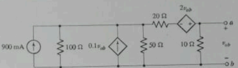
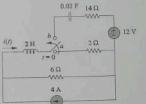
Análisis de circuitos 1er C 2019 – primer parcial

1.- Hallar los circuitos equivalentes de Thevenin y de Norton entre los terminales a-b de la figura

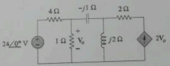


2.- La llave cambia de posición en t=0. Hallar la expresión de i(t) y graficar.

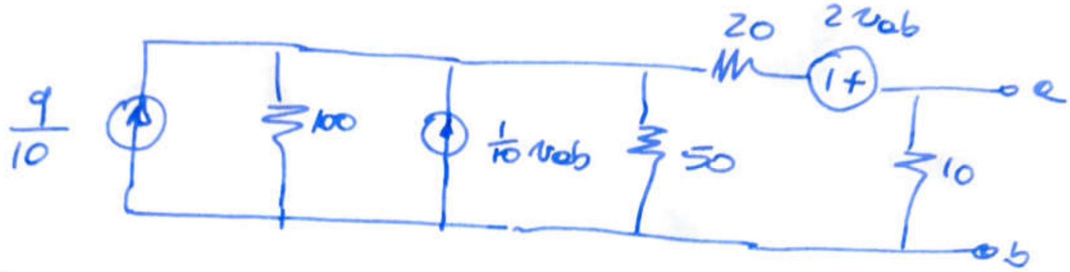


3.- Para el circuito de la figura

a) Realizar un diagrama fasorial de corrientes y tensiones en cada elemento de circuito
b) Hallar la potencia compleja entregada por cada generador y disipada en cada elemento de circuito

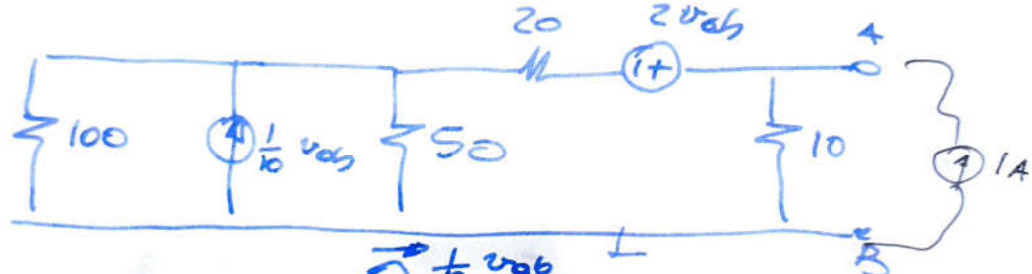


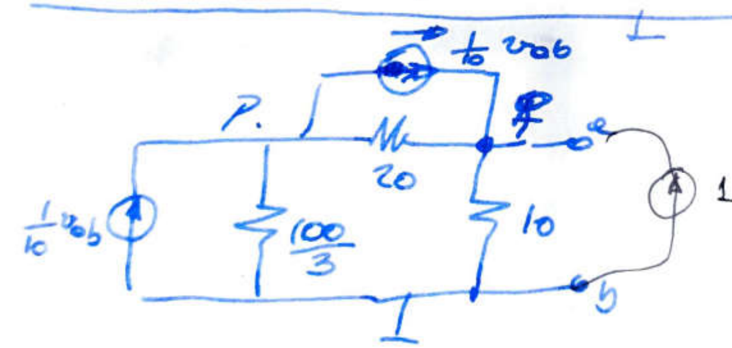
1er parcial C2019 ①



Tevenin y Norton.

Rth. → Pasivo fuentes indep — i prueba.





p) $\frac{1}{10}v_{ab} - \frac{1}{10}v_{ab} = v_p\left(\frac{3}{100}+\frac{1}{20}\right) - v_q\frac{1}{20}$

q) $1 + \frac{1}{10}v_{ab} = -v_p\cdot\frac{1}{20} + v_q\left(\frac{1}{10}+\frac{1}{20}\right)$

$v_{ab} = v_q$

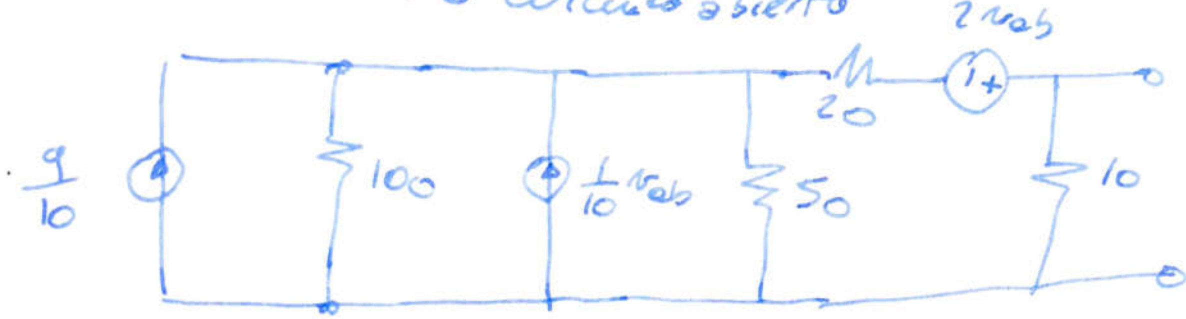
$0 = v_p\left(\frac{3}{100}+\frac{1}{20}\right) - v_q\left(\frac{1}{20}+\frac{1}{5}\right)$

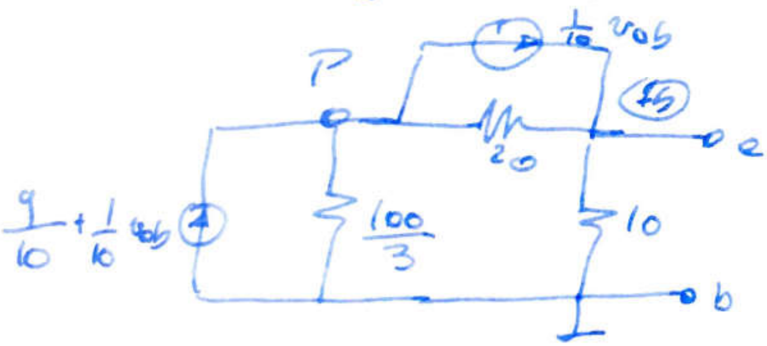
$1 = -v_p\left(\frac{1}{20}\right) + v_q\left(\frac{1}{20}+\frac{1}{10}+\frac{1}{10}\right)$

$$0 = v_p \cdot \frac{2}{25} - v_q \cdot \frac{1}{20}$$
$$1 = -v_p \cdot \frac{1}{20} + v_q \cdot \frac{1}{20} \rightarrow \quad v_p = \frac{100}{3} \quad v_q = \frac{160}{3}$$

$$\boxed{R_{th} = \frac{v_q}{1} = \frac{160}{3}}$$

Vth → tensión a circuito abierto





$v_{ab} = v_{th}$.

2 nodos

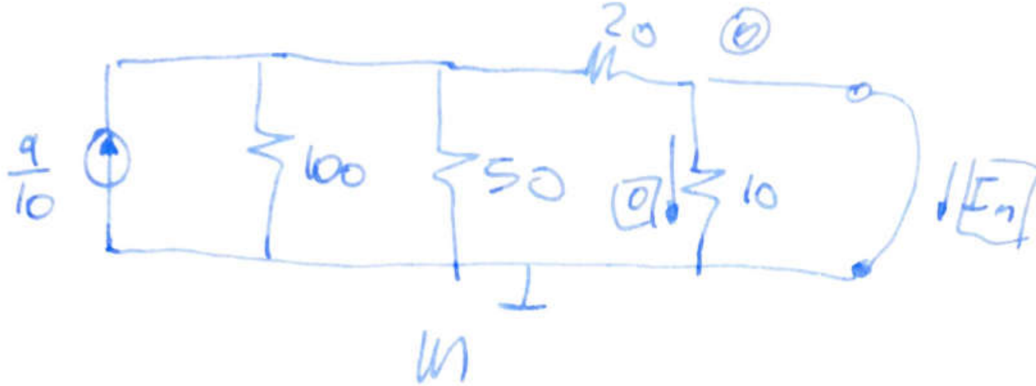
$$\frac{9}{10} + \frac{v_{ab}}{10} - \frac{v_{ab}}{10} = v_p\left(\frac{3}{100} + \frac{1}{20}\right) - v_{th}\frac{1}{20}$$

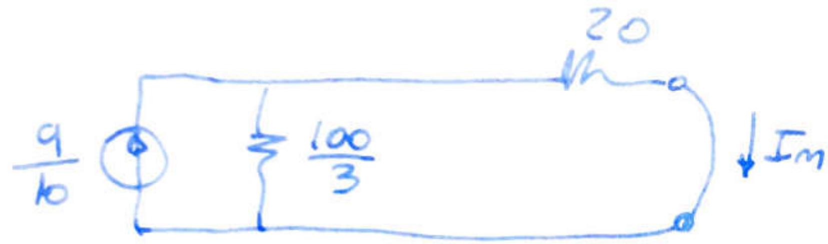
$$\frac{1}{10} v_{ab} = -v_p \frac{1}{20} + v_{th} \cdot \left(\frac{1}{10} + \frac{1}{20}\right)$$

$$\begin{pmatrix} \frac{9}{10} \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{3}{100} + \frac{1}{20} & -\frac{1}{20} \\ -\frac{1}{20} & \frac{1}{10} + \frac{1}{20} - \frac{1}{10} \end{pmatrix} \begin{pmatrix} v_p \\ v_{th} \end{pmatrix} \rightarrow \begin{pmatrix} 30 \\ 30 \end{pmatrix} = \begin{pmatrix} v_p \\ v_{th} \end{pmatrix}$$

I_n → Corrente de corto circuito

$V_{ab} = 0$





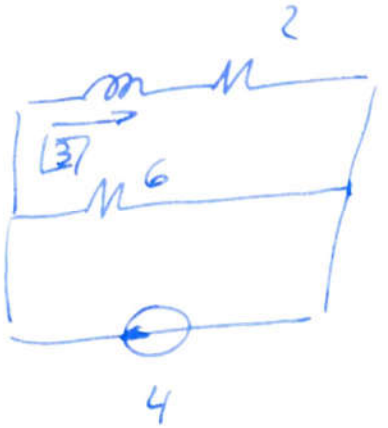
$$I_n = \frac{\frac{1}{20}}{\frac{1}{20} + \frac{3}{100}} \cdot \frac{9}{10} = \frac{9}{16}$$

$$\frac{V_{th}}{I_n} = \frac{30}{\frac{9}{16}} = \frac{160}{3}$$

✓

4

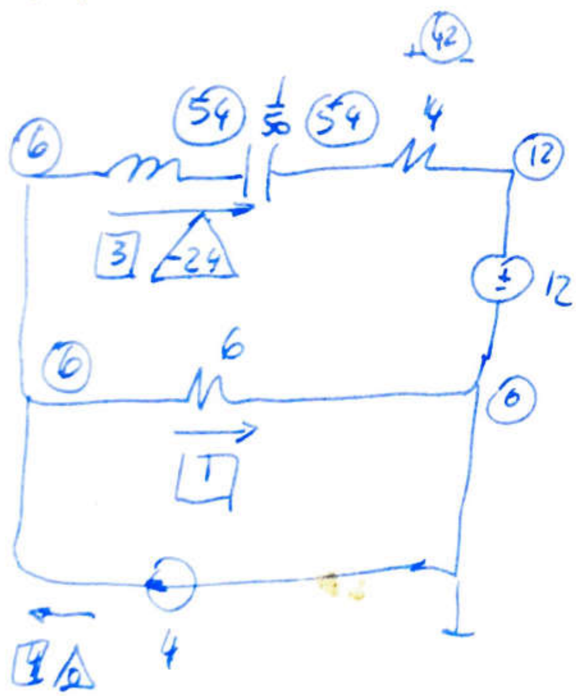
Ej 2 $t<0$



$i(0^-) = 4 \cdot \frac{\frac{1}{2}}{\frac{1}{6}+\frac{1}{2}} = 3$

$v(0^-) = 0$

$t>0$

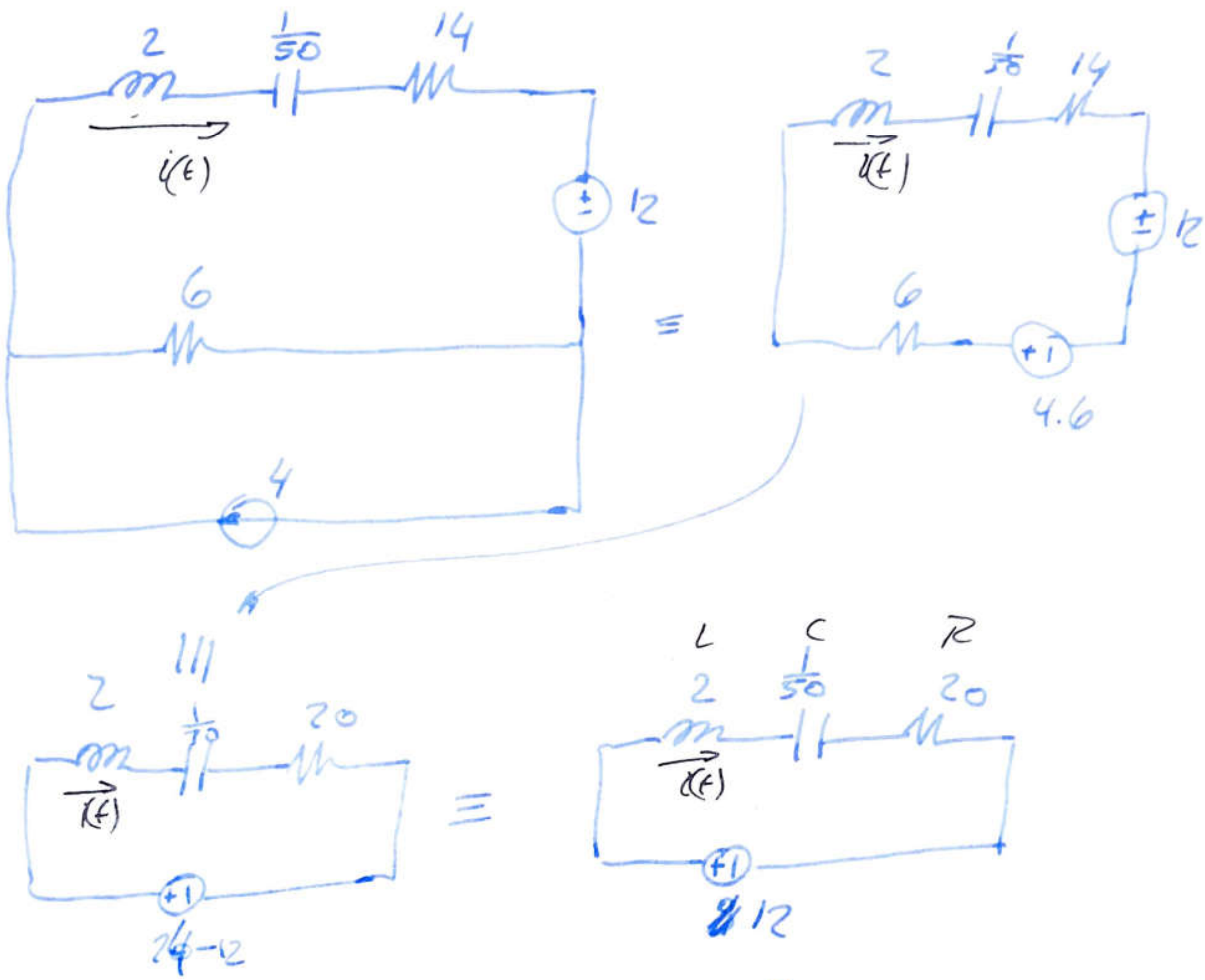


$L i' = v \rightarrow i' = \frac{v}{2}$

$i(0^+) = 3$

$i'(0^+) = -24$

$t > 0.$



$$12 = i' \cdot L + \frac{1}{C}\int i + i \cdot R$$

$$0 = i'' \cdot L + \frac{1}{C} i + i' \cdot R$$

$$0 = i'' + i' \cdot \frac{R}{L} + i \cdot \frac{1}{LC}$$

$$0 = i'' + 10 i' + 25 i.$$

Pol carect

$$\lambda^2 + 10\lambda + 25 = 0$$

$$(\lambda + 5)^2 = 0$$

$$\lambda_{1,2} = 5$$

No hay particular

$$i(t) = (A + Bt) \cdot e^{-5t} \qquad i(0) = A = 1$$

$$i'(t) = -5 e^{-5t}(A + Bt) + B e^{-5t} \qquad i'(0^+) = -5 \cdot A + B = -24$$

$$-5 + B = -24$$

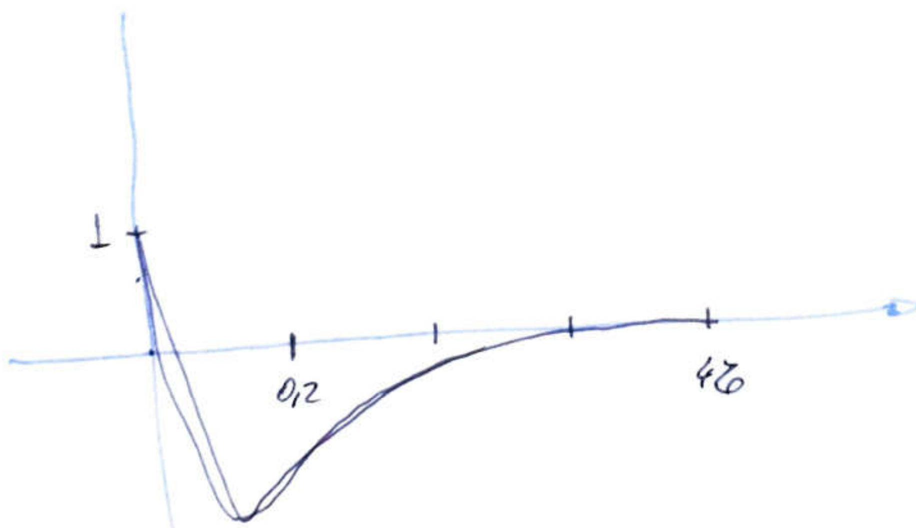
$$B = 11 + 5 = -19$$

$$i(t) = (1 - 19t)\, e^{-5t}\, u(t)$$

$i \underset{t \to \infty}{\to}$ es cero → En la curva se ve.

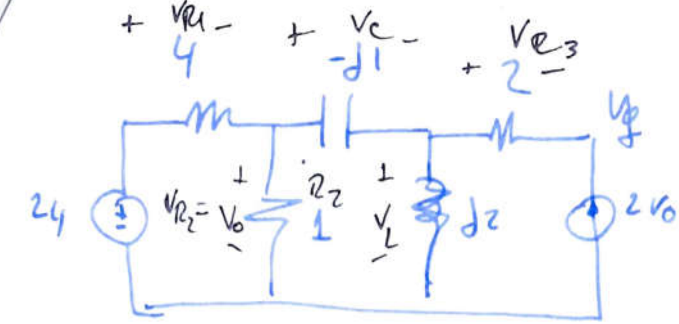
→ en el circuito: tengo la corriete por un capacitor en un transitorio de continua ⇒ $t \to \infty$ el capacite se porte como un abierto.

Gráfico:



$\tau = \frac{1}{5} = 0{,}2$

⑦



2 Nodos:

$\frac{24}{4} = V_o\cdot\left(\frac{1}{1}+\frac{1}{4}+\frac{1}{-j1}\right) - V_L\left(\frac{1}{-j1}\right)$

$2V_o = -V_o\left(\frac{1}{-j1}\right) + V_L\left(\frac{1}{j2}+\frac{1}{-j1}\right)$

$\begin{pmatrix}6\\0\end{pmatrix} = \begin{pmatrix}\frac{5}{4}+j & -j\\ -2-j & j/2\end{pmatrix}\begin{pmatrix}V_o\\V_L\end{pmatrix}$

$V_o = \frac{264}{137} + j\frac{96}{137}$

$V_L = \frac{-144}{137} + j\frac{1248}{137}$

$V_{R1} = 24 - V_o = 25,427 - j\,0,70073$

$I_{R1} = \frac{V_{R1}}{R} = 6,48175 - j\,0,17518$

$S_{R1} = V\cdot I^* = 168,175$

$V_{R2} = V_o = -1,92701 + j\,0,700730$

$I_{R2} = \frac{V_{R2}}{R_2} = -1,92707 + j\,0,700730$

$S_{R2} = I_{R2}^*\cdot V_{R2} = 4,20438$

$V_C = V_o - V_L = -0,875912 - j\,8,40876$

$I_C = \frac{V_C}{-j1}\ \ 8,40876 - j\,0,875912$

$S_C = V_C\cdot I_C^* = -j\,71,4745$

$V_L = -1,05109 + j\,9,10949$

$I_L = \frac{V_L}{j2} = 4,55474 + j\,0,525547$

$S_L = V_L\cdot I_L^* = j\,42,0438$

3 Nodos

$\frac{24}{4} = V_o\left(\frac{1}{4}+\frac{1}{1}+\frac{1}{-j1}\right) - V_L\cdot\left(\frac{1}{-j1}\right) - V_g\cdot 0$

$0 = -V_o\left(\frac{1}{-j1}\right) + V_L\left(\frac{1}{-j1}+\frac{1}{j2}+\frac{1}{2}\right) - V_g\,\frac{1}{2}$

$2V_o = -0\cdot V_o - V_L\,\frac{1}{2} + V_g\cdot\frac{1}{2}$

$\begin{pmatrix}6\\0\\0\end{pmatrix} = \begin{pmatrix}\frac{5}{4}+j & -j & 0\\ -j & \frac{1}{2}+j/2 & -1/2\\ -2 & -1/2 & \frac{1}{2}\end{pmatrix}\begin{pmatrix}V_o\\V_L\\V_g\end{pmatrix}$

$V_o = -\frac{264}{137} + j\frac{96}{137}$

$V_L = -\frac{144}{137} + j\frac{1248}{137}$

$V_g = -\frac{1200}{137} + j\frac{1632}{137}$

$V_{R3} = V_L - V_g = 7,70803 - j\,3,80...$

$I_{R3} = -2V_o = 3,85401 - j\,1,40146$

$S_{R3} = 30,1635$

$S_{F1} = 24\cdot I_{R1}^* = 155,562 + j\,4,20438$

$S_{F2} = (2V_o)^*\cdot V_g = 50,4526 - j\,33,63...$

$206,015 - j\,29,4307$

$S_R + S_L + S_C = 206,014 - j\,29,4305$ ✓