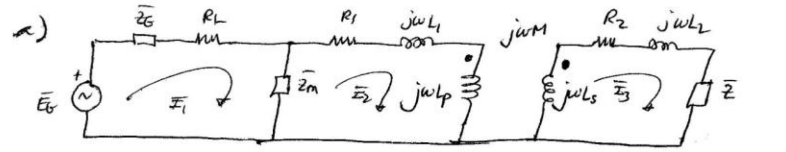
Solución Junio 2008 1)Método de las mallas 2)RES 3)Transformador Ideal 4)Adaptador de impedancia 5)mejora del fdp.

Junio 2008

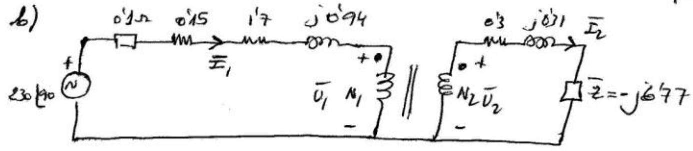
a)



paralelo: $\bar Z_m = \frac{j\omega L_m R_m}{R_m + j\omega L_m}$

$$\left.\begin{aligned}\bar E_G &= (\bar Z_G + R_L + \bar Z_m)\bar I_1 - \bar Z_m \bar I_2\\ 0 &= (R_1 + j\omega L_1 + j\omega L_p + \bar Z_m)\bar I_2 - \bar Z_m \bar I_1 - j\omega M \bar I_3\\ 0 &= (R_2 + j\omega L_2 + \bar Z + j\omega L_s)\bar I_3 - j\omega M \bar I_2\end{aligned}\right\} \rightarrow \underbrace{\begin{pmatrix}\bar E_G\\0\\0\end{pmatrix} = \begin{pmatrix}\bar Z_G + \bar Z_m + R & -\bar Z_m & 0\\ -\bar Z_m & (R_1 + \bar Z_m + j\omega L_1 + j\omega L_p) & -j\omega M\\ 0 & -j\omega M & (R_2 + j\omega L_2 + \bar Z + j\omega L_s)\end{pmatrix}\begin{pmatrix}\bar I_1\\ \bar I_2\\ \bar I_3\end{pmatrix}}_{\text{Forma Matricial!}}$$

b)



$\frac{N_1}{N_2} = 10$

$j\omega L_1 = j100\pi\, 3\cdot 10^{-3} = j0'94\,\Omega$

$j\omega L_2 = j100\pi\, 10^{-3} = j0'31\,\Omega$

$\bar Z = \frac{1}{jC\omega} = -j\frac{1}{470\cdot 10^{-6}\, 100\pi} = -j6'77\,\Omega$

T.I. $\left.\begin{aligned}&\frac{\bar U_1}{N_1} = \frac{\bar U_2}{N_2} \rightarrow \bar U_1 = 10\bar U_2\\ &N_1\bar I_1 - N_2\bar I_2 = 0 \rightarrow \bar I_1 = \frac{1}{10}\bar I_2\end{aligned}\right\}$

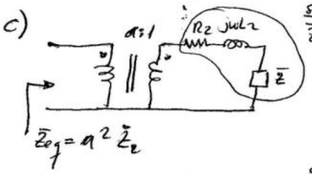
2ª LK $\left.\begin{aligned}j230 &= (0'1 + 0'15 + 1'7 + j0'94)\bar I_1 + \bar U_1\\ 0 &= (0'3 + j0'31 - j6'77)\bar I_2 - \bar U_2\end{aligned}\right\} \rightarrow \begin{pmatrix}230\angle 90\\0\end{pmatrix} = \begin{pmatrix}1'95 + j0'94 & 10\\ 3 - j64'6 & -1\end{pmatrix}\begin{pmatrix}\bar I_1\\ \bar U_2\end{pmatrix}$

$\bar I_1 = 0'356\angle 177'16$ A

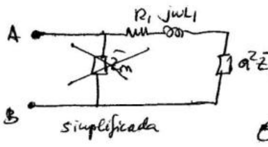
luego $\bar I_2 = 10\,\bar I_1 = 3'56\angle 177'16$ A

$\rightarrow \left[\, i(t) = 3'56\sqrt{2}\cos\left(100\pi t + 177'16\,\frac{\pi}{180}\right)\ \text{A} \,\right]$

c)



serie: $\bar Z_2 = R_2 + j\omega L_2 + \bar Z$



serie:

$\bar Z_1 = R_1 + j\omega L_1 + a^2\bar Z_2 = R_1 + j\omega L_1 + a^2(R_2 + j\omega L_2 + \bar Z)$

$\bar Z_1 = R_1 + a^2 R_2 + j\omega(L_1 + a^2 L_2) + a^2\bar Z$

Como queremos $\cos\varphi_{AB} = 1$ (equivalente a $Q_{AB} = 0$) la parte imaginaria debería ser nula (de $\bar Z_1$)

$j\omega(L_1 + a^2 L_2) + a^2\bar Z = 0 \rightarrow \boxed{\bar Z = -j\omega\left(\frac{L_1}{a^2} + L_2\right)}$

Sergio Castiñeira Ibáñez 2011