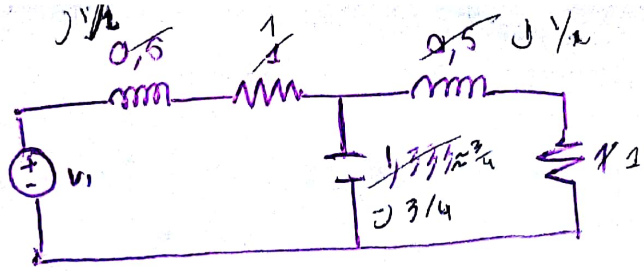
$= \frac{(j\omega L + R) \cdot (R + \frac{1}{j\omega C})}{2R + j(\omega L - 1/j\omega C)}$

$= \frac{R j\omega L + \frac{L}{C} + R^2 + \frac{R}{j\omega C}}{2R + j(\omega L - 1/\omega C)}$

$$\boxed{Z_{eq} = \frac{R^2 + \frac{L}{C} + Rj(\omega L - 1/\omega C)}{2R + j(\omega L - 1/\omega C)}}$$

φ meter

$\boxed{C_4}$



$V_1 = 1V_{ef}\cos(\omega t)$
$W = 1r/s$

asumo V eficaz

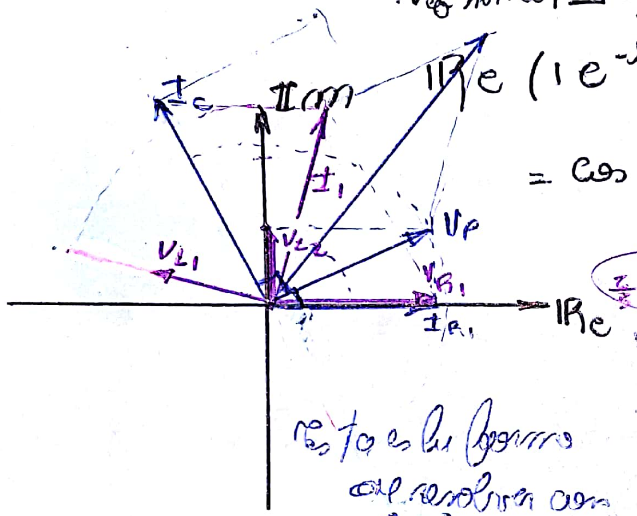
$1V\cos(\omega t) \sqsupset 1$

$\mathrm{Re}(1 \cdot e^{j\omega t}) = \mathrm{Re}[\cos(\omega t) + j\,\mathrm{sen}(\omega t)]$.

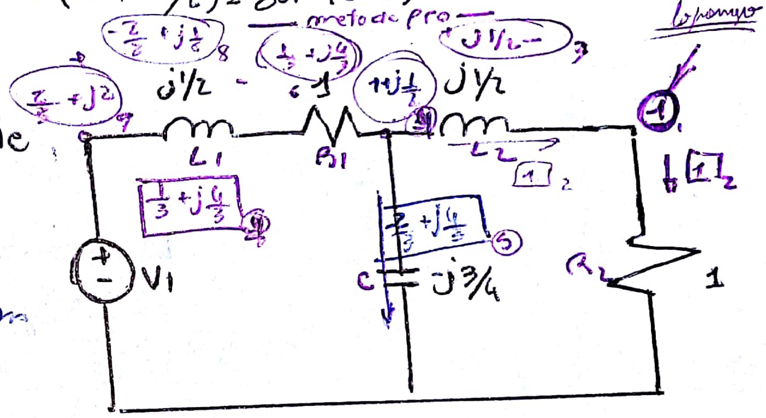
$1V_{ef}\,\mathrm{sen}\,\omega t \sqsupset -j = 1e^{-j\pi/2}$

$\mathrm{Re}(1e^{-j\pi/2} e^{j\omega t}) = \mathrm{Re}[\cos(\omega t - \frac{\pi}{2}) + j\,\mathrm{sen}(\omega t - \frac{\pi}{2})]$

$= \cos(\omega t - \pi/2) = \mathrm{Sen}(\omega t)$

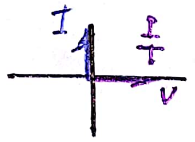


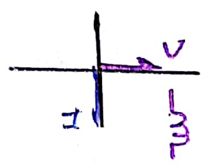
esta es la forma de resolver con fasores.



$\frac{2}{3} + j2 - 1$

$1 - \frac{1}{\frac{2}{3} + j2}$



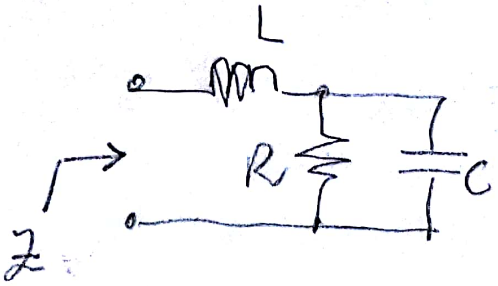


$\frac{1 + j1/2}{-j\frac{3}{4}} = \frac{4 + j2}{-j3}$

$= j(\frac{4}{3} + j\frac{2}{3})$

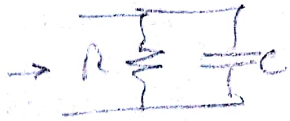
$= -\frac{2}{3} + j4/3$

EA AC



$Z_L = j\omega L$ $Y = \frac{1}{Z}$

$Z_C = \frac{1}{j\omega C}$



$Y = j\omega C + \frac{1}{R}$

$$Z = j\omega L + \frac{1}{j\omega C + \frac{1}{R}} =$$

$$= j\omega L + \frac{R}{1 + j\omega CR} = \frac{j\omega L(1 + j\omega CR) + R}{1 + j\omega CR} =$$

$$= \frac{j\omega L - \omega^2 LCR + R}{1 + j\omega CR} = \frac{[(R + j\omega L) - \omega^2 LCR][1 - j\omega CR]}{1 + (\omega CR)^2}$$

$$= \frac{R + j\omega L - j\omega CR^2 + \cancel{\omega^2 LR} - \cancel{\omega^2 LCR} + j\omega^3 LC^2R^2}{1 + (\omega CR)^2}$$

$$\operatorname{Im} Z = \omega L - \omega CR^2 + \omega^3 LC^2R^2 = 0$$

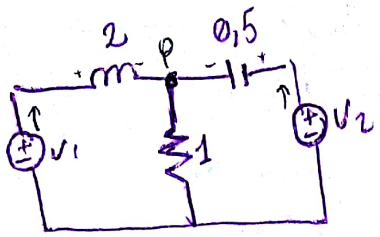
en Resonancia

$$\omega L - \omega CR^2 + \omega^3 LC^2R^2 = 0$$

$$L - CR^2 + \omega^2 LC^2R^2 = 0$$

$$\omega^2 = \frac{-L + CR^2}{LC^2R^2} = -\frac{1}{C^2R^2} + \frac{1}{LC}$$

C6



$V_1 = 1e^{j0°} = 1$ $\quad Rec(A,\varphi) \Rightarrow A+Xj$

$V_2 = 1e^{j120°} = 1e^{j\frac{2}{3}\pi} = -\frac{1}{2}+\frac{\sqrt{3}}{2}j$

$\omega = 1 r/s$

1) Buscamos las impedancias.

$Z_L = j\omega L = j2$

$Z_C = \frac{1}{j\omega C} = -2j$

• nodos

$[2j]^{-1} \quad [-2j]^{-1}$

$$\frac{1}{Z_L} + \frac{-\frac{1}{2}+\frac{\sqrt{3}}{2}j}{Z_C} = V_P\left(\frac{1}{Z_L}+\frac{1}{Z_C}+\frac{1}{R}\right)$$

$$V_P = -0,5j + \frac{1}{4}j \cdot \frac{\sqrt{3}}{4} \cdot R \quad R = 1$$

$$\boxed{V_P = -\frac{3}{4}j - \frac{\sqrt{3}}{4}}$$

Buscar V, las Potencia y corrientes

$$S_R = V_{ef} \cdot I_{ef}^* = \frac{|V_{ef}|^2}{R^*} = \frac{3}{4}$$

$$S_{Z_L} = V_{ef} \cdot I_{ef}^* = \frac{|V_1 - V_P|^2}{Z_L^*} = \frac{\left(\frac{3}{4}\right)^2 \left(1+\frac{\sqrt{3}}{4}\right)^2}{-(j2)} = \frac{7+2\sqrt{3}}{8}j$$

$$S_{Z_C} = V_{ef} I_{ef}^* = \frac{|V_2 - V_P|^2}{Z_C^*} = \left(+\frac{\sqrt{3}}{4}+\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}+\frac{\sqrt{3}}{2}\right)^2 = -\frac{7+2\sqrt{3}}{8}j$$

$$S_{V_1} = V_{ef} \cdot I_{ef}^* = V_1 \cdot \frac{(V_1 - V_P)^*}{Z_L^*} = 1 \cdot \frac{\frac{4+\sqrt{3}}{4} - \frac{3}{4}j}{-2i} = \frac{3}{8} + \frac{4+\sqrt{3}}{8}j$$

$$S_{V_2} = V_{ef} \cdot I_{ef}^* = V_2 \cdot \left(\frac{V_2 - V_P}{Z_L}\right)^* = \frac{3}{8} - \frac{4+\sqrt{3}}{8}j$$

$$\sum S_{fuentes} = \sum S_{Z_i}$$

$$\frac{3}{4} + \left[\frac{7+2\sqrt{3}}{8}j\right] + \left[-\frac{7+2\sqrt{3}}{8}j\right] = \left[\frac{3}{8} - \frac{4+\sqrt{3}}{8}j\right] + \left[\frac{3}{8}+\frac{4+\sqrt{3}}{8}j\right]$$

$$\frac{3}{4} = \frac{3}{4}$$

→ si dá todo bien hacemos el diagrama fasorial.

$V_L = I\, Z_L = \frac{V_1 - V_P}{Z_L} \cdot Z_L$

$V_L = \frac{4+\sqrt{3}}{4} + \frac{3}{4}j = 1,43 + 0,75j$

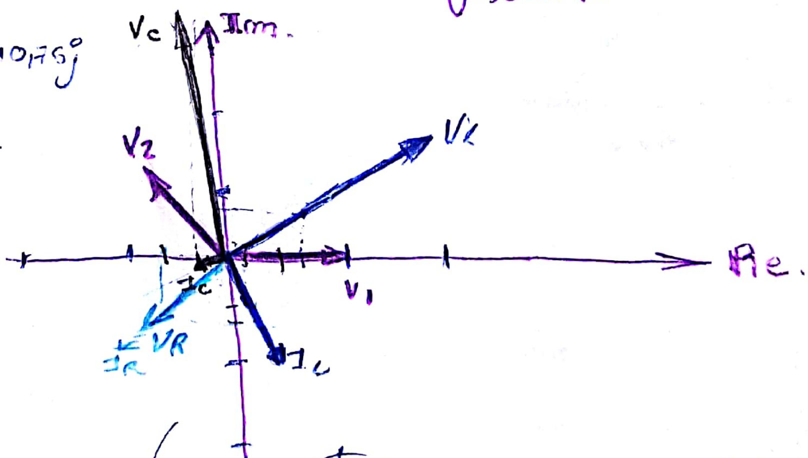
$I_L = \frac{3}{8} - \frac{4+\sqrt{3}}{8}j$

Sentido de la corriente

$V_C = V_2 - V_P$

$\approx 0,06 + 1,61j$

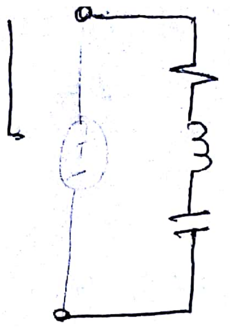
$I_C \approx -0,8 - 0,03j$



notar VR e IR son complejos. $S_R \in \mathbb{R}$

corriente, etc.

CIVIL



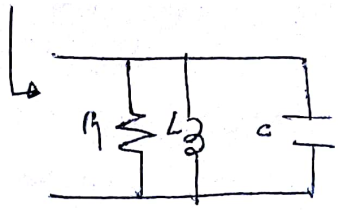
$Z_{th.Res} = R$

$I = MAX$

$\omega_R = \sqrt{\frac{1}{LC}}$

$\omega\downarrow \to CAP$

$\omega\uparrow \to IND$



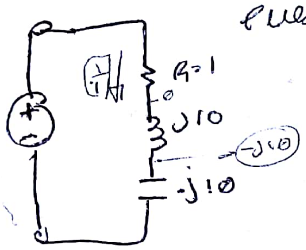
$Z_{th.Res} = R$

$I = MIN$

$\omega\downarrow \to IND$

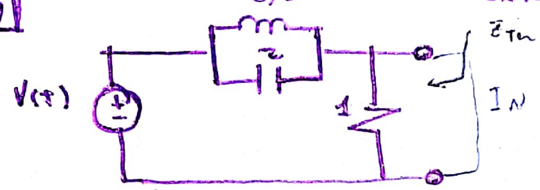
$\omega\uparrow \to CAP$

$\omega_0 = \sqrt{\frac{1}{LC}}$

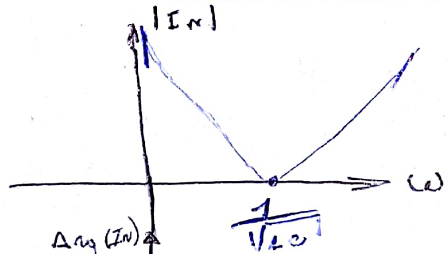


Puede tener algún nodo una tensión mayor a 1?

$\boxed{C9}$



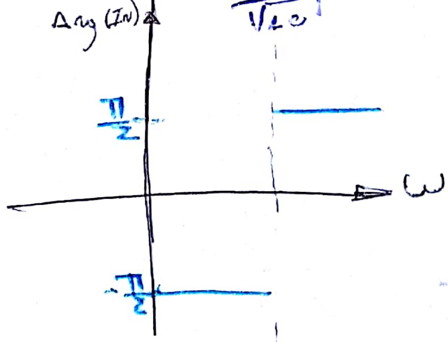
obtener eq. Norton. y graficar I_N : R_N en función de la frecuencia.

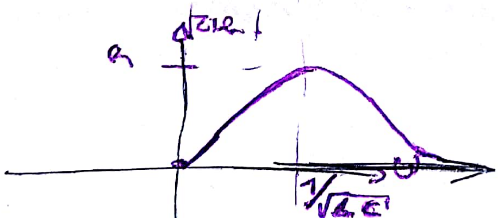


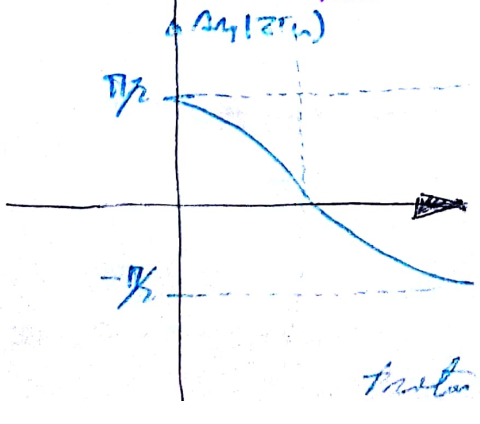
$Z_L = j\omega L$

$Z_C = \frac{1}{j\omega C}$

$\frac{V}{Z_L} = I = Arg(-90)$

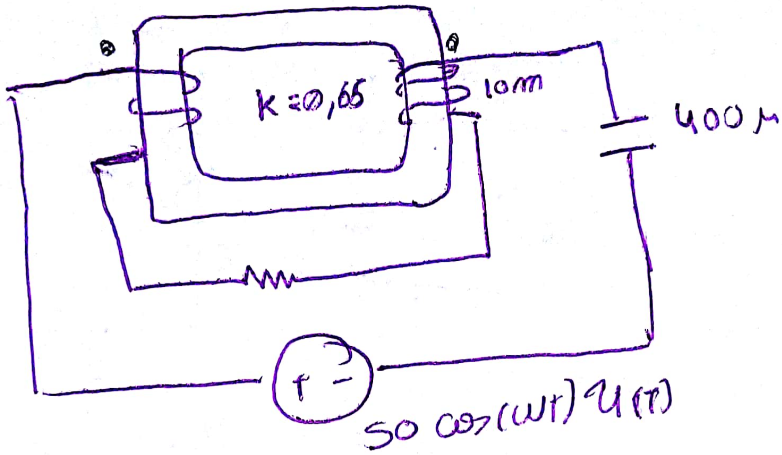




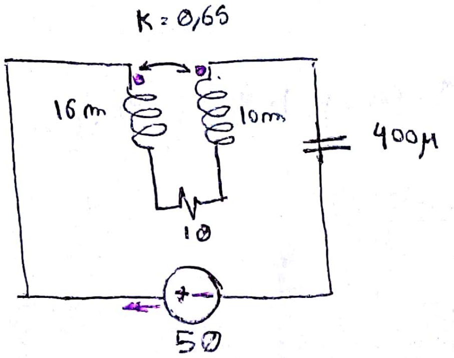


Tratar de hacer el plano con el θ.

$\boxed{C_{10}}$

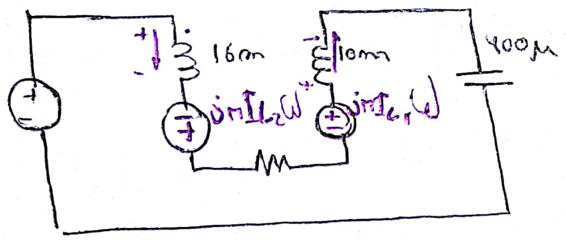


$\omega = 2\pi 50$



$M = k\sqrt{L_1 L_2}$

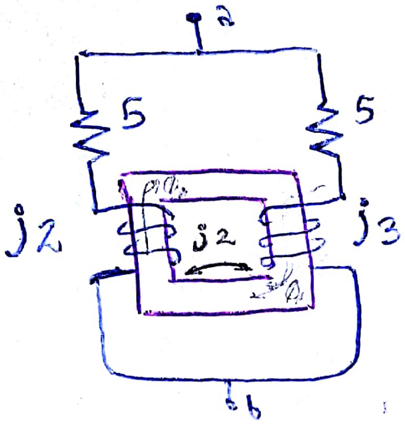
$M = 8{,}2m$



$$50 + j\omega M I_{L_2} + j\omega M I_{L_1} = I\left(j\omega 16m + j\omega 10m + \frac{1}{j\omega C} + 10\right)$$

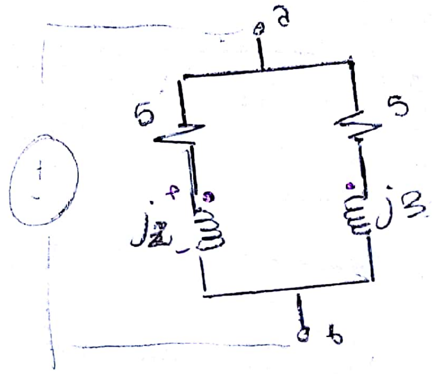
↳ Si entra por borne homologo
⇒ sumo las autoinductancias.
Si sale por borne ~~opuesto~~
homologo entonces restar las autoinductancias.

C_{11}

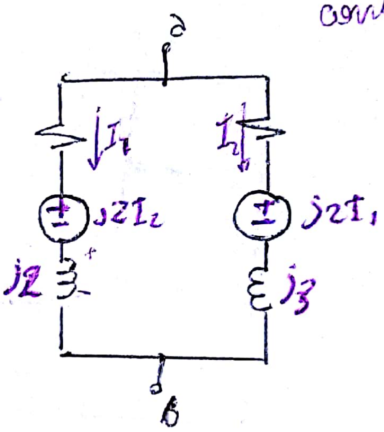


$Z_{eq_{A-B}}$?

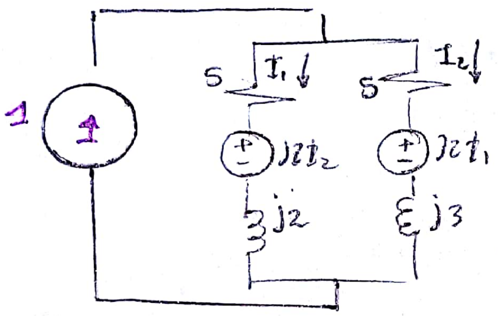
$\equiv$



· Definir corrientes



· Hacemos modelos



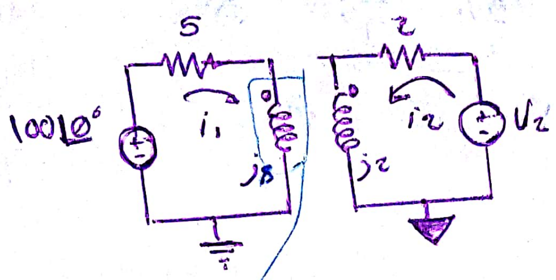
$I_1+I_2=1$

$$\underbrace{I_1(5+j2)+I_2 j2}_{V_{rama1}} = \underbrace{I_2(5+j3)+I_1 j2}_{V_{rama2}}$$

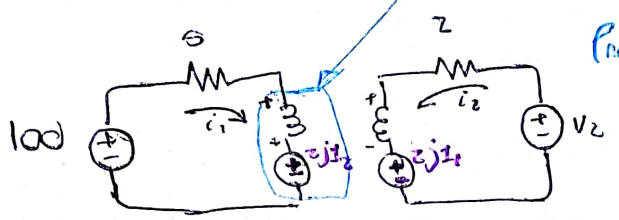
$\Rightarrow$ despejar:

$\boxed{C_{12}}$

$\boxed{A\angle B^\circ \equiv Ae^{jB}}$



$V_2 / i_1 = 0$



Propongo $\underline{I_1 = 0}$ $\Rightarrow 100 = 2j\,i_2$

$\boxed{i_2 = -50j}$

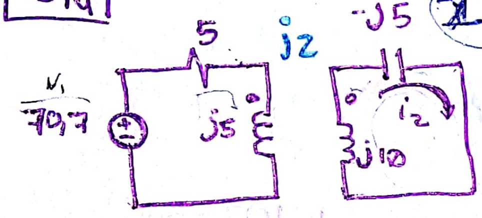
$V_2 = i_2(2+2j) = -50j(2+2j)$

$\boxed{V_2 = 100 - 100j}$

¿q' tensión aparece en la reactancia de 8 ohm en esta cond?

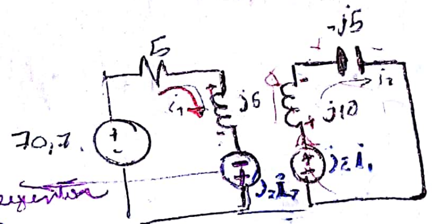
$\Rightarrow 2jI_2$

$\boxed{C_{14}}$



I_2 ?

mallas



frecuentar

$$i_1 = \frac{V_1}{5+j6} = \frac{V_1(5-j6)}{25+36} = \frac{(70,7)5}{61} - \frac{j(70,7)6}{61}$$

$i_1 \simeq 5,795 - j\,6,954$

~~mallas: ① = i_2~~

1: $70,7 + j2\,i_2 = i_1(5+j5)$

2: $2j\,i_1 = i_2(j10 - j5)$

$2j\,i_1 = 5j\,i_2$

$i_1 = \frac{5}{2} i_2$

$70,7 = i_2\left(-2j + \frac{5}{2}(5+5j)\right)$

$\boxed{i_2 = 3,316 - 2,785j}$

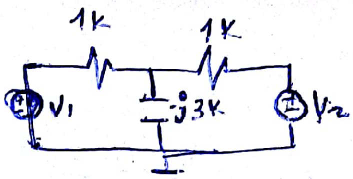
(OP) Sincronización ...

Tarea

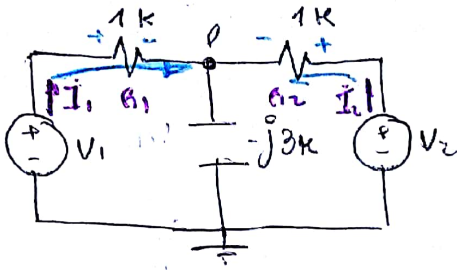
$V_1 = 220\,V_{ef}$

$V_2 = 220\,V_{ef}\, e^{j120°}$

$\boxed{V_2 = 220\, e^{\frac{2\pi}{3}}}$



potencias complejas / hacer balance de potencias



$V_2 = -110 + j\,190{,}525$.

Calculadora: Rec (Amp ; fase) $= \underline{X} + j\,\underline{Y}$

tengo que conocer las tensiones de cada elemento, para ello aplico nodos.

nodo: P

$$\frac{V_1}{1K} + \frac{V_2}{1K} = V_P\left(\frac{1}{1K} + \frac{1}{1K} + \frac{1}{-j3K}\right), \text{ volamos lo } K' \quad V_1 + V_2 = V_P\left(1 + 1 + \frac{1}{-j3}\right)$$

$$\Rightarrow V_1 + V_2 = V_P\left(\frac{-2 \cdot j3 + 1}{-j3}\right), \text{ quiero conocer } V_P = \frac{(V_1+V_2)\cdot -3j}{-6j+1} = \frac{[220 + (-110 + j190{,}525)]\cdot -3j}{-6j+1}$$

$$= \frac{(110 + j190{,}525)\cdot -3j}{(-6j+1)} \cdot \frac{(1+6j)}{1+6j} = \frac{(110 + j190{,}525)(18 - 3j)}{37}$$

$V = IZ \to I = \frac{V}{Z}$

$\Rightarrow P = I_{ef}^* V = \frac{V \cdot V^*}{Z^*}$

$P = \frac{|V|^2}{Z^*}$

$$= \frac{1980 + j3429{,}45 - 330j + 571{,}575}{37} = 68{,}9614 + j83{,}7689$$

$\boxed{V_P = 68{,}9614 + j\,83{,}7689}$

$\Rightarrow$

$P_{R_1} = I_{ef} V_{ef} = \frac{|V|^2}{R} = \frac{(V_1 - V_P)^2}{R_1} = \frac{|220 - (68{,}9614 + j\,83{,}7689)|^2}{1K} = 29{,}8298$ ~~29,1362~~

$P_{R_2} = \text{''} \quad \text{''} = \frac{(V_2 - V_P)^2}{R_2} = \frac{(-110 + j190{,}525) - (68{,}9614 + j83{,}7689)|^2}{1000} = 39{,}9448$ ~~8,10675~~

$P_{Z_C} = I_{ef} V_{ef}^* = \frac{|V|^2}{Z^*} = \frac{|V_P|^2}{Z_C^*} = \frac{(110)^2 + (190{,}525)^2}{+j3K} = -j \cdot 16{,}1332$

$$S_{V_1} = V_1 \cdot I_{ef}^* = V_1 \cdot \frac{(V_1 - V_P)^*}{R_1} = \frac{220 \cdot (151{,}0386 + j83{,}7689)}{1000} = 33{,}22 + j\,18{,}429$$

$$S_{V_2} = V_2 I_{ef}^* = V_2 \cdot \frac{(V_2 - V_P)^*}{R_2} = \frac{(-110 + j190{,}525)(-178{,}96114 + j106{,}7561)}{1000}$$

$$= 19{,}6857 + (-j34{,}09657) + j11{,}7437 + 20{,}3397.$$

$S_{V_2} = 40{,}0254 - j\,22{,}3528$

$\Sigma S_{fuent} = \Sigma S_{Z_i} \Rightarrow$

$73{,}2459 - j\,3{,}9235$

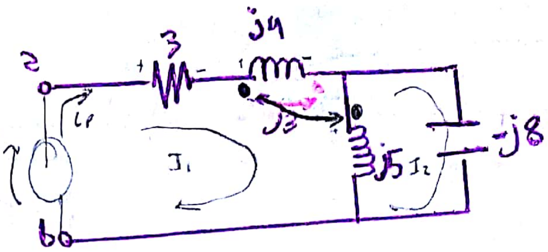
Gervin Cuentas

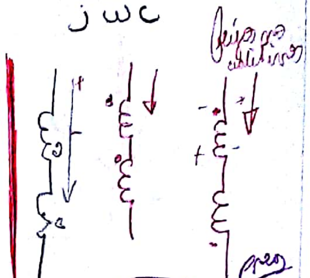
8-octubre-19 Encontrar impedancia de entrada.

$Z_L = jwL$

$Z_c = \frac{1}{jwc}$

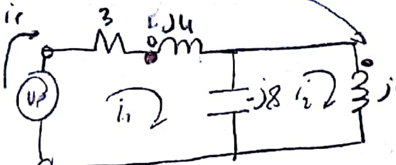
C15A





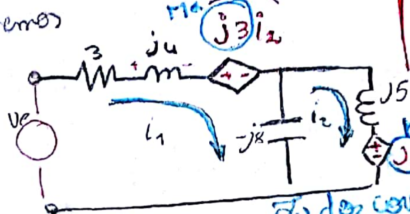
$\boxed{V_L = L\,i'}$ $V_{AL} = M i'$

(j3 = jwM) (a)



transformemos

Es una fuente de tensión



Planteo mallas

$$\begin{cases} \text{I)}\ \dot{i}_2 j3 + V_P = i_1(3+j4-j8) + i_2 j8 \\ \text{II)}\ -\dot{i}_1 j3 = i_1 j8 + i_2(j5-j8) \end{cases}$$

Busco la relación V_P con i_P

$\boxed{i_1 = i_P}$

$$\boxed{i_2 = \frac{i_P j8 + i_P j3}{j3}} = i_P(1 + 8/3) = \frac{11}{3} i_P$$

Las dos corrientes se encuentran entonces son aditivas

Reemplazando en (I)

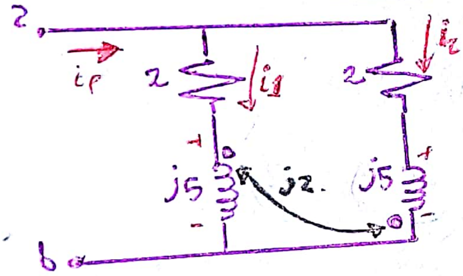
$$-\frac{11}{3} i_P j3 + V_P = i_P(3-j4) + \frac{11}{3} i_P j8.$$

Quiero buscar V_P/i_P

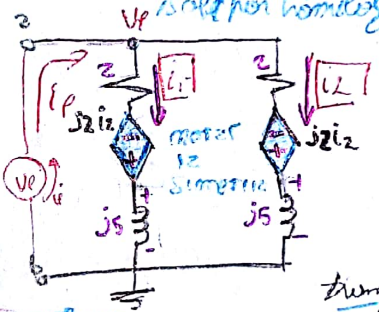
$$V_P = i_P\left(3 + 11j - j4 + \frac{11}{3} 8j\right)$$

$$\Rightarrow \frac{V_P}{i_P} = Z_{Ab} = 3 + \frac{109}{3} j \Rightarrow \boxed{Z_{AB} = 3 + \frac{109}{3} j}$$

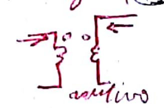
C15B

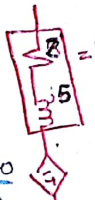


Entra por homólogo
sale por homólogo.



análogo al (II)





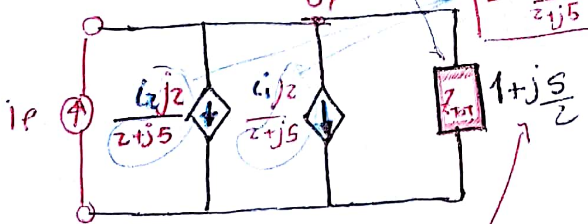
$= 2 + j5 = Z_{tot}$

$\Rightarrow i_{norma} = \frac{j2 i_2}{2+j5}$

como quedan impedancias iguales y en paralelo

transformo a fuente de corriente

$$\boxed{Z = \frac{j2}{2+j5}}$$



$Y_{TOT} = 2(2+j5)^{-1} = 2 \cdot \frac{1}{2+j5}$

$Z_{TOT} = \frac{1}{Y_{TOT}} = \frac{2+j5}{2} = 1 + j\frac{5}{2}$

nodo

$$(i_P)\quad i_P - Z(i_1 + i_2) = V_P\left(\frac{1}{Z} j\right)$$

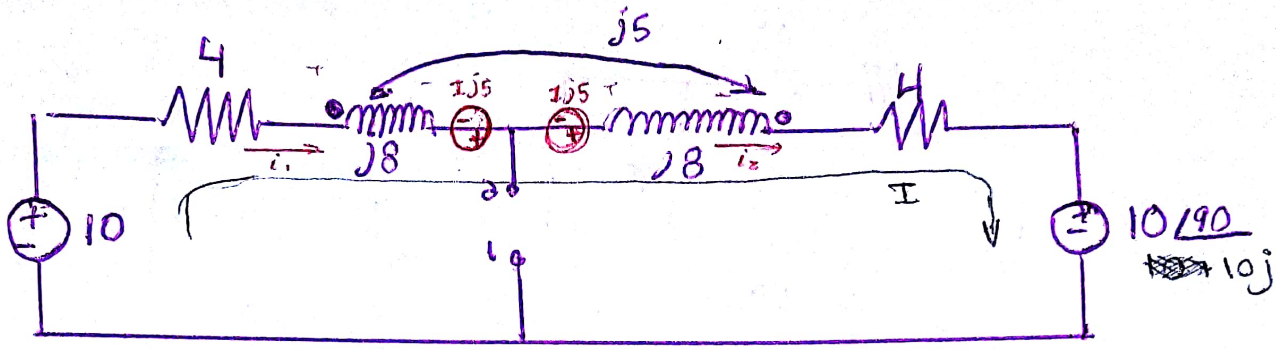
$$i_P - Z i_P = V_P\left(\frac{1}{Z} i\right)$$

$$i_P(1 - Z) = V_P\left(\frac{j}{Z}\right)$$

$$\frac{V_P}{i_P} = Z_{ab} = \frac{Z}{j}(1 - Z) = \frac{36}{841} - \frac{206 j}{841}$$

$$v = M i' \Rightarrow i' = \frac{V}{M}$$

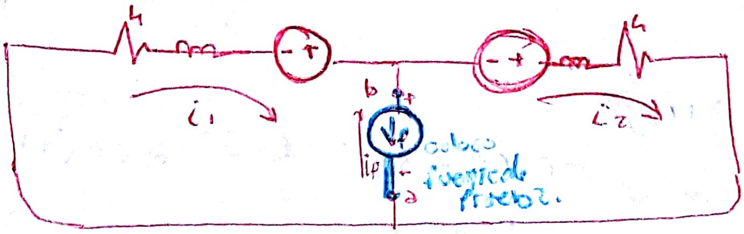
G16

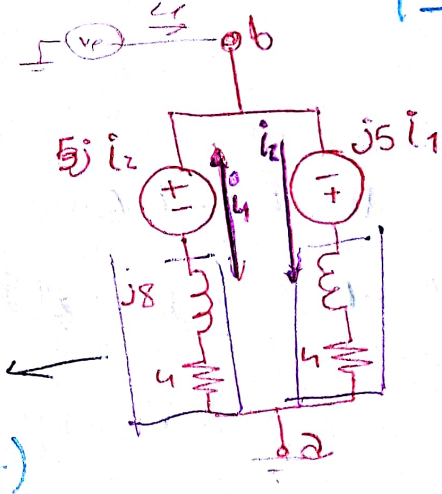


Pasivo fuentes independientes

y defino las corrientes.

como Pep 11





resuelvo por nodos $i_p + i_1 = i_2$, $Z = j8+4$

igual al $\boxed{C11}$

$V_p\left(\frac{1}{Z}+\frac{1}{Z}\right)$

$$i_p + \frac{5j\,i_2}{Z} - \frac{5j\,i_1}{Z} = V_p\left(\frac{2}{Z}\right)$$

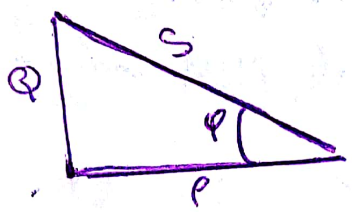
$$i_p + \frac{5j}{Z}\underbrace{(i_2 - i_1)}_{i_p} = V_p\left(\frac{2}{Z}\right)$$

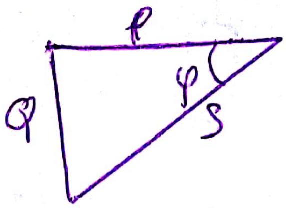
$$i_p\left(1+\frac{5}{Z}j\right) = V_p\left(\frac{2}{Z}\right)$$

$$\frac{V_p}{i_p} = Z_{ab} = \left(1+\frac{5}{Z}j\right)\frac{Z}{2}$$

$$\boxed{Z_{ab} = 2 + \frac{13}{2}j}$$

Corrección del factor de potencia





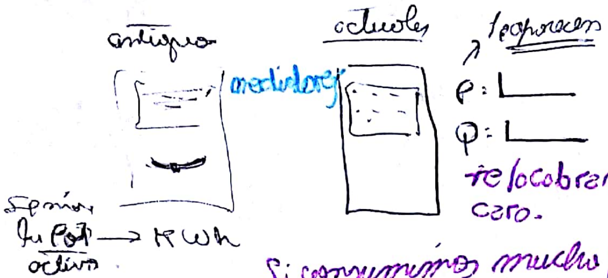
$S = P + jQ$

↓ aparente (VA)

↳ reactiva (VAR)

↳ Activa (W)

Factor de Potencia $FP = \cos(\varphi)$



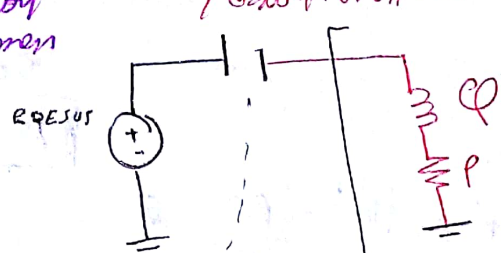
dice algo de $FP < 0,8$ multa

$FP < 0,6$ más multa

Si consumimos mucha pot reactiva, nos ponen multa

Energía q' usamos calentar los cables, energía perdida.

Todo tienen inductores



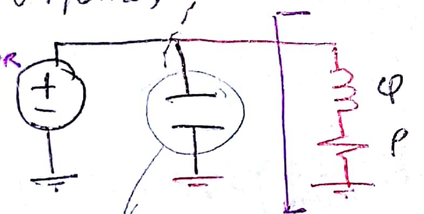
quiero compensar este φ, quiero volverlo menos inductivo.

fabrica

si lo pongo en serie me va a bajar la tensión q' obtenga según la corriente que use.

así me aseguro q' tenga 220.

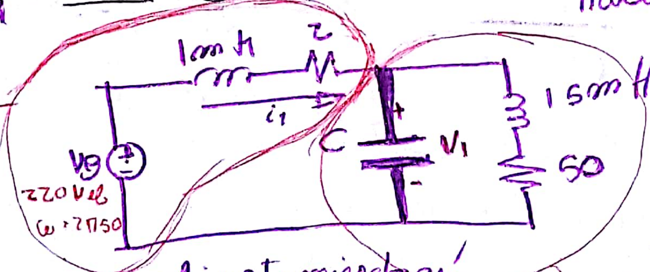
entonces



capacitor compensación

C18

Prey



Halla C tal q' V_1 e I_1 estén en fase

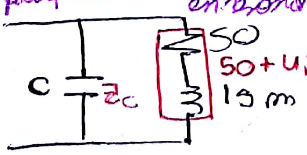
$\Rightarrow \cos\varphi = 1 \Rightarrow \boxed{\varphi = 0}$

V en fase con I $= \cos\varphi = 1$

$S = P + jQ$

$= Z \in \mathbb{R} =$ $= \text{Arg}(Z) = 0$ equivale a $\varphi = 0 \Rightarrow \boxed{S = P}$ potencia solamente activa (*)

Zeq me pide esto mirado así en resonancia



Si $Z_{eq} \in \mathbb{R} \Rightarrow V_{eq} \in \mathbb{R}$

$Y_T = Y_C + \frac{1}{50 + j4,71} \Rightarrow Y_T = Y_C + 19,82m - j\,1,8683m$

→ Entonces para q' me anule parte imaginaria $Y_C = +j$

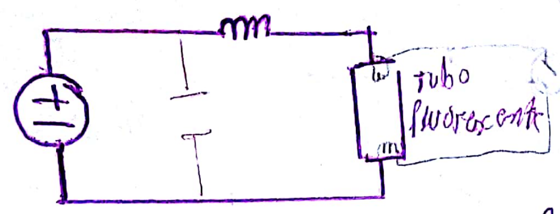
$Y_C = +j\,1,8683m$

$Y_C = j\omega C \rightarrow \frac{j\,1,8683m}{j\,314} = \boxed{C = 5,95\mu}$

(*) Pedir que $\varphi = 0$, es pedir que $S = P + jQ$ sea en resolución $S = P$ por lo que la reactancia $= 0$ en resolución y dicen que el circuito está en resonancia

C19

220Vef



$Pot_{tubo} = 60W$ (sin cos φ)

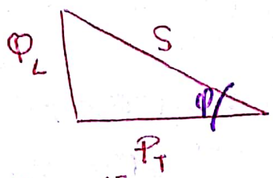
$V_t = 72 Vef$ · considerar el tubo como una resistencia

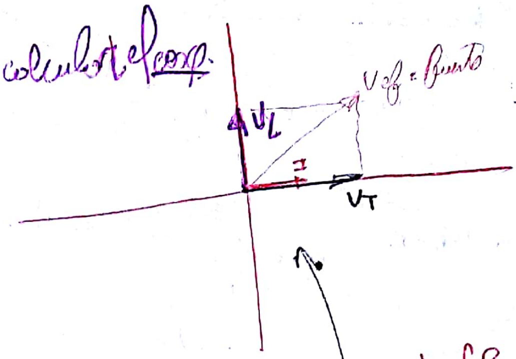
$V_L = Z_c \cdot I$
$= j\omega L \cdot I$
real

$V_T = I \cdot R$
escalar

$\Rightarrow I \in$ eje Real

intento buscar las potencias para calcular el cos φ.





$fp = \cos\varphi$

$\Rightarrow 220^2 = |V_T|^2 + |V_L|^2$

$V_L = \sqrt{220^2 - 72^2} = 207{,}884$

$\boxed{S_1 = Q_L + P_T}$

por estar en serie

$Q_L = V_L I_L^* =$

$|Q_t| = |V_t| \cdot |I_t| \Rightarrow |I_L| = \frac{|P_t|}{|V_t|} = \frac{5}{6}$

$Q_L = \overset{V_L}{207{,}884} \cdot \overset{|I_L|}{(5/6)}$

$\boxed{Q_L = 173{,}2366}$

$\Rightarrow S_1 = \overset{P_T}{60} + j\overset{Q_L}{173{,}2366}$
inductor complejo y positivo

$\boxed{\cos\varphi_1 = 0{,}33 = \frac{60^{P_T}}{\sqrt{60^2 + 173{,}2366^2}} = S_1}$

$\Rightarrow$ necesito un $\cos\varphi_2 = 0{,}8$

$\Rightarrow S_f = 60W + jQ_f$

~~$\text{Arctg}\left(\frac{Q_f}{60}\right) = \text{Arcos}(0{,}3)$~~

mas facil

$\cos(\varphi) = \frac{P}{\sqrt{60^2 + Q^2}} = 0{,}8 = \sqrt{\left(\frac{60}{0{,}8}\right)^2 - 60^2} = 45$

$\Rightarrow \boxed{Q_F = 45\ VAR}$

Estos son los q' tienen q' consumir con un capacitor ya puesto.

$Q_F - Q_i = 45 - 173{,}2360$
$= -128{,}24$

por tener en

$\boxed{Q_C = VI^* = -j128{,}24 VAR}$

$\frac{|V|^2}{Z_c^*} = -j128{,}24 \Rightarrow (220)^2 \cdot (j\omega C)^* = -j128{,}24$

$\boxed{C = 8{,}44\ \mu}$

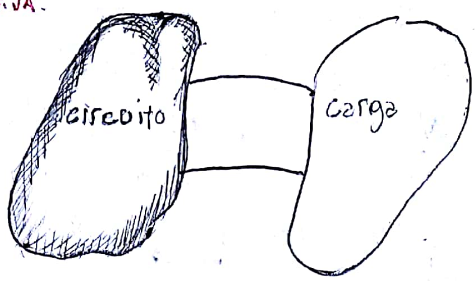
MTP → Maxima transferencia de Potencia

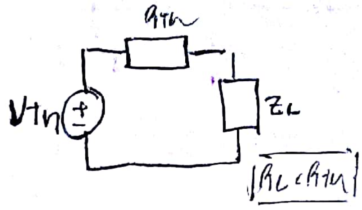
→ teorema de maxima transferencia

→ teorema de máxima transferencia de Potencia Activa a la carga

$S = P + jQ$ → Reactiva

↳ Activa

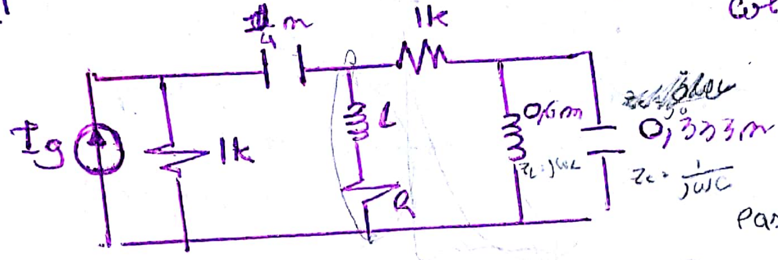




Si $\boxed{Z_L = Z_{Th}^*}$

$\boxed{E\ 20}$

calcular L y R para q' la pot entregada sea maxima.

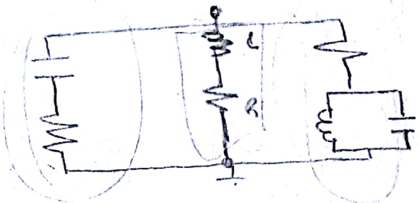


$I_g = 5mA \cdot e^{i0}$

$W = 2 \cdot 10^6 \frac{rad}{s}$

Pasivo fuentes indep.

$Z_{eq} = 2100 - j2200\ \Omega$



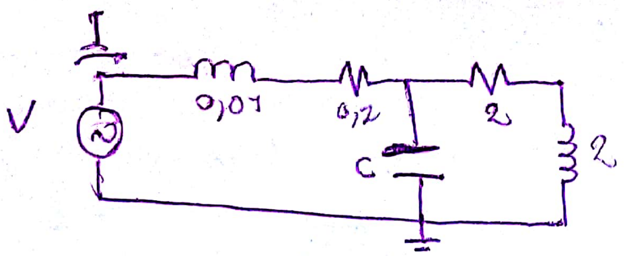
$Z_L = R + j\omega L = Z_{eq}^*$

$R = 2100$

$j\omega L = (-j2200)^* \to L = 1,1m$

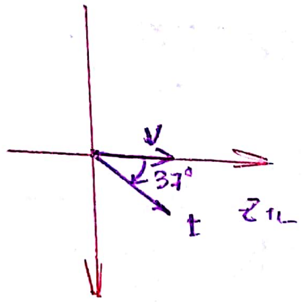
$$R_{Th} = \frac{1}{\frac{1}{j\omega \cdot 0.6m} + j\omega \cdot 0.333m} + 1k \,//\, \ldots$$

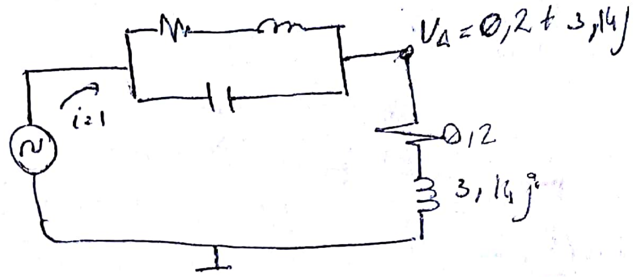
a terminar

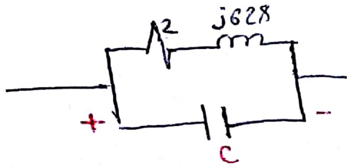


Encontrar C tal que I atrase 37° respecto de V. , $\omega = 314$

$$Z_{in} = \frac{V}{I} = \underset{\text{modulo}}{\bigcirc} \angle 37^\circ$$







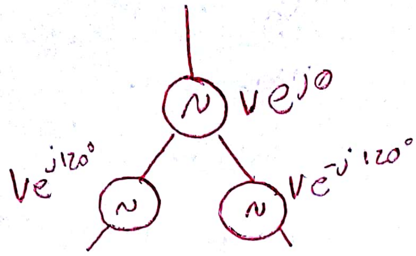
$$(2+j628) // \frac{-j}{314C} = \frac{\frac{-j}{314.C}(2+j628)}{2+j628-\frac{j}{314.C}}$$

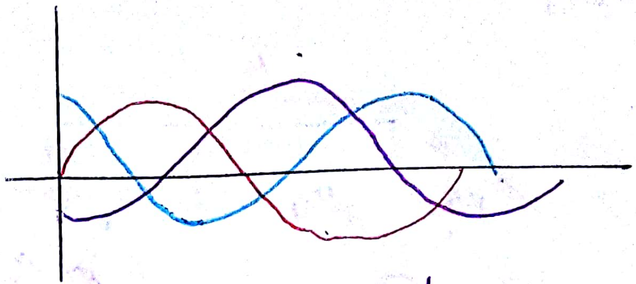
$$= \frac{\frac{-j}{314.C}(2+j628)}{j(628-\frac{1}{314C})} = \frac{\left(\frac{2}{C}-\frac{2j}{314.C}\right)\left(2-j\left(628-\frac{1}{314.C}\right)\right)}{4+\left(628-\frac{1}{314.C}\right)^2}$$

$$Z_{eq} = \frac{4}{C} - \frac{4j}{314C} - \frac{2j}{C}\left(628-\frac{1}{314C}\right) - \frac{2}{314C} \cdot \left(628-\frac{1}{314.C}\right)$$

$$\Rightarrow \begin{cases} Re(V) = 0,2 + \dfrac{\frac{4}{C}-\frac{2}{314.C}\left(628-\frac{1}{314C}\right)}{A} \\ Im(V) = 3,14 - j\left(\frac{4}{314.C} + \frac{2}{C}\left(628-\frac{1}{314C}\right)\right) \end{cases}$$

Trifasica.

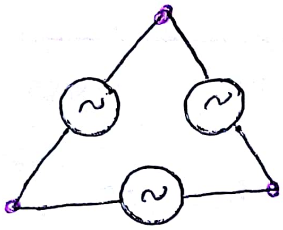


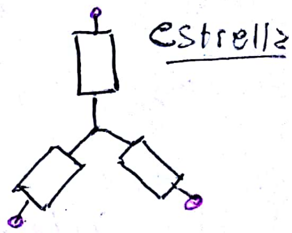


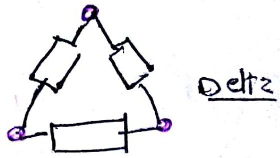
desfasaje 120° cada uno.

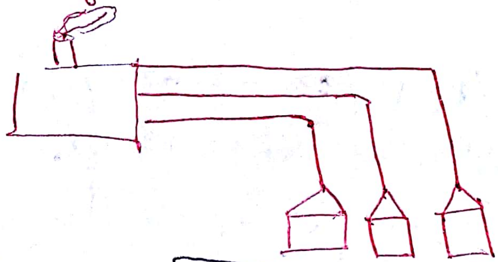
3 fuentes desfasadas

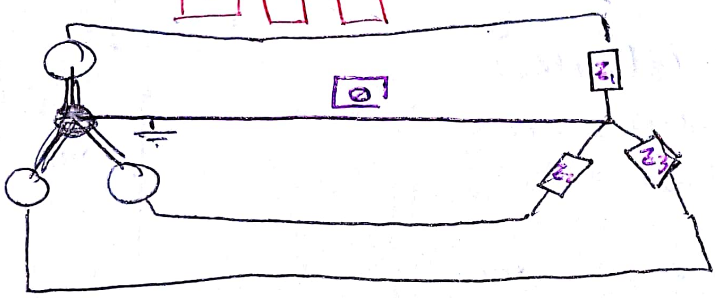
q' beneficio tiene?

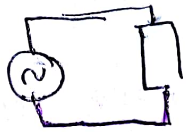






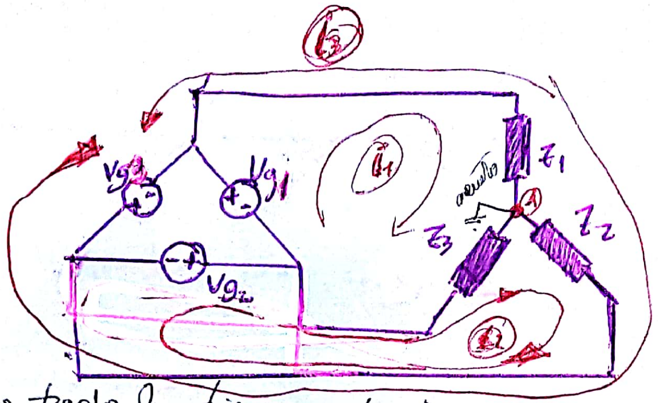






La ventaja es un cable q' tiene q' tener corriente cero, y ademas nos ahorramos cant de cables.

C21



$Z_1 = Z_2 = Z_3 = Z = 2 + j3$

$V_{g1} = 380\,e^{j0}$
$V_{g2} = 380 \cdot e^{-j120°}$
$V_{g3} = 380 \cdot e^{+j120°}$

Ref.

$\frac{2\pi}{3}$

$V_{g3} = -190 + j\,329{,}089...$
$V_{g2} = -190 - j\,329{,}089...$

quiero todas las tierras y tensiones.

① $V_{g1} = i_1(Z_1 + Z_3) - i_2 Z_3 + i_3 Z_1$

② $V_{g2} = -i_1 Z_3 + i_2(Z_2 + Z_3) - i_3 Z_2$

③ $V_{g3} = -i_1 Z_1 - i_2 Z_2 + i_3(Z_1 + Z_2)$

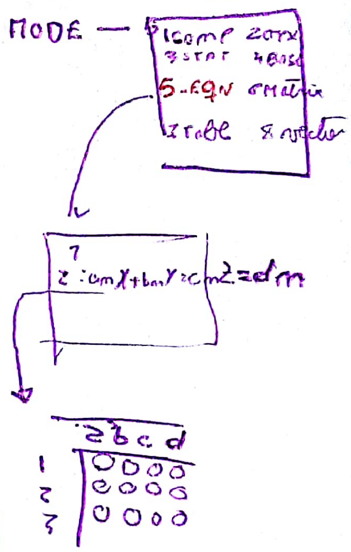
$$\begin{pmatrix} V_{g1} \\ V_{g2} \\ V_{g3} \end{pmatrix} = \begin{pmatrix} 2Z & -Z & +Z \\ -Z_3 & 2Z & -Z \\ -Z & -Z & +2Z \end{pmatrix} \begin{pmatrix} i_1 \\ i_2 \\ i_3 \end{pmatrix}$$

$\not\exists\, \angle 0$ *

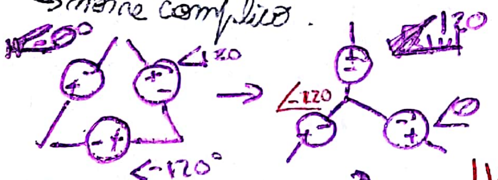
* Pero lo q' sabías que hacer es decir en el nodo A $i_1 + i_2 + i_3 = 0$ son todos entrantes

$$\begin{pmatrix} 380 \\ -190 + j\,329 \\ -190 - j\,329 \end{pmatrix} = \begin{pmatrix} 4+6j & -(2+3j) & -(2+3j) \\ -(2+3j) & 4+6j & -(2+3j) \\ -(2+3j) & -(2+3j) & 4+6j \end{pmatrix} \begin{pmatrix} i_1 \\ i_2 \\ i_3 \end{pmatrix}$$

Calculadora:

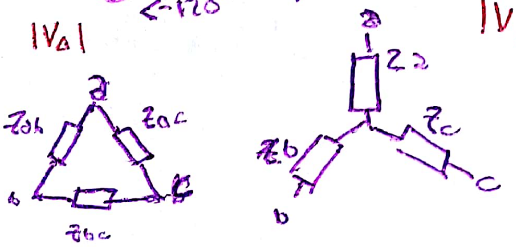


Si me re complico.



$|V_\Delta|$

$|V_\lambda| = \sqrt{3}\,|V_\Delta|$



$\Delta \to \lambda$

$$Z_a = \frac{Z_{ab}\, Z_{ac}}{Z_{ab} + Z_{bc} + Z_{ac}}$$

$$Z_b = \frac{Z_{ab}\, Z_{bc}}{Z_{ab} + Z_{bc} + Z_{ac}}$$

$$Z_c = \frac{Z_{ac}\, Z_{bc}}{Z_{ab} + Z_{bc} + Z_{ac}}$$

$\lambda \to \Delta$

$$Z_{ab} = \frac{Z_a \cdot Z_b + Z_a \cdot Z_c + Z_b \cdot Z_c}{Z_c}$$

$$Z_b = \frac{Z_{ab}\, Z_{bc}}{Z_{ab} + Z_{bc} + Z_{ac}}$$

$$Z_c = \frac{Z_{ac} \cdot Z_{bc}}{Z_{ab} + Z_{bc} + Z_{ac}}$$

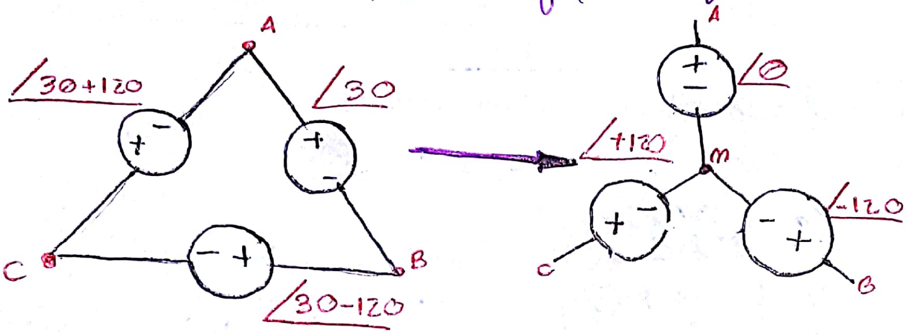
conjunto q' veníamos

$$\begin{pmatrix} 380 \\ -190-329j \\ 0 \end{pmatrix} = \begin{pmatrix} 4+6j & -2-3j & -2-3j \\ -2-3j & 4+6j & -2-3j \\ 1 & 1 & 1 \end{pmatrix}$$

$$i_1 = \frac{760}{39} - \frac{380j}{13} \qquad i_2 = -\frac{1367}{39} - \frac{88}{13}j \quad \left(\frac{1140j}{39}\right) \qquad i_3 = \frac{609}{39} + \frac{1728}{39}$$

Los modulos tienen que dar iguales (porq' el circ. está balanceado).

Sadiku: 518



$|V_\Delta|$ $\qquad$ $|V_\lambda| = \sqrt{3}\,|V_\Delta|$

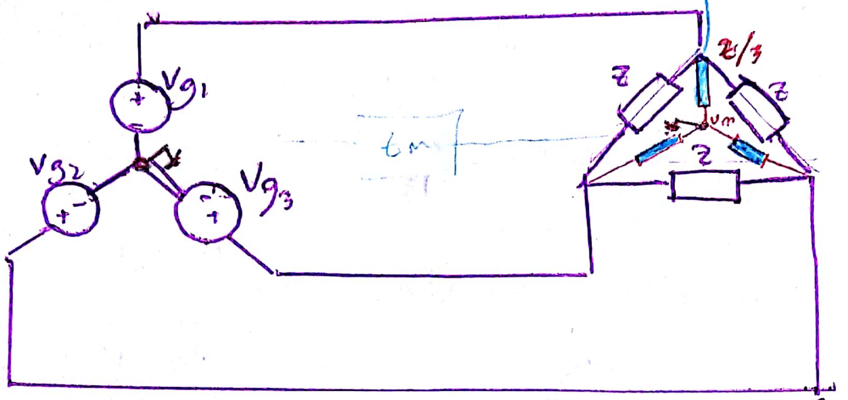
$$i_{Z_1} = \frac{51}{13} - \frac{2368}{39}j$$

$$i_{Z_2} = \frac{-658}{13} - \frac{1316}{39}j$$

$$i_{Z_3} = -\frac{668}{13} - \frac{1316}{39}j$$

C23

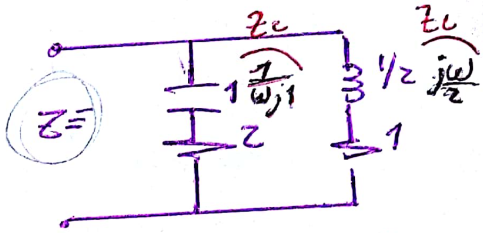
$\frac{Z \cdot Z}{Z+Z+Z} = \frac{Z^2}{3Z} = Z/3$



$V_{g1} = 220\, e^{j0}$

$V_{g2} = 220\, e^{-j120}$

$V_{g2} = 220\, e^{+j120}$



D - Hallar la frec de resonancia del circuito, Para q' se encuentre en resonancia la parte imaginaria debe ser cero / como q' tenemos ω hay q' hacerlo a mano.

$Z = (2 + \frac{1}{j\omega}) // (1 + j\frac{\omega}{2})$ $\Rightarrow Z = A + 0j$

$= (2 - j\frac{1}{\omega}) // (1 + j\frac{\omega}{2})$

$Z = \frac{(2 - \frac{1}{\omega}j)(1 + \frac{\omega}{2}j)}{2 - \frac{1}{\omega}j + 1 + \frac{\omega}{2}j} = \frac{2 + \omega j + \frac{1}{\omega}j + \frac{1}{2}}{3 + (\frac{\omega}{2} - \frac{1}{\omega})j}$

$Z = \frac{(\frac{5}{2} + (\frac{5}{2} + (\omega - \frac{1}{\omega})j)}{3^2 + (\frac{\omega}{2} - \frac{1}{\omega})^2} \cdot (3 - (\frac{\omega}{2} - \frac{1}{\omega})j) = A + 0j$

La parte real no me importa $\Rightarrow = 0$.

Quedandome los cruzados $\rightarrow$ $\frac{-\frac{5}{2}(\frac{\omega}{2} - \frac{1}{\omega})j + 3(\omega - \frac{1}{\omega})j}{9 + \frac{\omega^2}{4} - 1 + \frac{1}{\omega^2}} = 0$

Esos son los imag.

no me interesa

$\frac{5\omega}{4} - \frac{5}{2\omega} = 3\omega - \frac{3}{\omega} \Rightarrow \frac{5\omega}{4} - 3\omega = \frac{5}{2\omega} - \frac{3}{\omega}$

Planteamos nodos: $Z_1 = Z/3$ / toda la impedancia que hay desde V_g hasta el nodo V_m

$-\frac{7}{4}\omega = -\frac{1}{2}\cdot\frac{1}{\omega}$

$\boxed{\omega^2 = 2/7}$

$\boxed{\omega = \frac{\sqrt{14}}{7}}$

Frec. Para q' entre en resonancia.

$Z_1 = Z/3$
$Z_2 = Z/3$
$Z_3 = Z/3$

como sabemos q' es balanceado

V_m: $\frac{V_{g1}}{Z_1} + \frac{V_{g2}}{Z_2} + \frac{V_{g3}}{Z_3} = V_m(\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3})$ $V_m = 0$.

$+V_m(\frac{1}{Z_m})$

0

Es simétrica con R centrales tierras.

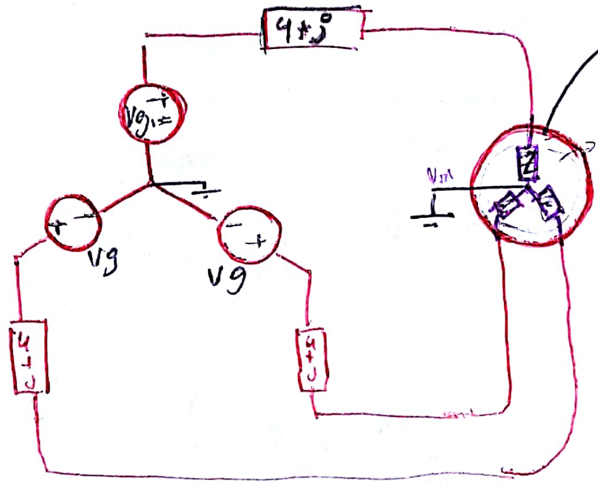
$\frac{3}{Z}(V_{g1} + V_{g2} + V_{g3}) = 0$

$\Rightarrow$ $Z_C = \frac{7}{\sqrt{14}} j$ // $Z_C = \frac{1}{\omega j}$

$Z_L = \frac{1}{\sqrt{14}} j$ // $Z_L = \frac{j\omega}{2}$

... una impedancia de $(4+j)\Omega$ por fase. Si alimenta una carga de un 1M VA con FP = 0,75. Hallar la potencia compleja, la 'C' para FP = 0,95, Pérdida de potencia en la línea.

Trifásico: 3500 Vrms = Vef, 50 Hz, $Z = (4+j)\Omega$ por fase. carga $1\frac{MVA}{?}$



→ 1MVA, FP = 0,75 atrasado, 3500 Vef.

→ hay q' interpretarlo asumo q' está balanceado. *

el fabricante te dice

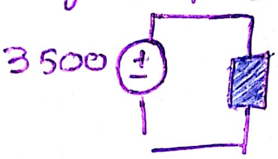
VA 220

Si fuera monofásica

→ como está balanceado yo pienso en una sola

y como dice FP = 0,75

Tengo q' ue pensar en algo como:



$\cos\varphi = \frac{P}{S}$

FP → ATRASADO = inductor; → ADELANTADO = capacitor

Pot activa ← $P = \frac{0,75}{\cos(\varphi)} \cdot \frac{1MV}{S} = 750KW$

Pot reactiva ← $\boxed{Q = \sqrt{(1M)^2 - (750K)^2} = 661,44K\,VAR}$

$S = 750K \oplus j661,44K$ ← por q' me dice q' es atrasado

Estoy buscando ver un modelo de como es la configuración de impedancias dentro de la carga.

$S = \frac{|V|^2}{Z^*}$

$Z^* = \frac{|V|^2}{S} = \frac{(3500)^2}{750000 + j661440} = 74951,82 - j\,661499,14$

$\boxed{Z = 9,186 + j\,8,102}$ Reemplazo en la máquina (*)

• $S_{g1} = V_{g1} \cdot I_1^*$, $I_1 = V_{g1} \cdot \frac{1}{Z+(4+j)}$ = 179,78 + j124,09 — mallas hasta el nodo Vn

análogo para las otras líneas

Pérdida de pot en la línea

• $\boxed{S_{Z1} = I_1^* V_1 = Z_L \cdot |I_1|^2 = 141K + j47,7K}$ — (4+j)

• Si quiero FP = 0,95? → agrego un capacitor a cada Z tal q' FP = 0,95

(*) $Q_C = 246,5K - 661,44K = -414,44K$

$S = VI^* = \frac{|V|^2}{Z^*} = -j414,44K$

despejo 'Z' y luego 'C'

mantengo la pot activa

$P = 750KW$

$|S| \cdot 0,95 = 750K$

$|S| = 789K$

$Q = \sqrt{(789K)^2 + (750K)^2}$

$= 246,5K$ (*)

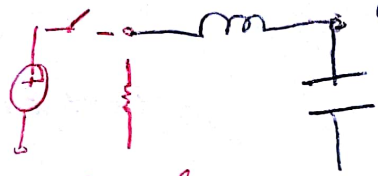
Fuentes swiching

manejan el valor medio

continua Valor med = Vc

unas

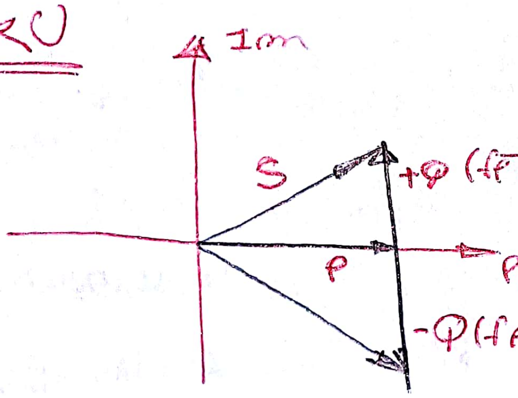
duty cycle



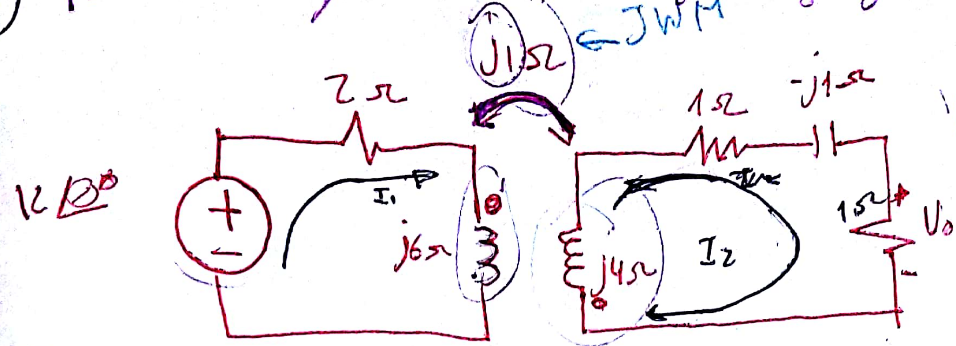
Swichiando puedo generar las tensiones que yo quiero

5 @ 1500A

Sadiku



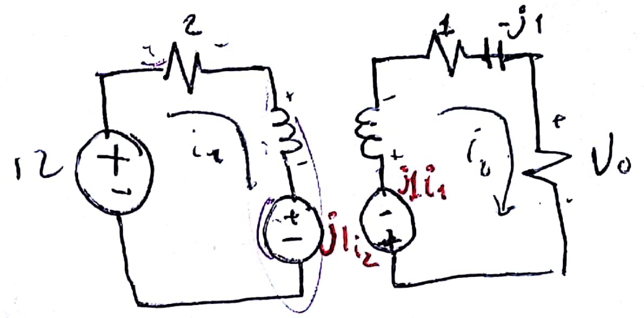
(3) Hallar V_0 y la pot. complejo conjugada entregada por el gen. realizar un diagrama fasorial de corrientes y tensiones en cada elemento.



$\cancel{V_1 m = V_2}$

$\cancel{I_1 = m I_2}$

Hago 2 mallas



$\cancel{12}\ i_1$

$12 - jI_2 = I_1 (2 + j6) \Rightarrow$

$I_1 = (12 - jI_2)/2+j6$

$-jI_1 = I_2 (1 + 1 + j4 - j1)$

$I_{L_2} j\omega M = j1 I_{L_2}$

$$-j\frac{(12 - jI_2)}{2+j6} = I_2 (2+3j)$$

$-j(12 - I_2) = I_2(-14 + 18i) = I_2 - 12j \Rightarrow I_2[(-14+18j) - 1] = -12j$

Shift Abs

$$\boxed{I_2 = \frac{-12j}{-15+18j}} = -\frac{24}{61} + \frac{20}{61}j$$

$$I_1 = \frac{12 - j\left(\frac{-24}{61} + \frac{20}{61}\right)}{2+j6}$$

Shift cmplx → ang

$\Rightarrow V_0 = I_2 \cdot 1\Omega$

$\cancel{V_0} = I_2$

$$\boxed{I_1 = \frac{206}{305} - \frac{558}{305} i}$$

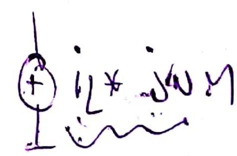
$I_1 = 595 \angle -1{,}22\text{ rad} \quad 70°$

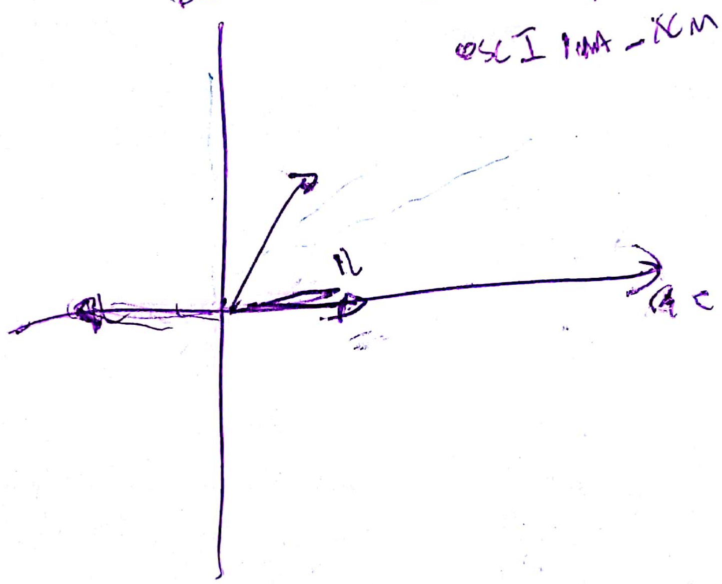
esc V 1V _ ycm

esc I 1mA _ xcm

$i' = j\omega i$ (RSP)

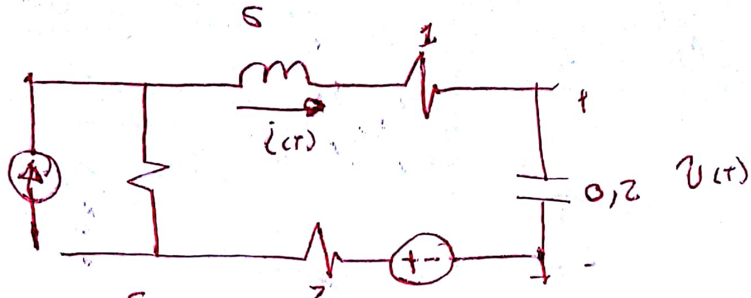
$i' M = i j\omega M$



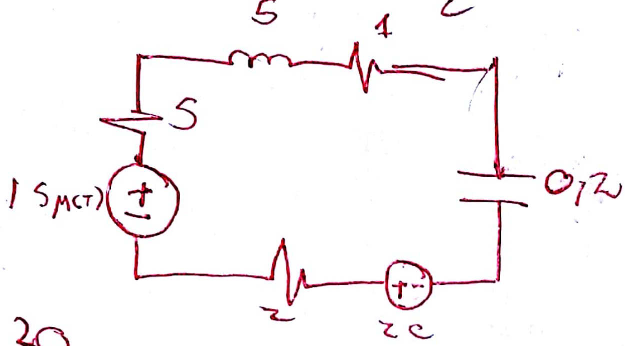


t
(ANS)

$tg = \frac{O}{A}$



$\omega = \frac{1}{2\pi f}$



$20 + 15\mu(t) + i(2+5+1) + 5i' + \frac{1}{0,2}\int i$

$20 + 15\mu(t) = 8i + 5i' + 5\int i$ Derive

$15\delta(t) = 8i' + 5i'' + 5i$

$3\delta(t) = i'' + \frac{8}{5}i' + i \rightarrow$ Raices $-\frac{4}{5} \pm \frac{3}{5}i$

Es todo alto
no me deja, la ec es homogenea

R+A: $\left[A \operatorname{sen}\left(\frac{3}{5}t\right) + B\cos\left(\frac{3}{5}t\right)\right]e^{-\frac{4}{5}t}\mu(t)$

$i(0^+) = 0 = B$

$i'(0^+) = B\left(-\frac{4}{5}\right) + 1\cdot\left(A\cdot\frac{3}{5}\right) = 3$

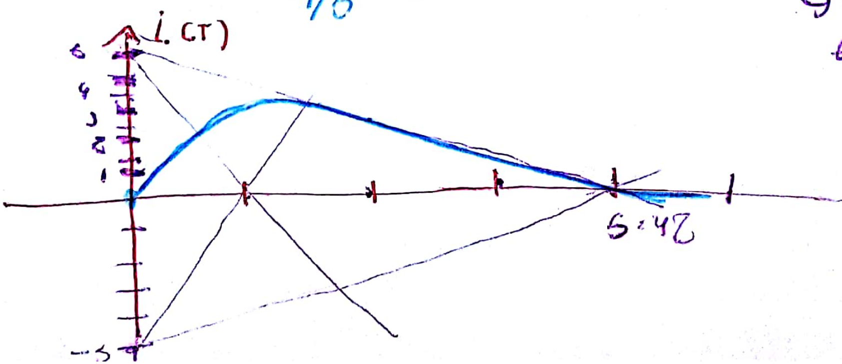
$\Rightarrow \boxed{A = 5}$

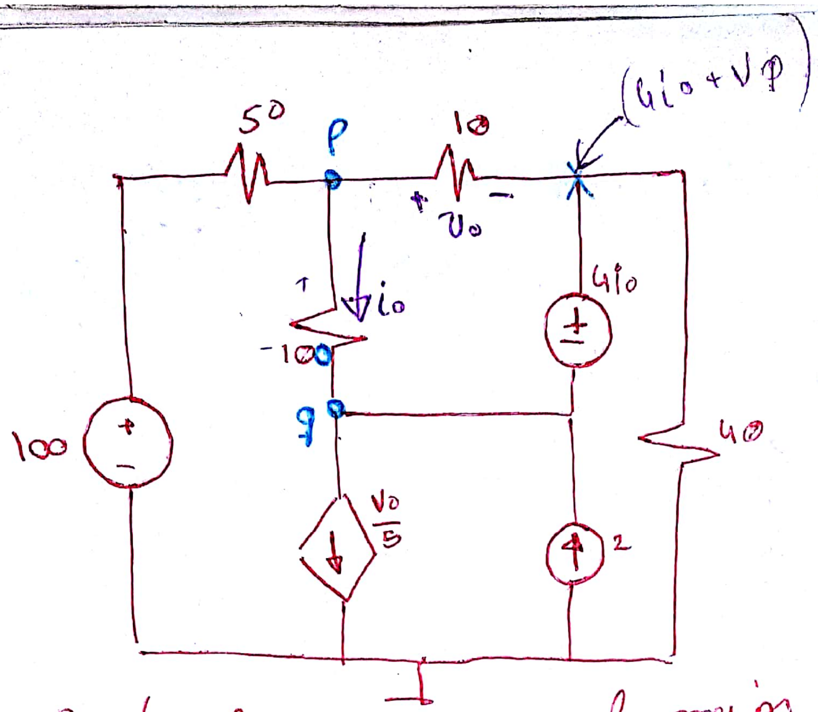
$i(t) = 5\operatorname{sen}\left(\frac{3}{5}t\right)\cdot e^{-\frac{4}{5}t}$

$\omega = 3/5$, $f = \frac{3}{5}\frac{1}{2\pi} \Rightarrow \boxed{T = \frac{2\pi 5}{3} \simeq 10,5}$

$\tau = \frac{1}{4/5} = 5/4 \simeq 1,25. \rightarrow 4\tau = 5$

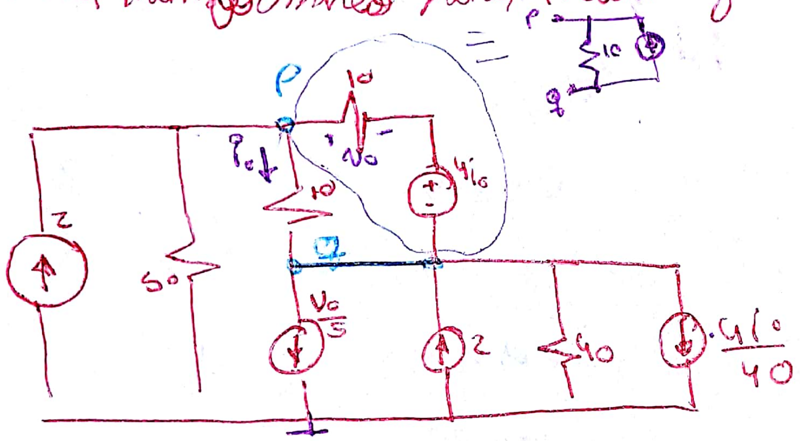
↳ menos media onda





$$\begin{cases} i_o = \dfrac{V_P - V_Q}{10} \\ v_o = V_P - (4i_o + V_P) \end{cases}$$

vamos a transformarlo para verlo mejor



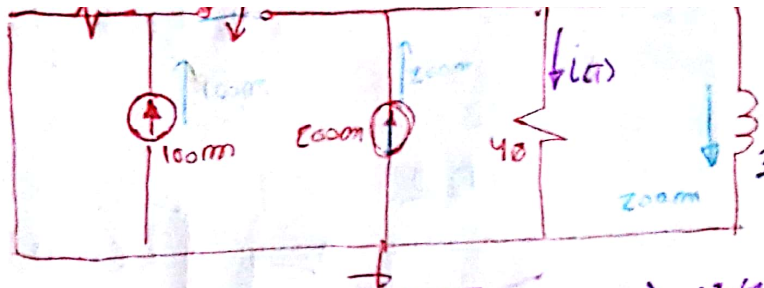
$$P: \; 2 + \frac{4 i_o}{10} = V_P\left(\frac{1}{10} + \frac{1}{10} + \frac{1}{50}\right) - V_Q\left(\frac{1}{10} + \frac{1}{10}\right)$$

$$Q: \; 2 - \frac{V_o}{5} - \frac{4i_o}{40} - \frac{4i_o}{10} = V_P\left(\frac{1}{10} + \frac{1}{10}\right) + V_Q\left(\frac{1}{40} + \frac{1}{10} + \frac{1}{10}\right)$$

$$\begin{cases} i_o = \dfrac{V_P - V_Q}{10} \\ V_o = \cancel{V_P - V_P} - 4i_o \end{cases}$$

→ resolver

2



Potencia disipada en R = 40 en T = 25 ms

Busco $V_L(T)$, es mejor
$V_L = L\, i'_C$

$\boxed{T=0^-}$ $V_L(T=0^-) = 0$.
$i_L(T=0^-) = 200m$

$\boxed{T=0^+}$ $V_L(T=0^+) = 12/7$

100m

⇒ divisor de corriente +

$i(T=0^+) = \frac{100m \cdot 30}{30+40}$

$\boxed{i(T=0^+) = 3/70}$

. cobalto un nodo.

$$100m + 200m = V_L \cdot \left(\frac{1}{30} + \frac{1}{40}\right) + \frac{1}{30m}\int V_L$$

derivo

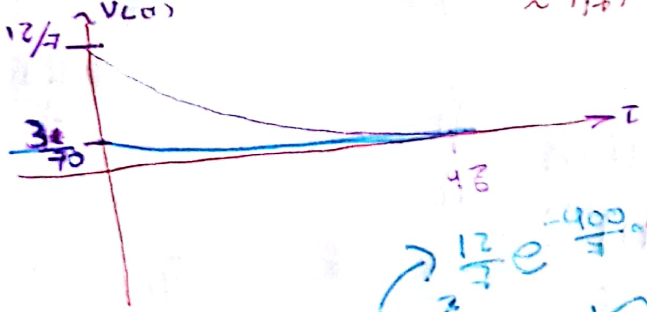
$$0 = \frac{7}{120} V_L' + \frac{100}{3} V_L \quad , \text{Propongo Sol: } V_L = Ae^{\lambda T}, \; V_L' = Ae^{\lambda T}\cdot\lambda$$

$$\frac{7}{120}\lambda + \frac{100}{3} = 0 \Rightarrow \lambda = -\frac{4000}{7} \simeq -571{,}430$$

$$\Rightarrow V_L(T) = Ae^{-\frac{4000T}{7}}\,\mu(T)$$

$$V_L(T=0^+) = \frac{12}{7} = Ae^{-(\;)0} = \boxed{A = \frac{12}{7}} \Rightarrow \boxed{V_L(T) = \frac{12}{7}e^{-\frac{4000T}{7}}}$$

$\simeq 1{,}71$



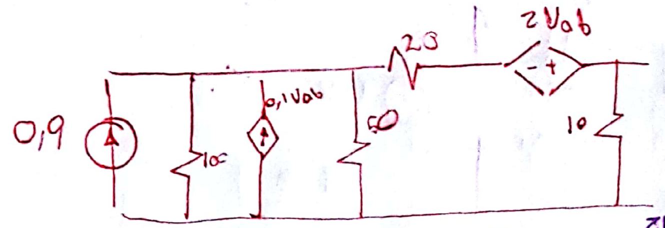
$i(T) = \frac{V_L}{R_{40}} = \frac{3}{70}$

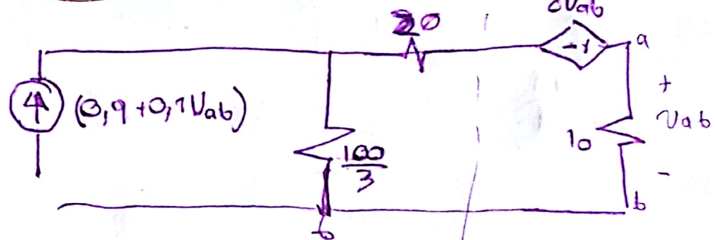
$\frac{12}{7}e^{-\frac{4000}{7}\cdot 25ms} \simeq \frac{12}{7}\, e^{(0{,}8605)}$

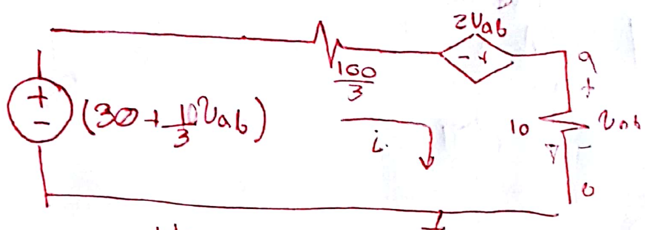
$$P_{(40)} = I\,V = \frac{|V|^2}{40} = \frac{\left(\frac{12}{7}\right)^2}{40} \quad \frac{1{,}486}{245}$$

↳ no importa el $+$.

$\frac{21{,}486}{40} \simeq 0{,}03715$



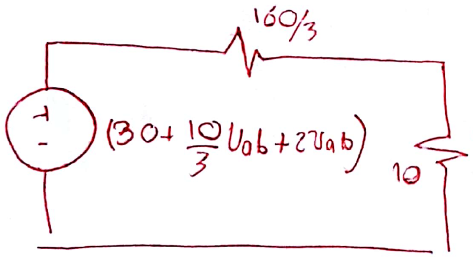




$\boxed{\frac{V_{ab}}{10} = i}$

$$30 + \frac{10}{3}V_{ab} + 2V_{ab} = i\left(\frac{160}{3} + 10\right) = 30 + \frac{16}{3}V_{ab} = i\,\frac{190}{3}$$

$$30 + \frac{16}{3}V_{ab} = V_{ab}\cdot\frac{19}{3} \Rightarrow \underline{V_{ab} = 30}$$

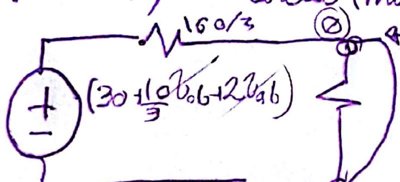


$$\Rightarrow V_{ab} = \frac{\left(30 + \frac{16}{3}V_{ab}\right)\cdot 10}{160/3 + 10 = \frac{190}{3}}$$

$$\frac{19}{3}V_{ab} = 30 + \frac{16}{3}V_{ab}$$

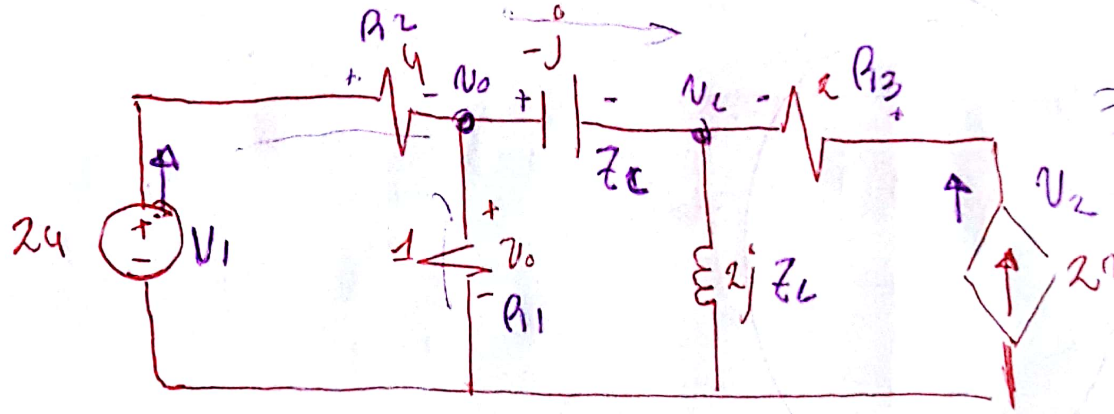
$\boxed{V_{ab} = 30}$ $\boxed{V_h = 30}$

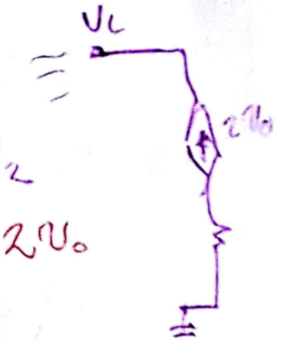
Para I_N, cortocircuito mis terminales A y B.



$\equiv$

$\Rightarrow \boxed{I_N = 9/16}$





∘ Planteo los 2 nodos.

$$V_0 : \frac{24}{4} = V_0\left(\frac{1}{4}+1+\frac{1}{-j}\right) - V_0\left(\frac{1}{-j1}\right)$$

$$V_L : 2V_0 = V_L\left(\frac{1}{2j}+\frac{1}{-j}\right) - V_0\frac{1}{-j} \Rightarrow V_0(2+j) - V_L\left(\frac{1}{2j}-\frac{1}{j}\right) = \emptyset$$

$$\Rightarrow \begin{pmatrix} 6 \\ \emptyset \end{pmatrix} = \begin{pmatrix} (5/4 - \frac{1}{j}) & +\frac{1}{j} \\ (2+j) & (-\frac{1}{2j}+\frac{1}{j}) \end{pmatrix} \begin{pmatrix} V_0 \\ V_L \end{pmatrix} \Rightarrow \begin{pmatrix} V_0 \\ V_L \end{pmatrix} = \begin{pmatrix} -1{,}9270 + 0{,}7007j \\ -1{,}0511 + 9{,}1095j \end{pmatrix}$$

$$V_{R_1} = V_0 = -1{,}927, 0{,}7007j$$

$$I_{R_1} = \frac{V_0}{R_1} =$$

$$S_{R_1} = \frac{|V_{R_1}|^2}{R_1} =$$

$$V_{Z_C} = V_0 - V_L =$$

$$I_{Z_C} = \frac{V_{Z_C}}{Z_C} =$$

$$S_{Z_C} = \frac{|V_{Z_C}|^2}{Z_C^*}$$

$$V_{R_2} = V_1 - V_0 =$$

$$I_{R_2} = \frac{V_{R_2}}{R_2} =$$

$$S_{R_2} = \frac{|V_{R_2}|^2}{R_2} =$$

$$V_{R_3} = \underbrace{2V_0}_{I} \cdot R_3 =$$

$$I_{R_3} = 2 \cdot V_0 =$$

$$S_{R_3} = \frac{|V_{R_3}|^2}{R_3} =$$