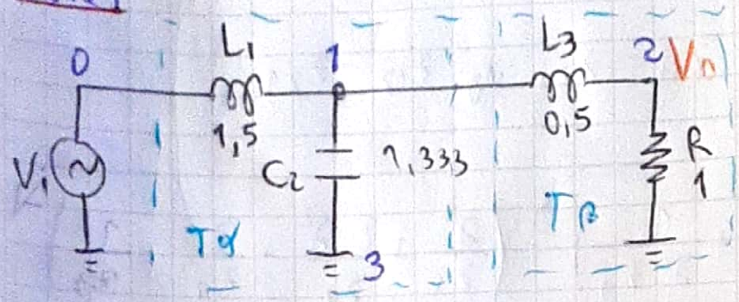
Tarea semanal 8

Parte 1



Parámetros Z L INV:

$$z_{11} = \frac{V_1}{I_1}\bigg|_{I_2=0} = L_1 + \frac{1}{sC_2} \qquad z_{12} = \frac{V_1}{I_2}\bigg|_{I_1=0} = \frac{1}{sC_2}$$

$$z_{21} = \frac{V_2}{I_1}\bigg|_{I_2=0} = \frac{1}{sC_2} \qquad z_{22} = \frac{V_2}{I_2}\bigg|_{I_1=0} = \frac{1}{sC_2}$$

$$Z_\alpha = \begin{pmatrix} L_1 + \frac{1}{sC_2} & \frac{1}{sC_2} \\ \frac{1}{sC_2} & \frac{1}{sC_2} \end{pmatrix}$$

Para el β:

$$Z_\beta = \begin{pmatrix} L_3 + 1 & 1 \\ 1 & 1 \end{pmatrix}$$

$$Z \begin{cases} V_1 = z_{11} \cdot I_1 + z_{12} \cdot I_2 \\ V_2 = z_{21} \cdot I_1 + z_{22} \cdot I_2 \end{cases} \qquad T \begin{cases} V_1 = A \cdot V_2 + B \cdot (-I_2) \\ I_1 = C \cdot V_2 + D \cdot (-I_2) \end{cases}$$

$$A = \frac{V_1}{V_2}\bigg|_{-I_2=0} = \frac{z_{11}}{z_{21}} \qquad B = \frac{V_1}{-I_2}\bigg|_{V_2=0} =$$

$$0 = z_{21} \cdot I_1 + z_{22} \cdot I_2 \rightarrow I_1 = \frac{-z_{22} \cdot I_2}{z_{21}}$$ → Reemplazo en la 2° ecuación

$$V_1 = z_{11} \cdot \left(\frac{-z_{22} \cdot I_2}{z_{21}}\right) + z_{12} \cdot I_2$$

$$\frac{V_1}{-I_2} = \frac{z_{11} \cdot z_{22} - z_{12} \cdot z_{21}}{z_{21}} = \frac{\det(Z)}{z_{21}} = B$$

$$C = \frac{I_1}{V_2}\bigg|_{-I_2=0} = \frac{1}{z_{21}} \qquad D = \frac{I_1}{-I_2}\bigg|_{V_2=0} = \frac{z_{22}}{z_{21}}$$

$T\alpha$:

$$A = \frac{z_{11}}{z_{21}} = \frac{L_1 + \frac{1}{sC_2}}{\frac{1}{sC_2}} = sL_1C_2 + 1 \qquad C = sC_2$$

$$B = \frac{\left(L_1 \cdot \cancel{\frac{1}{sC_2}}\right) - \frac{1}{s^2 C_2^2}}{\cancel{\frac{1}{sC_2}}} = L_1 - \frac{1}{sC_2}$$

$$D = \frac{\frac{1}{sC_2}}{\frac{1}{sC_2}} = 1 \qquad T\alpha = \begin{pmatrix} sL_1C_2 + 1 & L_1 - \frac{1}{sC_2} \\ sC_2 & 1 \end{pmatrix}$$

$T\beta$:

$$A = \frac{z_{11}}{z_{21}} = L_3 + 1 \qquad C = 1$$

$$B = L_3 + 1 - 1 = L_3 \qquad D = 1$$

$$T_\beta = \begin{pmatrix} L_3 + 1 & L_3 \\ 1 & 1 \end{pmatrix}$$

$$T_T = T\alpha \cdot T_\beta$$

$$T_T = \begin{pmatrix} sL_1C_2 + 1 & L_1 - \frac{1}{sC_2} \\ sC_2 & 1 \end{pmatrix} \cdot \begin{pmatrix} L_3 + 1 & L_3 \\ 1 & 1 \end{pmatrix}$$

$$T_T = \begin{pmatrix} (L_3+1)(sL_1C_2+1) + (L_1 - 1/sC_2) & L_3(sL_1C_2+1) + L_1 - 1/sC_2 \\ sC_2L_3 + sC_2 + 1 & sC_2L_3 + 1 \end{pmatrix}$$

$$A = \frac{V_1}{V_2} = (L_3+1)(sL_1C_2+1) + L_1 - \frac{1}{sC_2}$$

No me gusta este signo

$$A = sL_1L_3C_2 + sL_1C_2 + \cancel{sC_2}L_3 + 1 + L_1 - \frac{1}{sC_2}$$

$$A = \frac{s^2(L_1L_3C_2^2 + L_1C_2^2) + s(C_2L_3 + C_2L_1 + C_2) - 1}{sC_2}$$

$$\frac{V_o}{V_i} = A^{-1} = \frac{sC_2}{s^2(L_1L_3C_2^2 + L_1C_2^2) + s(C_2L_3 + C_2L_1 + C_2) - 1}$$

$$
Y_{MAI} = \begin{pmatrix} Y_1 & -Y_1 & 0 & 0 \\ -Y_1 & Y_1 + Y_2 + Y_3 & -Y_3 & -Y_2 \\ 0 & -Y_3 & Y_3 + Y & -Y \\ 0 & -Y_2 & -Y & Y_2 + Y \end{pmatrix}
$$

$$
Y_{MAI} = \begin{pmatrix} \frac{1}{sL_1} & -\frac{1}{sL_1} & 0 & 0 \\ -\frac{1}{sL_1} & \frac{1}{sL_1} + sC_2 + \frac{1}{sL_3} & -\frac{1}{sL_3} & -sC_2 \\ 0 & -\frac{1}{sL_3} & \frac{1}{sL_3} + 1 & -1 \\ 0 & -sC_2 & -1 & sC_2 + 1 \end{pmatrix}
$$

$$
A^{23}_{03} = \frac{V_{23}}{V_{03}} = \text{signo}(0-3) \cdot \text{signo}(2-3) \cdot \frac{\underline{Y}^{03}_{23}}{\underline{Y}^{03}_{03}}
$$

$$
\frac{V_0}{V_i} = (-1) \cdot (-1) \cdot \frac{\underline{Y}^{03}_{23}}{\underline{Y}^{03}_{03}}
$$

$$
\underline{Y}^{03}_{23} = \frac{1}{s^2 L_1 L_3}
$$

$$
\underline{Y}^{03}_{03} = \left(\frac{1}{sL_1} + sC_2 + \frac{1}{sL_3} \right) \cdot \left(\frac{1}{sL_3} + 1 \right) - \frac{1}{s^2 L_3^2}
$$

$$
= \frac{1}{s^2 L_1 L_3} + \frac{1}{sL_1} + \frac{C_2}{L_3} + sC_2 + \cancel{\frac{1}{s^2 L_3^2}} + \frac{1}{sL_3} - \cancel{\frac{1}{s^2 L_3^2}}
$$

$$
= \frac{1 + sL_3 + s^2 L_1 C_2 + s^3 L_1 C_2 L_3 + sL_1}{s^2 L_1 L_3}
$$

$$
\frac{V_0}{V_i} = \frac{\cancel{\frac{1}{s^2 L_1 L_3}}}{\frac{s^3 L_1 L_3 C_2 + s^2 L_1 C_2 + s(L_1 + L_3) + 1}{\cancel{s^2 L_1 L_3}}}
$$

Me gusta más esto transformando que lo anterior

$$
\underline{\frac{V_0}{V_i} = \frac{1}{s^3 L_1 L_3 C_2 + s^2 L_1 C_2 + s(L_1 + L_3) + 1}}
$$