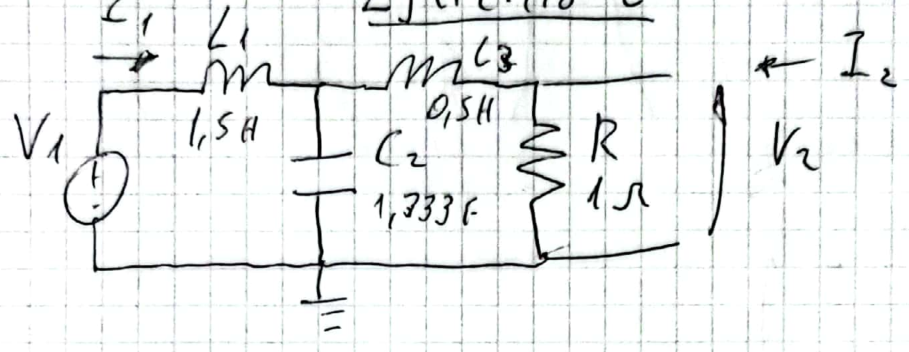
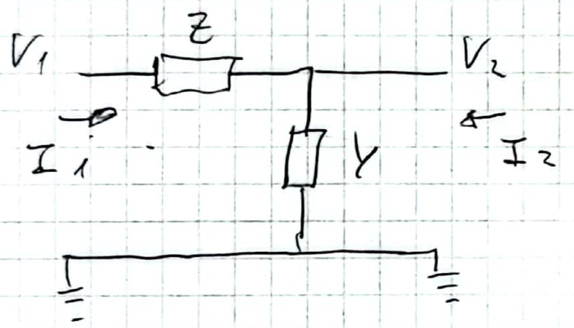
HOJA Nº

FECHA

Ejercicio 2



Cuadripolo con parámetros T



$$T_{ABCD} = \begin{cases} V_1 = AV_2 + B(-I_2) \\ I_1 = CV_2 + D(-I_2) \end{cases}$$

$$A = \frac{V_1}{V_2}\Big|_{-I_2=0} \Rightarrow I_1 = \frac{V_1 - V_2}{Z} = V_2 Y$$

$$A \Rightarrow V_1 = V_2 Y Z + V_2 \Rightarrow \frac{V_1}{V_2} = \boxed{ZY+1}$$

$$B = \frac{V_1}{-I_2}\Big|_{V_2=0} = \boxed{Z}$$

$$C = \frac{I_1}{V_2}\Big|_{-I_2=0} = \boxed{Y}$$

$$D = \frac{I_1}{-I_2}\Big|_{V_2=0} = \boxed{1}$$

$$T_{ABCD} = \begin{pmatrix} ZY+1 & Z \\ Y & 1 \end{pmatrix}$$

$$\Delta T = ZY+1 - ZY = \boxed{1}$$ PASIVO

NOTA

Cu:

$$T_1 = \begin{pmatrix} \frac{3}{2}s \cdot \frac{4}{3}s + 1 & \frac{3}{2}s \\ \frac{4}{3}s & 1 \end{pmatrix} = \begin{pmatrix} 2s^2+1 & \frac{3}{2}s \\ \frac{4}{3}s & 1 \end{pmatrix}$$

$$T_2 = \begin{pmatrix} \frac{s}{2}+1 & \frac{s}{2} \\ 1 & 1 \end{pmatrix}$$

Como están en cascada: $|T_1| \cdot |T_2| = T_T$

$$T_T = \begin{pmatrix} 2s^2+1 & \frac{3}{2}s \\ \frac{4}{3}s & 1 \end{pmatrix} \begin{pmatrix} \frac{s}{2}+1 & \frac{s}{2} \\ 1 & 1 \end{pmatrix}$$

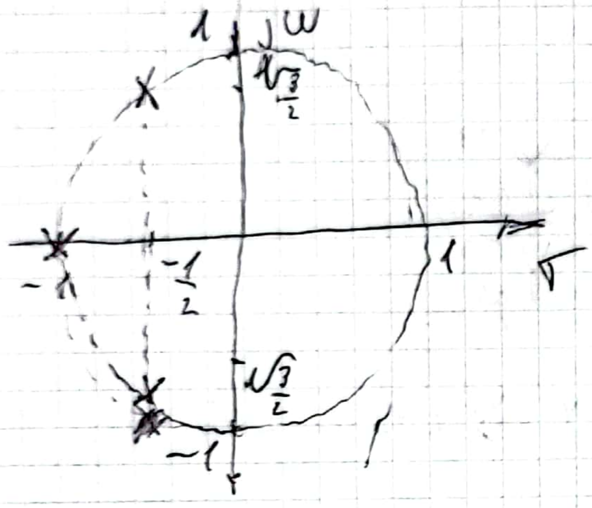
$$T_T = \begin{pmatrix} (2s^2+1)\left(\frac{s}{2}+1\right) + \frac{3}{2}s & (2s^2+1)\frac{s}{2} + \frac{3}{2}s \\ \frac{4}{3}s\left(\frac{s}{2}+1\right) + 1 & \frac{4}{3}s \cdot \frac{s}{2} + 1 \end{pmatrix}$$

$$T_T = \begin{pmatrix} s^3+2s^2+2s+1 & s^3+2s \\ \frac{2}{3}s^2+\frac{4}{3}s+1 & \frac{2}{3}s^2+1 \end{pmatrix}$$

$$\frac{V_2}{V_1} = \frac{1}{A} = \boxed{\frac{1}{s^3+2s^2+2s+1}}$$

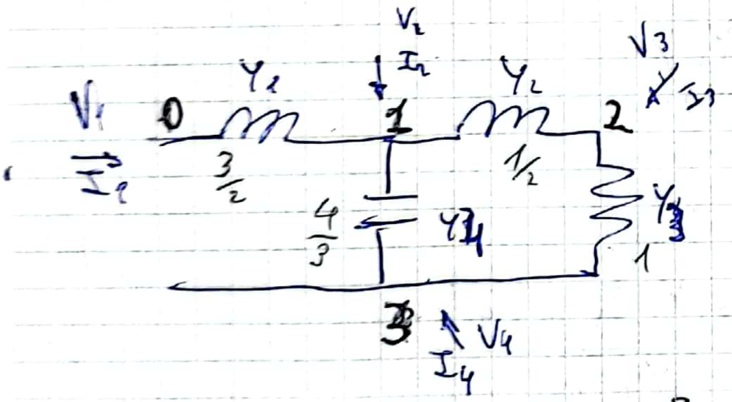
NOTA:

Diagrama de polos y ceros



Circunferencia de radio unitario.

Matriz de admitancia indefinida (MAI):



$$Y = \begin{array}{c} \\ 0 \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{cccc} 0 & 1 & 2 & 3 \end{array} \\ \begin{pmatrix} Y_1 & -Y_1 & 0 & 0 \\ -Y_1 & Y_1+Y_2+Y_4 & -Y_2 & -Y_4 \\ 0 & -Y_2 & Y_2+Y_3 & -Y_3 \\ 0 & -Y_4 & -Y_3 & Y_3+Y_4 \end{pmatrix} \end{array} \begin{array}{c} \\ \Sigma=0 \\ \Sigma=0 \\ \Sigma=0 \\ \Sigma=0 \end{array}$$

$\Sigma=0 \quad \Sigma=0 \quad \Sigma=0 \quad \Sigma=0$

$Y_1 = \frac{2}{3s}$ $\quad Y_2 = \frac{2}{s}$ $\quad Y_3 = 1$ $\quad Y_4 = \frac{4}{3}s$

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$$V_{mn}^{ij} = \frac{V_{ij}}{V_{mn}} = sig(i-j)\, sig(m-n)\, \frac{Y_{mn}^{ij}}{Y_{mn}^{mn}}$$

$$\frac{V_{23}}{V_{03}} = sig(2-3)\, sig(0-3)\, \frac{Y_{03}^{23}}{Y_{03}^{03}}$$

$\to$ Filas $\Rightarrow$ TAPAR

$\to$ Eliminar

$$Y_{03}^{23} = \begin{vmatrix} -Y_1 & Y_1+Y_2+Y_4 \\ 0 & -Y_2 \end{vmatrix} = Y_1 Y_2$$

$$Y_{03}^{03} = \begin{vmatrix} Y_1+Y_2+Y_4 & -Y_2 \\ -Y_2 & Y_2+Y_3 \end{vmatrix} = (Y_1+Y_2+Y_4)(Y_2+Y_3) - Y_2^2$$

$$Y_{03}^{03} = Y_1Y_2 + Y_1Y_3 + \cancel{Y_2^2} + Y_2Y_3 + Y_2Y_4 + Y_3Y_4 - \cancel{Y_2^2}$$

$$Y_{03}^{03} = \frac{1}{sL_1}\cdot\frac{1}{sL_2} + \frac{1}{sL_1}\frac{1}{R} + \frac{1}{sL_2}\cdot\frac{1}{R} + \frac{\cancel{s}C}{\cancel{s}L_2} + \frac{sC}{R}$$

$$Y_{03}^{03} = \frac{1}{s^2L_1L_2} + \frac{1}{sL_1R} + \frac{1}{sL_2R} + \frac{C}{L_2} + \frac{sC}{R}$$

$$Y_{03}^{03} = \frac{R + sL_2 + sL_1 + s^2CL_1R + s^3CL_1L_2}{s^2L_1L_2R}$$

$$Y_{03}^{23} = \frac{1}{sL_1}\cdot\frac{1}{sL_2} = \frac{1}{s^2L_1L_2}$$

NOTA

$$\frac{V_{23}}{V_{03}} = \frac{Y_{03}^{23}}{Y_{03}^{33}} = \frac{1}{\cancel{s^2 L_1 L_2}} \frac{\cancel{s^2 L_1 L_2} R}{s^3 C L_1 L_2 + s^2 C L_1 R + s(L_1 + L_2) + R}$$

$$\frac{V_2}{V_1} = \frac{\frac{R}{L_1 L_2 C}}{s^3 + s^2 \frac{R}{L_2} + s\left(\frac{L_1 + L_2}{L_1 L_2 C}\right) + \frac{R}{L_1 L_2 C}}$$

$$\frac{V_2}{V_1} = \frac{\frac{1}{\frac{3}{2} \cdot \frac{1}{2} \cdot \frac{4}{3}}}{s^3 + s^2 \frac{1}{1/2} + s\left(\frac{\frac{3}{2} + \frac{1}{2}}{\frac{3}{2} \cdot \frac{1}{2} \cdot \frac{4}{3}}\right) + \frac{1}{\frac{3}{2} \cdot \frac{1}{2} \cdot \frac{4}{3}}}$$

$$\boxed{\frac{V_2}{V_1} = \frac{1}{s^3 + 2s^2 + 2s + 1}}$$

Lo misma transferencia que antes.