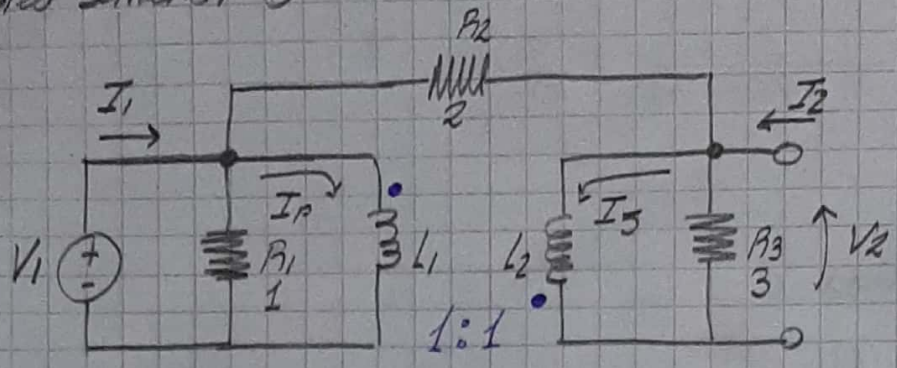
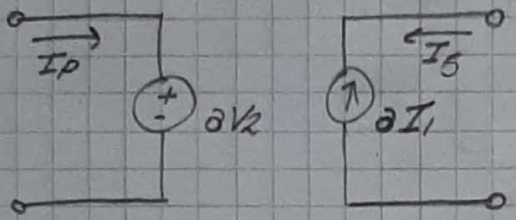
Tarea semanal 6

1)



Trafo ideal (bornes homólogos)



$$\begin{cases} V_1 = \partial V_2 \\ I_P = 1/\partial\,(-I_5) \end{cases}$$

Bornes NO homólogos $\partial = -1 \Rightarrow$

$$\begin{cases} V_1 = -V_2 & (1) \\ I_P = I_5 & (2) \end{cases}$$

Nodos

$$\begin{cases} V_1 (G_1 + G_2) - V_2 G_2 = I_1 - I_P & (3) \\ V_2 (G_3 + G_2) - V_1 G_2 = I_2 - I_5 & (4) \end{cases}$$

Parámetros Z

$$\begin{cases} V_1 = Z_{11} I_1 + Z_{12} I_2 \\ V_2 = Z_{21} I_1 + Z_{22} I_2 \end{cases}$$

Z_{11}

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

de (3) $\rightarrow$ $I_P = I_1 - V_1 (G_1 + G_2) + V_2 G_2$

en (4) usando (2) $\rightarrow$ $V_2 (G_3 + G_2) - V_1 G_2 = \underbrace{I_2}_{=0} - I_1 + V_1 (G_1 + G_2) - V_2 G_2$ (5)

NOTA

reemplazo x (1) → $-V_1(G_3+G_2)-V_1G_2 = -I_1 + V_1(G_1+G_2)+V_2G_2$

$$I_1 = V_1(G_1+2G_2)+V_1(G_3+2G_2)$$

$$\Rightarrow Z_{11} = \frac{1}{G_1+4G_2+G_3} = \frac{3}{10}\,\Omega$$

Z_{12}

$$Z_{12} = \frac{V_1}{I_2}\Big|_{I_1=0}$$

en (5) reemplazo (1)

$$-V_1(G_3+G_2)-V_1G_2 = I_2 + V_1(G_1+G_2)+V_1G_2$$

$$I_2 = V_1(-G_3-2G_2-G_1-2G_2)$$

$$\Rightarrow Z_{12} = -\frac{1}{(G_1+4G_4+G_3)} = -\frac{3}{10}\,\Omega$$

Por propiedad de los cuadripolos pasivos y recíprocos $\boxed{Z_{12}=Z_{21}}$

Z_{22}

$$Z_{22} = \frac{V_2}{I_2}\Big|_{I_1=0}$$

en (5) reemplazo (1)

$$V_2(G_3+G_2)+V_2G_2 = I_2 - V_2(G_1+G_2)-V_2G_2)$$

$$I_2 = V_2(G_1+4G_2+G_3)$$

$$\Rightarrow Z_{22} = \frac{V_2}{I_2} = \frac{1}{G_1+4G_2+G_3} = \frac{3}{10}\,\Omega$$

como $Z_{22}=Z_{11}$ el circuito es simétrico también

NOTA