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TS12

HOJA Nº 3

FECHA

② Dada la siguiente transferencia:

$$T(s) = \left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{k\,(s+1)}{(s+2)(s+4)}$$

a) Obtener la topología circuital que respeta la transferencia solicitada, utilizando parámetros Z e Y.

b) Calcular el valor de los componentes y el parámetro k.

* Recordamos que:

$$\left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{1}{A} = \frac{-Y_{21}}{Y_{22}} = \frac{Z_{21}}{Z_{11}}$$

Resolución:

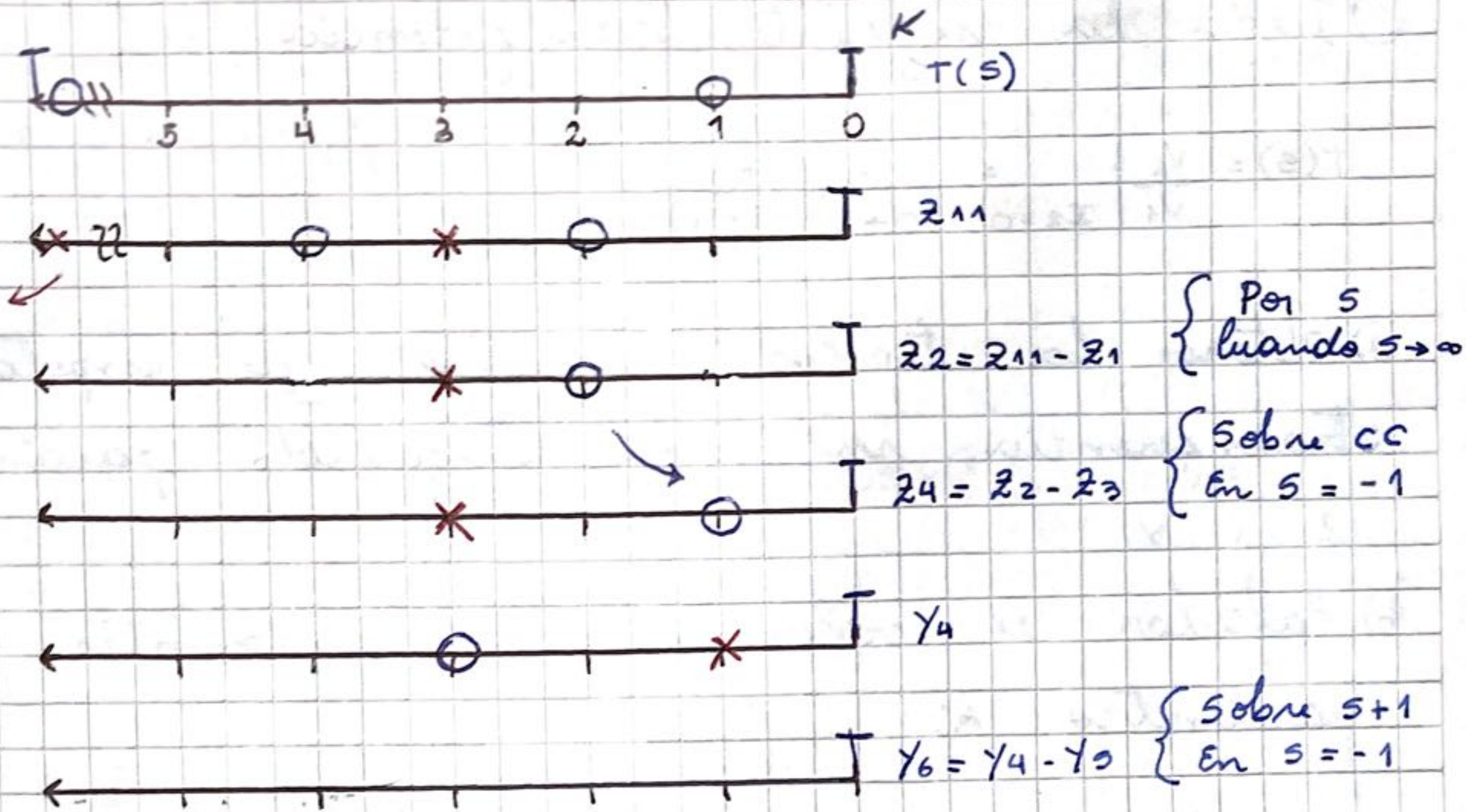
Planteamos: $\left.\frac{V_2}{V_1}\right|_{I_2=0} = \frac{k(s+1)}{Aux(s)} \cdot \frac{Aux(s)}{(s+2)(s+4)}$

Elejimos $Aux(s) = (s+3)$, ya que solo necesitamos 1 polo para ubicar el cero de transmición y debe haber alternancia.

Entonces: $Z_{21} = k\,\frac{(s+1)}{s+3}$ y $\frac{1}{Z_{11}} = \frac{(s+3)}{(s+2)(s+4)}$

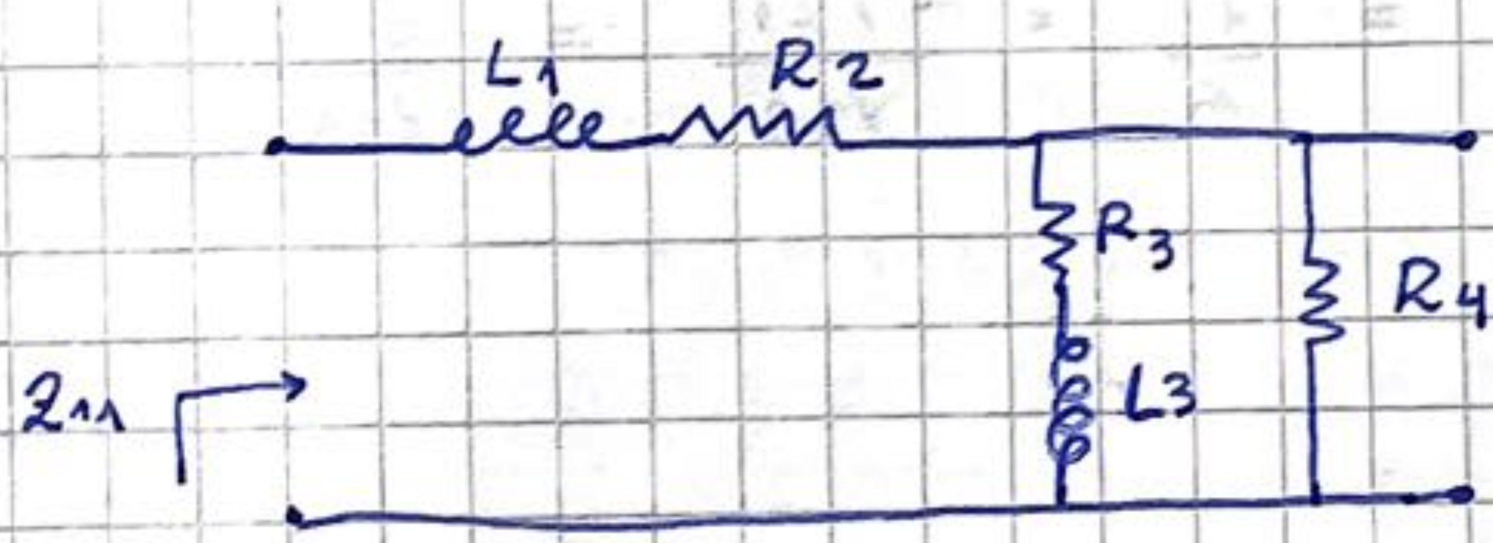
NOTA

Síntesis Gráfica:



Topología circuital:

I) L en Z.
II) R en Z.
III) RC_s en Y.
IV) R en Y.



Síntesis analítica:

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

* $Z_2 = Z_{11} - Z_1 = Z_{11} - K_1 \cdot s$

· $K_1 = Z_{11} \cdot \frac{1}{s}\Big|_{s\to\infty} = \frac{s^2}{s^2}\Big|_{s\to\infty} = 1$

$$Z_2 = \frac{s^2+6s+8}{(s+3)} - \overset{Z_I}{s} = \frac{s^2+6s+8-s^2-3s}{(s+3)} = \frac{3s+8}{(s+3)}$$

* $Z_4 = Z_2 - Z_3 = Z_2 - K_3$

· $K_3 = Z_2\Big|_{s=-1} = \frac{5}{2}$

NOTA

$$Z_4 = \frac{3s+8}{s+3} - \overset{Z_{II}}{\frac{5}{2}} = \frac{3s+8-\frac{5}{2}s-\frac{15}{2}}{(s+3)} = \frac{\frac{1}{2}s+\frac{1}{2}}{s+3}$$

$$Z_4 = \frac{1}{2}\frac{(s+1)}{(s+3)} \longrightarrow Y_4 = \frac{2(s+3)}{(s+1)}$$

$$* \; Y_6 = Y_4 - Y_5 = Y_4 - \frac{K_5}{s+1}$$

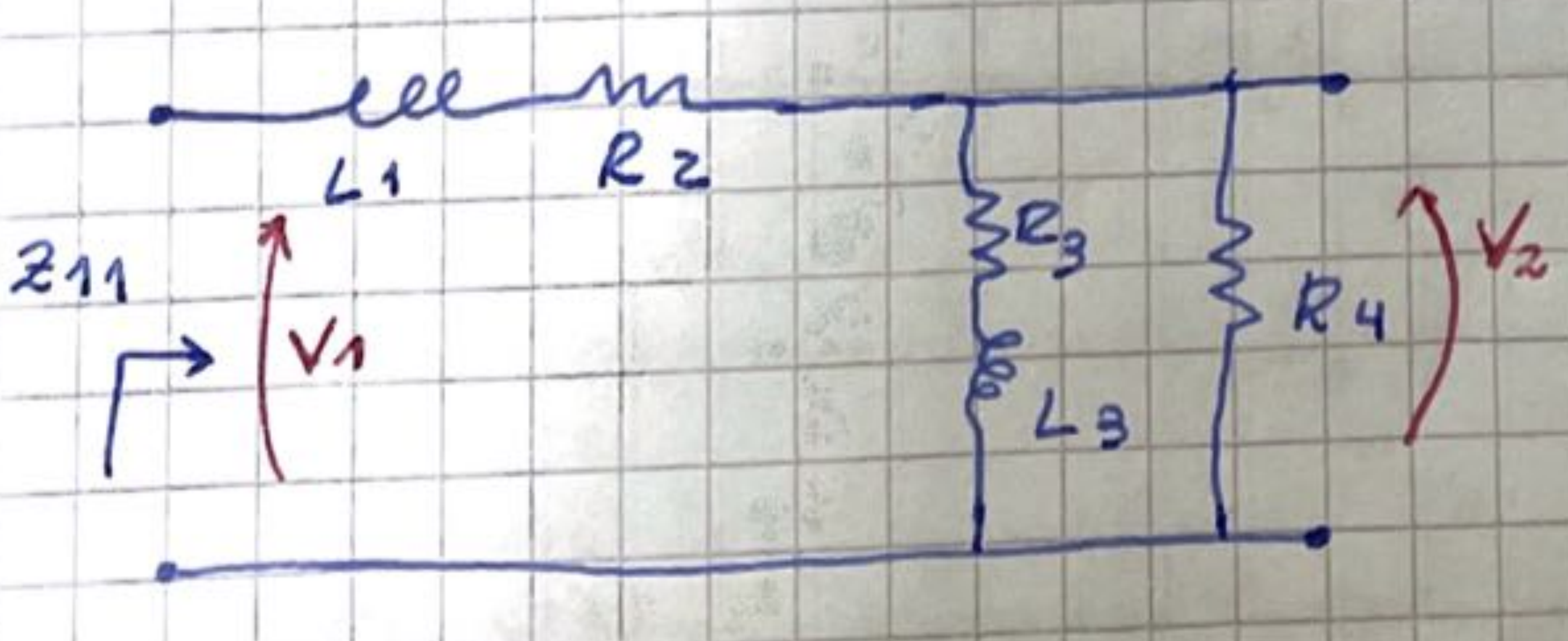
$$\cdot \; K_5 = Y_4(s+1)\Big|_{s=-1} = 2\frac{(s+3)}{(s+1)}(s+1)\Big|_{s=-1} = 4$$

$$Y_6 = \frac{2(s+3)}{(s+1)} - \overset{Y_{III}}{\frac{4}{(s+1)}} = \frac{2s+6-4}{(s+1)} = \frac{2(s+1)}{(s+1)} = 2 \; Y_{IV}$$

Entonces:

- $L_1 = 1\,H$
- $R_2 = 5/2\,\Omega$
- $\begin{cases} L_3 = 1/4\,H \\ R_3 = 1/4\,\Omega \end{cases} \longrightarrow Z = Ls + R = L(s + R/L) \Rightarrow Y = \dfrac{1/L}{s+R/L}$
- $R_4 = 1/2\,\Omega$

* Para despejar K



$$T(s)\Big|_{s\to\infty} = K \cdot \cancel{Z} \rightarrow \frac{1}{s}$$

$$T(s)\Big|_{s=0} = \frac{R_3 // R_4}{R_2 + R_3 // R_4}$$

$$T(s)\Big|_{s=0} = \frac{1}{16}$$

Luego, por la función $T(s)$, sabemos que:

$$T(s)\Big|_{s=0} = K \cdot \frac{1}{8} \Longrightarrow \boxed{K = \frac{1}{2}}$$