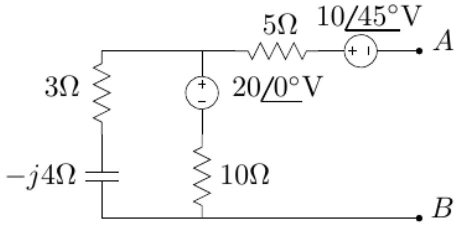
thevenin y norton

Ejercicio 1.

Encontrar el equivalente de Thevenin en los puntos AB del circuito de la figura 1.



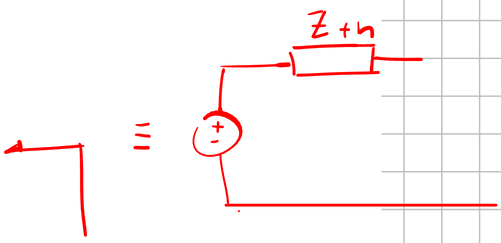


Figura 1: Equivalente Thevenin.

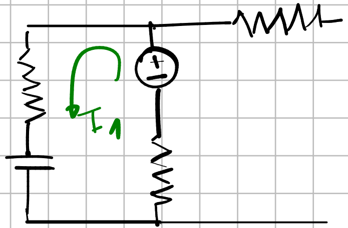
$V_{th} = V_{ABCA}$

$Z_{th} = Z_{out}$

$= \dfrac{V_{ABCA}}{I_{cc}}$

primero necesito V_{CA}

↳ superposicion



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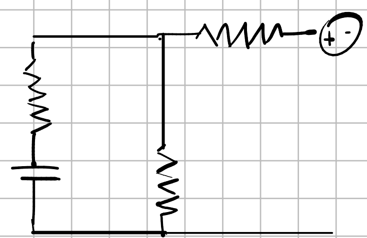


$I_1 = \dfrac{20}{13-j4}$

$V_{AB} = \dfrac{20}{13-j4}(3-j4) = 5,94 - j4,32$

$V_{AB} = 7,35 \measuredangle -36^\circ$

$V_{th} = 11,45 \measuredangle -95^\circ$

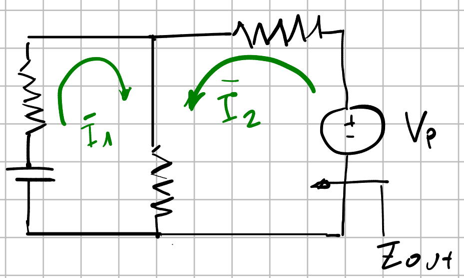
como no hay circ de corriente, te queda la V de la Fuente

$V_{AB2} = 10 \measuredangle 45 \cdot 1 \measuredangle 180^\circ$

$= 10 \measuredangle 225$

Pasivas todas las Fuentes y operas las impedancias

$Z_{th} = [(3-j4)//10] + 5 = 7,97 - j2,16$



$$\begin{bmatrix} 13-j4 & 10 \\ 10 & 15 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 0 \\ V_p \end{bmatrix}$$

$$I_2 = \frac{\begin{vmatrix} 13-j4 & 0 \\ 10 & V_P \end{vmatrix}}{\Delta Z} = \frac{V_P \, \Delta_{22}}{\Delta Z}$$

$Z_{out} = \dfrac{\Delta Z}{\Delta_{22}}$ ✓ ; da lo mismo que antes

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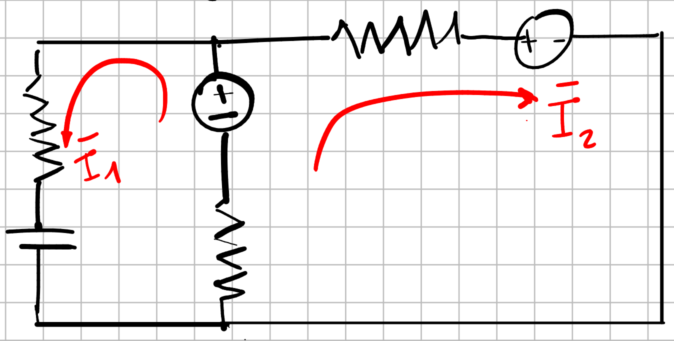
Otra forma es con la formula

$$Z_{th} = \frac{V_{ABCA}}{I_{cc}}$$



$$\begin{bmatrix} 13-j4 & 10 \\ 10 & 15 \end{bmatrix} \begin{bmatrix} I_1 \\ I_{cc} \end{bmatrix} = \begin{bmatrix} 20 \\ 20-10\angle 45^\circ \end{bmatrix}$$

$$I_{cc} = \frac{\Delta_{S2}}{\Delta Z} \rightarrow \Delta Z = 95 - j60$$

$$\Delta_{S2} = (13-4j)(20-10\angle 45^\circ) - 20 \cdot 10$$

$$I_{cc} = 1,47 \angle 32,66^\circ$$

$$Z_{th} = 7,99 - j2,02$$ ✓

Ejercicio 2.

Dado el circuito de la figura 2, encontrar el equivalente de Norton en los puntos A y B.

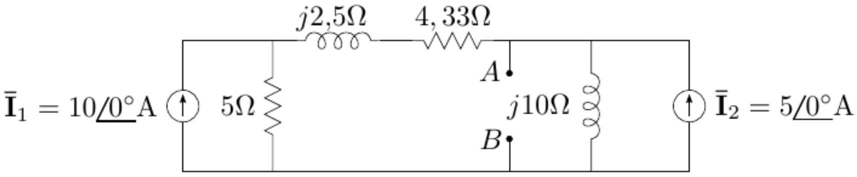


Figura 2: Equivalente Norton.

Z_{out} pasivando todo

$$Z_{out} = (5+4,33+j2,5) // 10 = 3,834 + j4,86$$

$V_{ABCA} \longrightarrow$ nodos

$$\begin{bmatrix} \frac{1}{5}+\frac{1}{4,33+j2,5} & -\frac{1}{4,33+j2,5} \\ -\frac{1}{4,33+j2,5} & \frac{1}{j10}+\frac{1}{4,33+j2,5}\end{bmatrix}\begin{bmatrix}\bar{V}_1\\ \bar{V}_2\end{bmatrix} = \begin{bmatrix}10\\ 5\end{bmatrix}$$

$$\bar{V}_2 = \frac{\Delta_{s2}}{\Delta Y} = \frac{,59 - j1,5}{0,0246 - j0,057} = 45,14 + j43,7$$

$$\bar{I}_{cc} = \frac{\bar{V}_2}{Z_{out}} = 10,13 \angle -8,13^\circ$$

$$\bar{I}_{cc} = \bar{I}_{cc1} + \bar{I}_{cc2}$$

$$\bar{I}_{cc2} = 5$$

$$\bar{I}_{cc1} = \frac{\bar{V}_{cc1}}{Z_1} = \frac{10 \cdot (5 // 4,3+j2,5)}{4,3+j2,5} = 10,1 \angle -8,10^\circ$$

Ejercicio 5.

Se desea construir una resistencia para un horno que va a ser alimentado por un generador de tensión senoidal de $V_{\text{ef}} = 24\text{V}$ (ver figura 4), para lo cual se pide

(a) calcular el valor resistivo necesario para lograr máxima transferencia de potencia si la impedancia de salida del generador es de $\mathbf{Z}_\text{o} = 5 + j3{,}32\Omega$,

(b) calcular la potencia transferida,

(c) construir el triángulo de potencias en el generador y diagrama fasorial de tensiones del circuito generador mas horno.

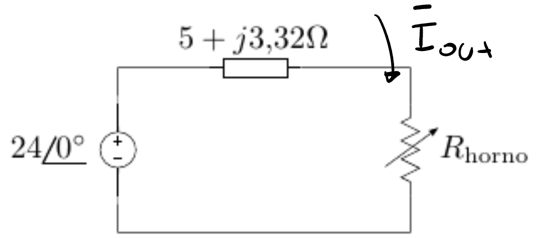


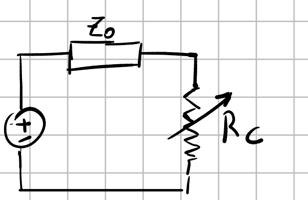
Figura 4: Resistencia para horno eléctrico.

a) $R_h = |5 + j3,32| = 6$

b) $P_{max} = \bar{I}_{out}^2 R_h$

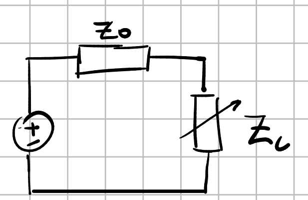
$$= \left(\frac{V}{Z_{out}}\right)^2 R_h$$

$$= \left(\frac{V}{Z_0 + R_h}\right)^2 R_h$$



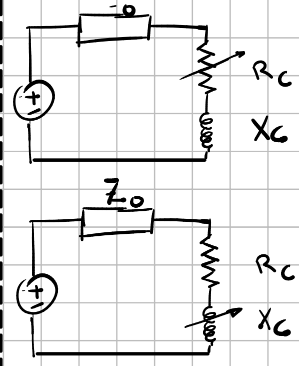
max transf P

$R_c = |Z_0|$



$Z_c = Z_0^*$

$P_{max} = 26{,}15\ W$



$R_C = |Z_0 + X_C|$

$X_C = -X_0$

c) $\bar{V}\, I^* = P \pm jQ$

$= S \angle \varphi$

$$24 \cdot \operatorname{conj}\left(\frac{24}{5+j13{,}32+6}\right) = \overset{P}{48} + \overset{Q}{14{,}48} = \overset{S}{50{,}13} \angle \overset{\varphi}{16{,}79}$$

$\bar{I} = 2{,}088 \angle -16^\circ$