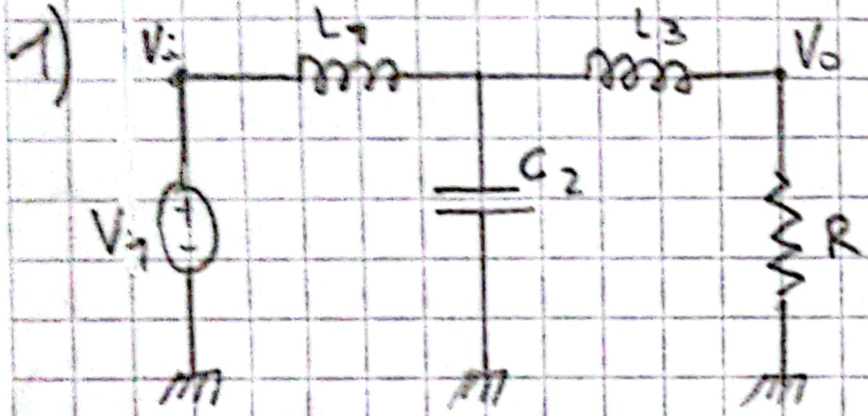
TS 8

1)



$L_1 = 1,5$ $\quad C_2 = 1,\hat{3}$ $\quad L_3 = 0,5$ $\quad R = 1$

Cascada T. To-Z : $Z = \begin{pmatrix} \frac{A}{C} & \frac{\Delta T}{C} \\ \frac{1}{C} & \frac{D}{C} \end{pmatrix}$

$$T_1 = \begin{pmatrix} 1 & Z_{L_1} \\ 0 & 1 \end{pmatrix} \quad T_2 = \begin{pmatrix} 1 & 0 \\ Y_{C_2} & 1 \end{pmatrix} \quad T_3 = \begin{pmatrix} 1 & Z_{L_2} \\ 0 & 1 \end{pmatrix} \quad T_4 = \begin{pmatrix} 1 & 0 \\ Y_R & 1 \end{pmatrix}$$

$$T_{12} = \begin{pmatrix} 1 & Z_{L_1} \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ Y_{C_2} & 1 \end{pmatrix} = \begin{pmatrix} 1 + Z_{L_1} Y_{C_1} & Z_{L_1} \\ Y_{C_2} & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & Z_{L_2} \\ 0 & 1 \end{pmatrix}$$

$$T_{123} = \begin{pmatrix} 1 + Y_{C_2} Z_{L_1} & Z_{L_2} + Z_{L_2} Z_{L_1} Y_{C_2} + Z_{L_1} \\ Y_{C_2} & Y_{C_2} Z_{L_2} + 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 \\ Y_R & 1 \end{pmatrix}$$

NOTA

$$T = \begin{pmatrix} 1 + Y_{C_2} Z_{L_1} + Y_R (Z_{L_3} + Z_{L_1} + Z_{L_3} Z_L Y_{C_2}) & Z_{L_3} + Z_{L_1} + Z_{L_3} Z_L Y_{C_2} \\ Y_{C_2} + Y_R (Y_{C_2} Z_{L_3} + 1) & (Y_{C_2} \cdot Z_{L_1} + 1) \end{pmatrix}$$

Transferencia en 2 $= \left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{Z_{21}}{Z_{11}}$ $\quad Z_{21} = \frac{1}{C} \quad Z_{11} = \frac{A}{C}$

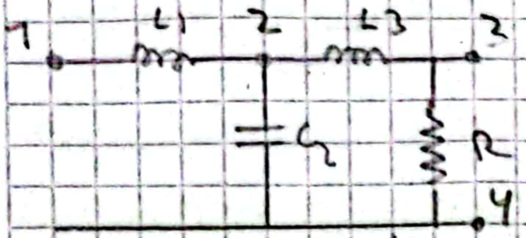
$$H = \frac{1}{C} \cdot \frac{C}{A} = \frac{1}{1 + Y_{C_2} Z_{L_1} + Y_R (Z_{L_3} + Z_{L_1} + Z_{L_3} Z_L Y_{C_2})}$$

$$H(s) = \frac{1}{\frac{1}{R}(s^3 L_1 L_3 C_2) + \frac{1}{R} s (L_3 + L_1) + s^2 C_2 L_1 + 1}$$

$$H(s) = \frac{R}{L_1 L_3 C_2} \cdot \frac{1}{s^3 + s^2 \frac{R}{L_3} + s \frac{R (L_3 + L_1)}{L_1 L_3 C_2} + \frac{R}{L_1 L_3 C_2}}$$

$$H(s) = \frac{1}{s^3 + s^2 \cdot 2 + s \cdot 2 + 1} = \frac{1}{(s^2 + s + 1)(s + 1)}$$

Con MAI: (cuando es 01 o 21 etc, es la impedancia que está entre esos nodos (negativo))



Para T(s) defino nodo 4 como masa.

$$T(s) = \frac{V_3(s)}{V_1(s)}$$

$$Y_{MAI} = \begin{pmatrix} Y_{L_1} & -Y_{L_1} & 0 & 0 \\ -Y_{L_1} & Y_{L_1} + Y_{C_2} + Y_{L_3} & -Y_{L_3} & -Y_{C_2} \\ 0 & -Y_{L_3} & Y_{L_3} + G & -G \\ 0 & -Y_{C_2} & -G & Y_{C_2} + G \end{pmatrix}$$

$$Y_{MAI} = \begin{pmatrix} \frac{1}{sL_1} & -\frac{1}{sL_1} & 0 & 0 \\ -\frac{1}{sL_1} & \frac{1}{sL_1} + sC_2 + \frac{1}{sL_3} & -\frac{1}{sL_3} & -sC_2 \\ 0 & -\frac{1}{sL_3} & \frac{1}{R} + \frac{1}{sL_3} & -\frac{1}{R} \\ 0 & -sC_2 & -\frac{1}{R} & sC_2 + \frac{1}{R} \end{pmatrix} = \begin{pmatrix} \frac{2}{3s} & -\frac{2}{3s} & 0 & 0 \\ -\frac{2}{3s} & \frac{8}{3s} + s\frac{4}{3} & -\frac{2}{s} & -s\frac{4}{3} \\ 0 & -\frac{2}{s} & 1 + \frac{2}{s} & -1 \\ 0 & -s\frac{4}{3} & -1 & \frac{4}{3}s + 1 \end{pmatrix}$$

$$V_3 = \begin{vmatrix} -\frac{2}{3s} & 0 \\ \frac{8}{3s} + \frac{s4}{3} & -\frac{2}{s} \end{vmatrix} = \frac{4}{3s^2}$$

$$V_1 = \begin{vmatrix} \frac{4s}{3} + \frac{8}{3s} & -\frac{2}{s} \\ -\frac{2}{s} & 1 + \frac{2}{s} \end{vmatrix} = \frac{4s}{3} + \frac{8}{3} + \frac{8}{3s} + \frac{16}{3s^2} - \frac{4}{s^2} = \frac{4s}{3} + \frac{8}{3} + \frac{8}{3s} + \frac{4}{3s^2}$$

$$A_v = \frac{V_3}{V_1} = \frac{1}{\frac{4s}{3} + \frac{8}{3} + \frac{8}{3s} + \frac{4}{3s^2}} \cdot \frac{4}{3s^2} = \frac{4}{4s^3 + 8s^2 + 8s + 4}$$

$$A_v = \frac{1}{s^3 + 2s^2 + 2s + 1}$$