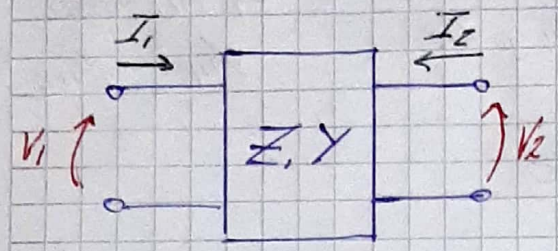
Síntesis de funciones transferencia



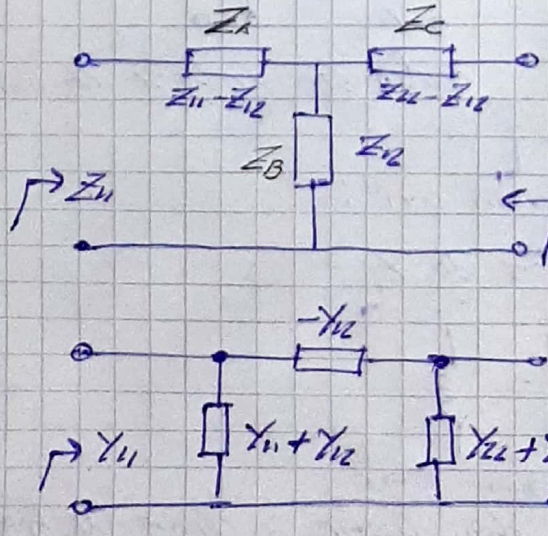
$$\left.\begin{array}{l} \left.\dfrac{V_2}{V_1}\right|_{I_2=0} \\ \left.\dfrac{I_2}{I_1}\right|_{V_2=0} \end{array}\right\} \text{en vacío}$$

$$\begin{cases} V_1 = Z_{11} I_1 + \cancel{Z_{12} I_2} \\ V_2 = Z_{21} I_1 + \cancel{Z_{22} I_2} \end{cases} \Rightarrow \left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{Z_{21}}{Z_{11}} = -\frac{Y_{21}}{Y_{11}}$$

$$\begin{cases} I_1 = Y_{11} V_1 + \cancel{Y_{12} V_2} \\ I_2 = Y_{21} V_1 + \cancel{Y_{22} V_2} \end{cases} \Rightarrow \left.\frac{I_2}{I_1}\right|_{V_2=0} = \frac{Y_{21}}{Y_{11}} = -\frac{Z_{21}}{Z_{22}}$$

Describimos props de los $T(s)$

- $T(s) = \dfrac{P(s)}{Q(s)}$; $T(s)$ debe ser real si s es real
  $\Rightarrow$ P y Q tendrán coeficientes reales
  ↳ $\text{Gr}\{P\} \leq \text{Gr}\{Q\}$
- Polos en el semiplano izquierdo
- Ceros sin restricciones.
- T no necesariamente es FTBP.



$$\left.\frac{V_2}{V_1}\right|_{I_1=0} = \frac{Z_{12}}{Z_{11}} \quad ; \quad \begin{array}{l} Z_{11} = Z_A + Z_B \\ Z_{12} = Z_B \end{array}$$

$\frac{P_A}{G_A} + \frac{P_B}{G_B}$

Polos de Z_{12} están $\rightarrow$ Z_{11}

" Z_{11} no necesariamente están en Z_{12}

" Z_{22} " " " "

NOTA 11:40 ⇒ 13:00

Condición de residuos garantizado (reciprocidad) y simetría

$R_{11}R_{22} - R_{12}^2 \geq 0$

↳ " entre Z_{22} y Z_{12}

↳ Residuo calculado en polo común de Z_{11} y Z_{12}

↳ $R_{11} = R_{22}$

$R_{11}^2 - R_{12}^2 \geq 0$

cuadripolo compacto $R_{11}R_{22} - R_{12}^2 = 0$

⇒ condición de residuos en un límite de realizabilidad

ceros de transmisión de una transferencia (red pasiva)

↳ son los mismos para todos los juegos de parámetros

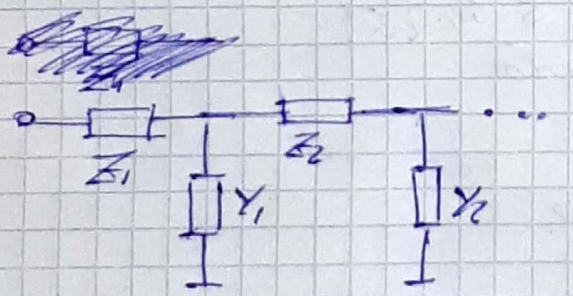
$Z_{21} = Z_{12} = -\frac{Y_{12}}{\Delta Y}$, $Y_{21} = Y_{12} = -\frac{Z_{12}}{\Delta Z}$

ceros en el SPI

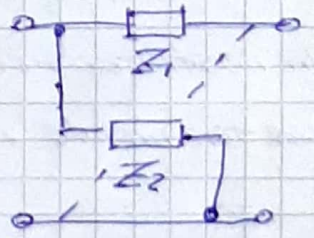
↳ Fase mínima

ceros en el SPD

↳ Fase No mínima.



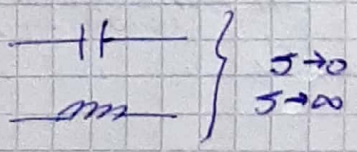
Suelen ser de fase mínima (red escalera)



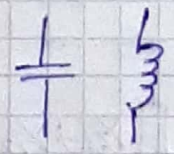
Suelen ser de fase no mínima.

Los ceros de transmisión se logran con:

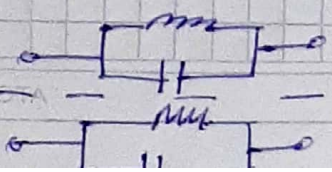
Polos de Z

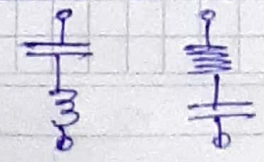


Polos de Y



Polo de impedancia o admitancia dan lugar a ceros de transmisión





Polos de imp sobre el eje ...

$$\left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{Z_{12}}{Z_{11}} = -\frac{Y_{12}}{Y_{22}}$$

$$= \frac{P}{Q} = \frac{P/D}{Q/D}$$

D es un denominador auxiliar
→ los ceros los impone P

Sea que Q/D coincida con Y_{22} o Z_{11}

⇒ Sintetizar como FE (FBP) respetando ceros de Tx

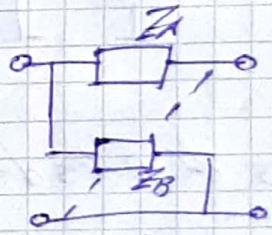
de $\begin{cases} T(s) = V_2/V_1 \\ T(s) = I_2/I_1 \end{cases}$

Síntesis de transferencias descargadas

Sint. Balanceada

• Sint desbalanceada

$P_{12} \rightarrow \begin{cases} \oplus \\ \ominus \end{cases}$ $\begin{cases} Z_A = Z_{11} - Z_{12} \\ Z_B = Z_{11} + Z_{12} \end{cases}$



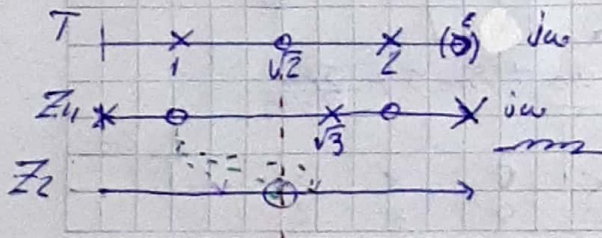
$$Z_{11} = P_{12_\oplus} + P_{12_\ominus} \quad ; \quad Z_{12} = P_{12_\oplus} - (P_{12_\ominus})$$

$$\Rightarrow \begin{cases} Z_A = +2\, P_{12_\ominus} \\ Z_B = 2\, P_{12_\oplus} \end{cases}$$

$$T(s) = \left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{Z_{21}}{Z_{11}} = -\frac{Y_{21}}{Y_{22}} \qquad \begin{cases} V_1 = I_1 Z_{11} + I_2 Z_{12} \\ V_2 = I_1 Z_{21} + I_2 Z_{22} \end{cases}$$

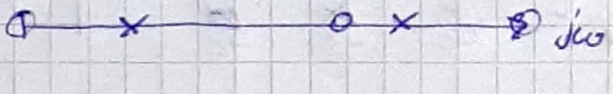
EJ:

$$\frac{V_2}{V_1} = \frac{(s^2+2)}{(s^2+1)(s^2+4)} = \frac{P}{Q} = \frac{P/D}{Q/D} \rightarrow Z_{11} \text{ ó } Y_{22}$$



$$Z_{11} = \frac{(s^2+1)(s^2+4)}{s(s^2+3)}$$

Par / Impar

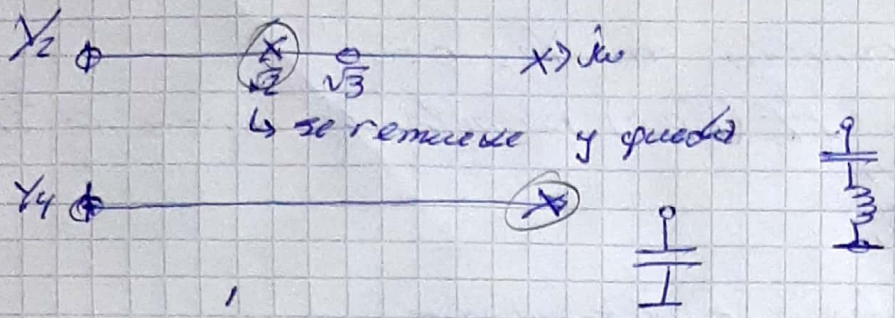


NOTA 14:12 17:13

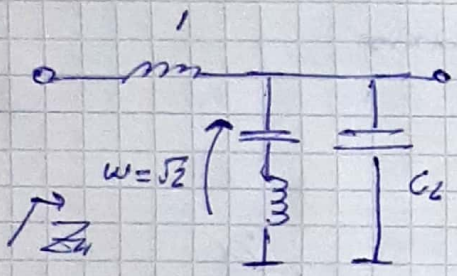
$Z_2 = Z_{11} - 5R_\infty$ $\quad R_\infty = \lim_{s\to\infty} \frac{Z_{11}}{s} = \lim_{s\to\infty} \frac{(s^2+1)(s^2+4)}{s^2(s^2+3)} = 1$

$Z_2 = Z_{11} - s \Rightarrow Z_2 = \frac{s^4+5s^2+4-s^4-3s^2}{s^3+3s} = \frac{2s^2+4}{s^3+3s}$

$Z_2 = \frac{2(s^2+2)}{s^3+3s}$ → en este caso la remoción completa resto llevó el cero a 2



↳ se remueve y queda



$Z_{11} = \frac{V_1}{I_1}\Big|_{I_2=0}$

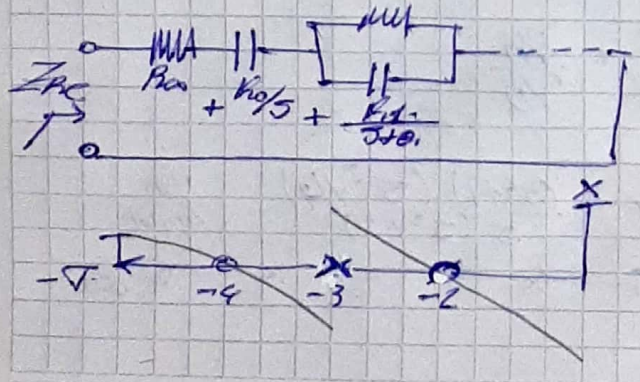
Síntesis de redes disipativas y descargadas.

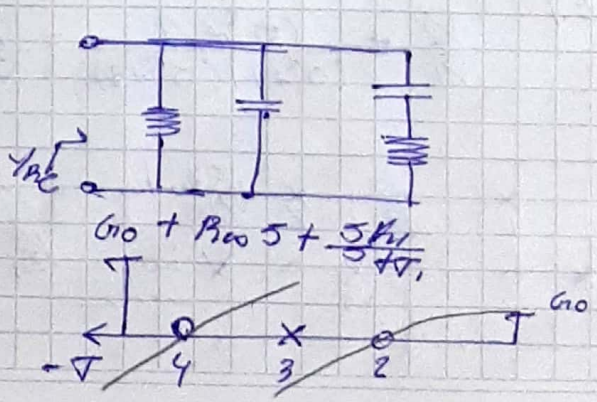
$T = \frac{V_2}{V_1} = \frac{K_1(s+1)}{(s+2)(s+4)} = \frac{P/D}{Q/D}$

$Q/D = Z_{11} \vee Y_{22}$ ↳ Z_{RC} ↳ Y_{RC}

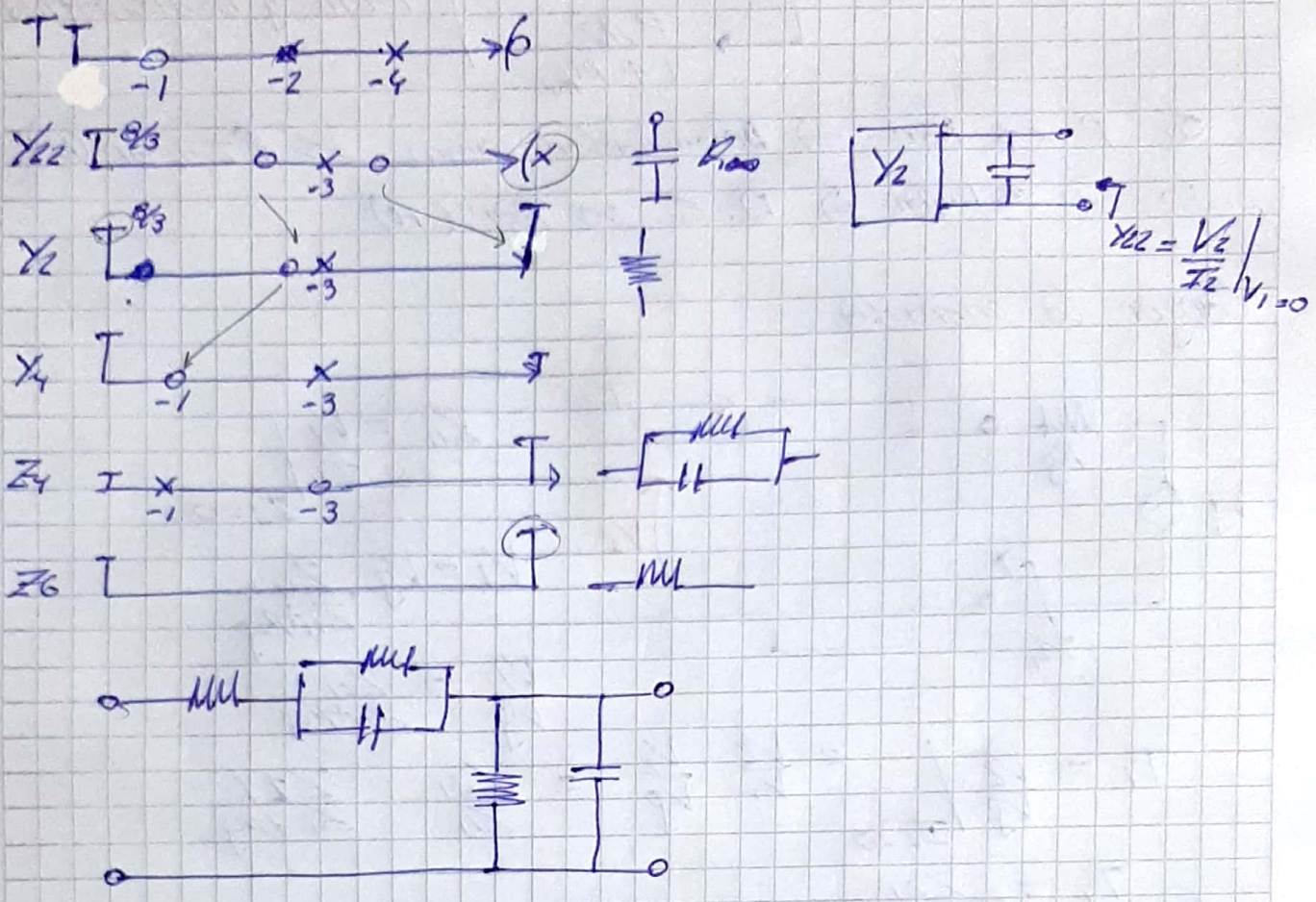
$Z_{11} = \frac{(s+2)(s+4)}{s(s+3)}$ $\qquad Y_{22} = \frac{(s+2)(s+4)}{(s+3)}$

↳ por alternancia

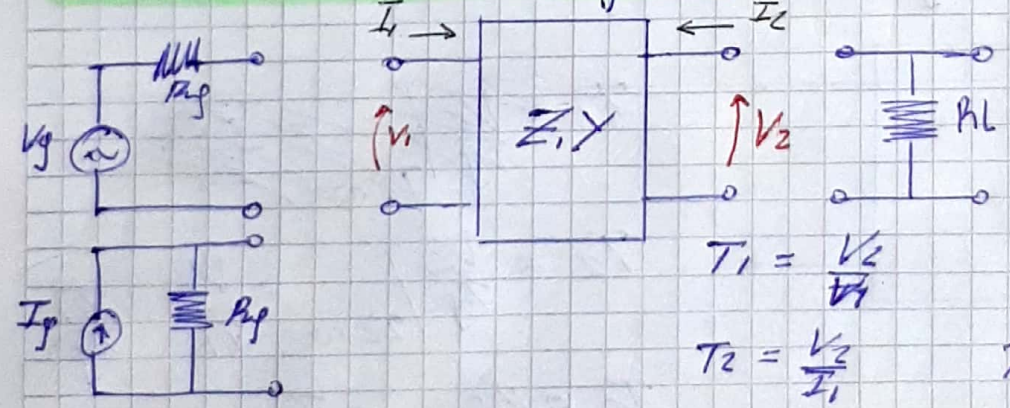




NOTA



Síntesis simplemente cargadas.



$T_1 = \frac{V_2}{V_1}$ $\quad T_3 = \frac{I_2}{V_1}$

$T_2 = \frac{V_2}{I_1}$ $\quad T_4 = \frac{I_2}{I_1}$

$T_1 = \frac{V_2}{V_1} \Rightarrow V_2 = -I_2 R$

$I_2 = -\frac{V_2}{R} = V_1 Y_{21} + V_2 Y_{22} \Rightarrow \frac{V_2}{V_1} = \frac{-Y_{21}}{1/R + Y_{22}}$

T_1

$T_2 = \frac{V_2}{I_1}$; $V_2 = I_1 Z_{21} - \frac{V_2}{R} Z_{22}$

$T_2 = \frac{V_2}{I_1} = \frac{Z_{21}}{1 + Z_{22}/R}$ $\quad T_3 = \frac{Y_{21}}{1 + Y_{22}/Y_1}$ $\quad T_4 = \frac{-Z_{21}}{R_L + Z_{22}}$

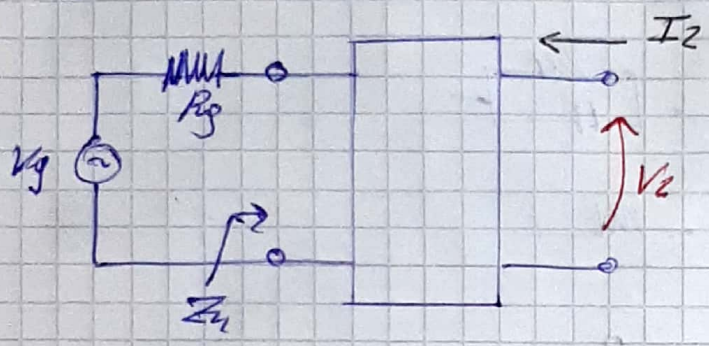
T_2

$$T_x = \frac{P}{Q} = \frac{P}{M+N} = \begin{cases} \longrightarrow \dfrac{P/M}{1+N/M} \\ \longrightarrow \dfrac{P/N}{1+M/N} \end{cases}$$ FBP y no disipativas

Si P es Par $\Rightarrow$ Denominador común es N Impar

" " es Impar $\Rightarrow$ D.C es Par (M)

Cargar la entrada



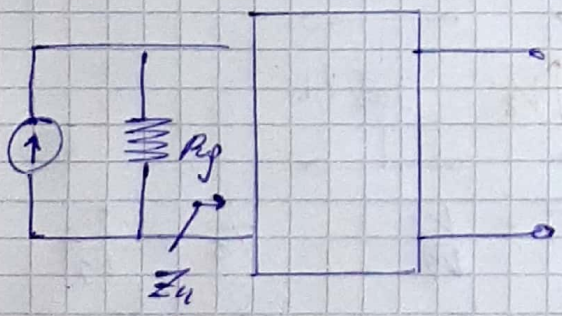
$$Z_{11} = \frac{V_1}{I_1}\Big|_{I_2=0}$$

$$V_1 = V_g \frac{Z_{11}}{Z_{11}+R_g}$$

$$\frac{V_1}{V_g} = \frac{Z_{11}}{Z_{11}+R_g}$$

$$T_1 = \frac{V_2}{V_g}\Big|_{I_2=0} = \frac{V_2}{V_1}\cdot\frac{V_1}{V_g} = \frac{Z_{21}}{Z_{11}}\cdot\frac{Z_{11}}{Z_{11}+R_g}$$

$$T_1 = \frac{Z_{21}}{Z_{11}+R_g}$$



~~$T_1 = \frac{V_2}{V_g}\Big|_{I_2=0} = \frac{Z_{21}}{Z_{11}}$~~

$$T_2 = \frac{V_2}{I_g}\Big|_{I_2=0} = \frac{V_2}{I_1}\cdot\frac{I_1}{I_g}$$

$$I_g \cdot \frac{R_g}{R_g+Z_{11}} = I_1$$

$$\Rightarrow T_2 = Z_{21}\frac{R_g}{R_g+Z_{11}} = \frac{Z_{21}}{1+Z_{11}/R_g}$$

NOTA