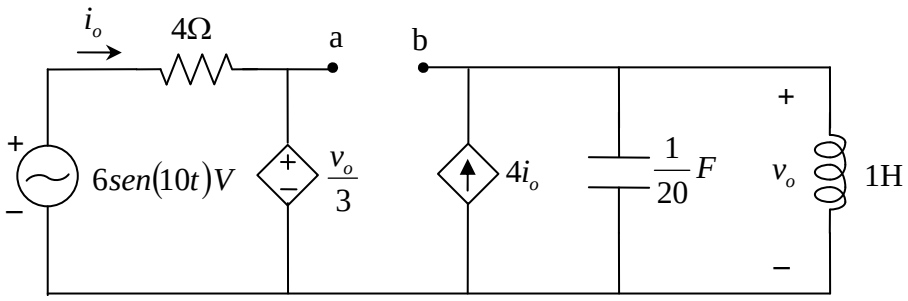
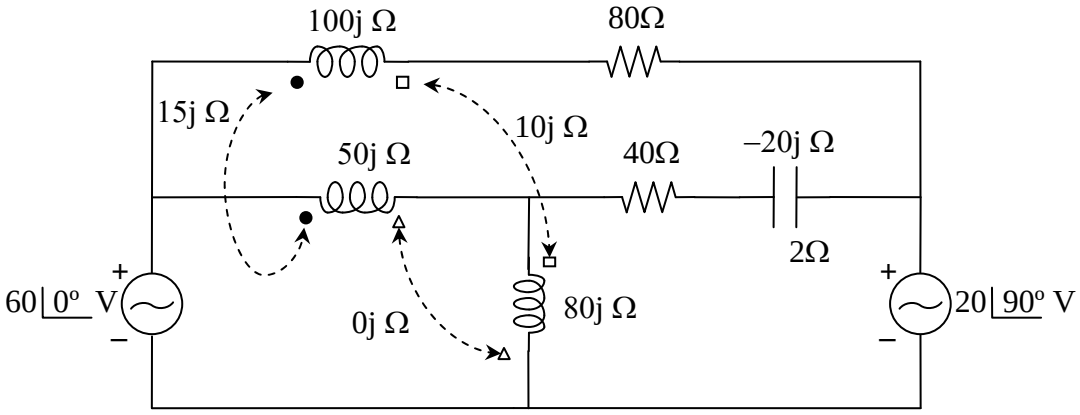
3er Parcial de Circuitos Eléctricos 1. Marzo 2016

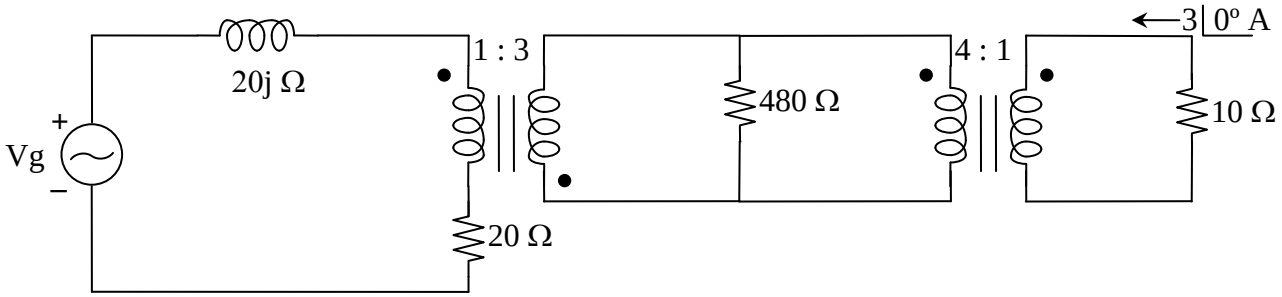
1-En el siguiente circuito encuentre la impedancia de Thevenin vista desde los terminales a-b. Encuentre los elementos conectados en serie que constituyen a Z_{TH}. Encuentre los elementos que conectados en paralelo conforman a Z_{TH}. (5 ptos)



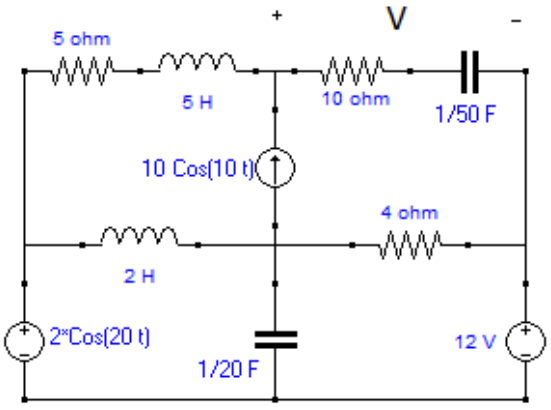
2-Plantear las ecuaciones de corrientes de Mallas (5 ptos).



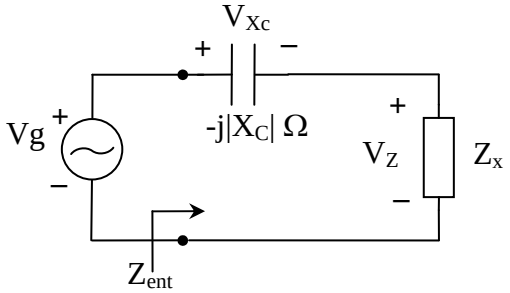
3- Hallar Vg (5 ptos). **Válido para la Sección de Ceballos**



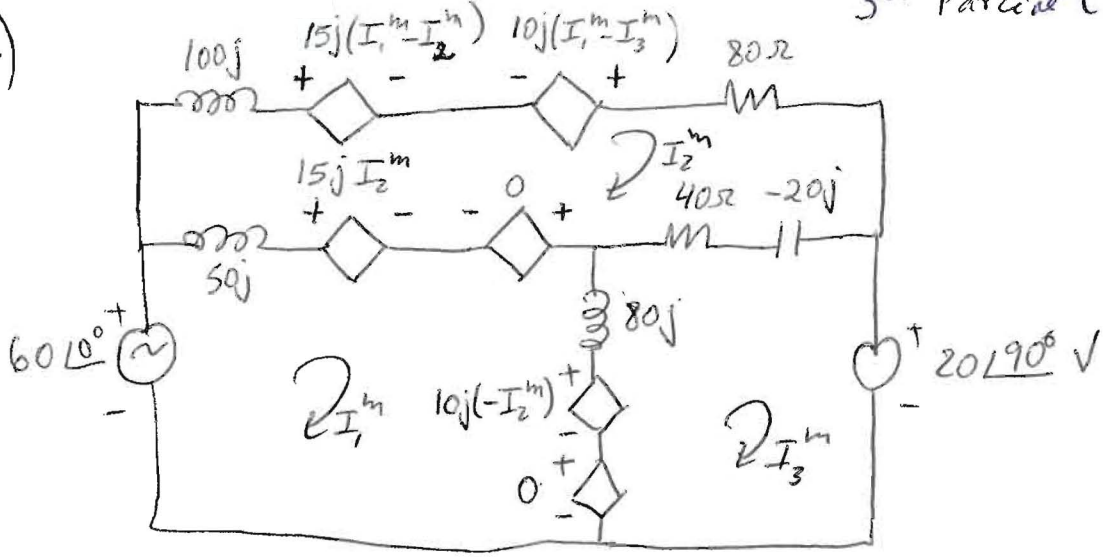
3- Encuentre la tensión V (5 ptos). **Válido para las secciones de Paredes y Molina**



4- Se sabe que la impedancia de entrada es $Z_{ent} = |Z_{ent}| \angle 30º\ \Omega$, $|V_g| = 200$ V, $|V_{Xc}| = 50$ V, la parte real de Z_x es $10\sqrt{3}\,\Omega$. Encuentre los valores de Z_x, X_C y Z_{ent}. (5 ptos)



2)



M1: $130j\,I_1^m - 50j\,I_2^m - 80j\,I_3^m = 60 - 15j\,I_2^m + 10j\,I_2^m$

$130j\,I_1^m - 45j\,I_2^m - 80j\,I_3^m = 60$ (1)

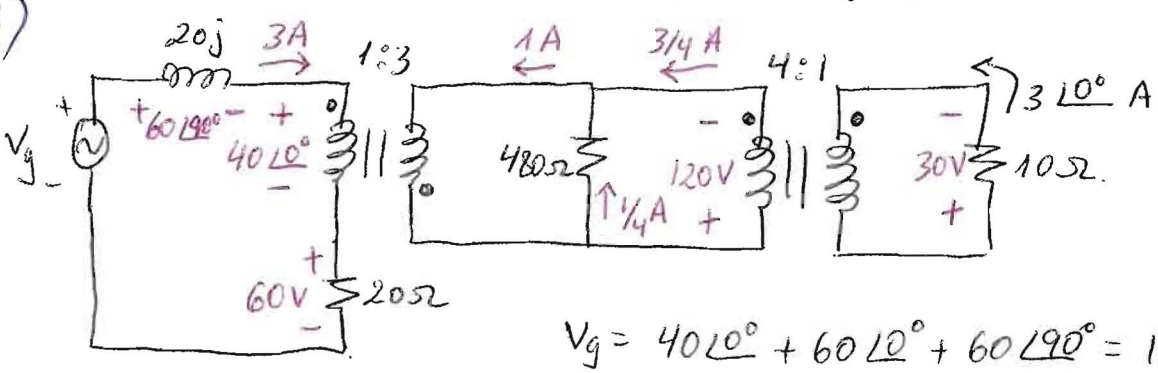
M2: $-50j\,I_1^m + (120+130j)I_2^m - (40-20j)I_3^m = -15j(I_1^m - I_2^m) + 10j(I_1^m - I_3^m) + 15j\,I_2^m$

$-45j\,I_1^m + (120+100j)I_2^m - (40-30j)I_3^m = 0$ (2)

M3: $-80j\,I_1^m - (40-20j)I_2^m + (40+60j)I_3^m = -20\angle 90° - 10j\,I_2^m$

$-80j\,I_1^m - (40-30j)I_2^m + (40+60j)I_3^m = -20\angle 90°$ (3).

3)



$V_g = 40\angle 0° + 60\angle 0° + 60\angle 90° = 100 + 60j$

$V_g = 116{,}61\angle 30°$ V

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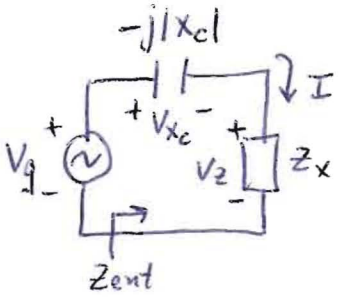
4) $Z_{ent} = |Z_{ent}| \angle 30°$

$|V_g| = 200\,V$

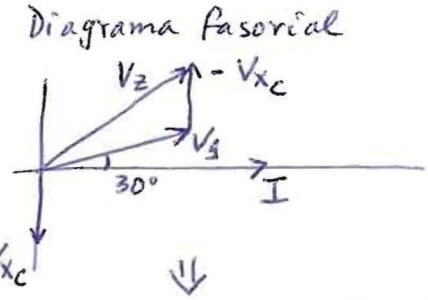
$|V_{Xc}| = 50\,V$

$Real\{Z_x\} = 10\sqrt{3}\,\Omega$

$Z_x = ?,\ X_c = ?,\ Z_{ent} = ?$



$\Rightarrow$



$\Downarrow$

$V_{Xc} = 50 \angle -90°\,V\ ;\ V_g = 200 \angle 30°\,V$

$V_g = V_{Xc} + V_z \Rightarrow V_z = V_g - V_{Xc}$

$V_z = 200 \angle 30° - 50 \angle -90° = 229{,}13 \angle 40{,}89°\,V$

$V_z = 173{,}21 + 150j$ ↓

$V_z = Z_x I$

$173{,}21 + 150j = (10\sqrt{3} + Xj)\,|I| \angle 0°$

$Real = Real$

$173{,}21 = 10\sqrt{3}\,|I| \Rightarrow |I| = \frac{173{,}21}{10\sqrt{3}}$

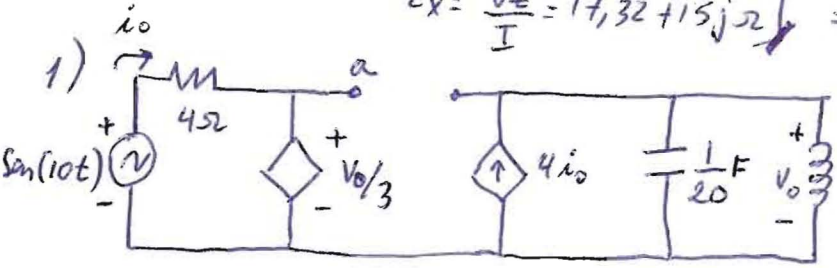
$|I| = 10 \Rightarrow I = 10 \angle 0°$ ↓

$Z_x = \frac{V_z}{I} = 17{,}32 + 15j\,\Omega$ ↓ $\Rightarrow X_c = \frac{|V_{Xc}|}{|I|} = \frac{50}{10} = 5\,\Omega$ ↓

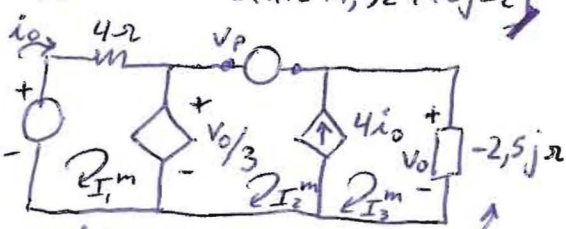
$Z_{ent} = Z_x - |X_c|j$

$Z_{ent} = 17{,}32 + 10j\,\Omega$ ↓

1)



$\Rightarrow 6 \angle 0°$



$10j \,//\, (-2j) = \frac{20}{8j} = -2{,}5j\,\Omega$

M1: $4I_1^m = 6 - \frac{V_o}{3}\ ,\ V_o = -2{,}5j\,I_3^m$

$4I_1^m - \frac{2{,}5}{3}j\,I_3^m = 6$

$4I_1^m - \frac{5}{6}j\,I_3^m = 6$ (1)

SP: $-2{,}5j\,I_3^m = \frac{V_o}{3} - V_p$

$-2{,}5j\,I_3^m + \frac{2{,}5j}{3}I_3^m + V_p = 0$

$-\frac{2(2{,}5)}{3}j\,I_3^m + V_p = 0$

$-\frac{5}{3}j\,I_3^m + V_p = 0$ (2)

Eq Cond: $4i_o = I_3^m - I_2^m\ ;\ I_o = I_1^m$

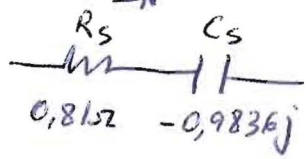
$4I_1^m + I_2^m - I_3^m = 0$ (3)

$V_{TH} = V_p\big|_{I_2^m = 0} = 7{,}68 \angle 129{,}8°\,V$ ↓

$I_N = I_2^m\big|_{V_p = 0} = -6 \angle 0°$ ↓

$\Rightarrow$

$Z_{TH} = \frac{V_{TH}}{I_N} = 0{,}8197 - 0{,}9836j\,\Omega$ ↓

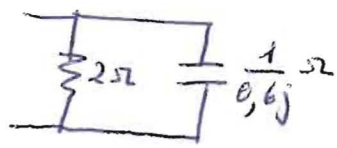


$\frac{-j}{\omega C_s} = -0{,}9836j$

$\Rightarrow C_s = 101{,}7\,mF$

$R_s = 0{,}81\,\Omega$ ↓

$Y_{TH} = \frac{1}{Z_{TH}} = 0{,}5 + 0{,}6j\,\mho$



$\omega C_p = 0{,}6$

$C_p = 60\,mF$

$R_p = 2\,\Omega$ ↓