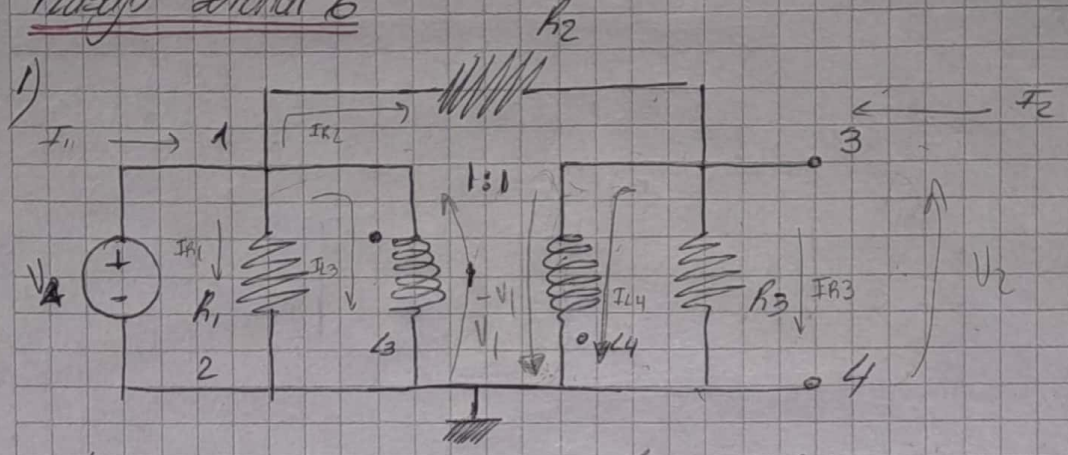
HOJA Nº 1

FECHA

Trabajo Semanal 6

1)



$V_1 = I_1 Z_{11} + I_2 Z_{12}$

$V_2 = I_1 Z_{21} + I_2 Z_{22}$

$R_1 = 1$

$R_2 = 2$

$R_3 = 3$

$$\begin{cases} V_1 = a \cdot V_2 (-1) \\ I_1 = \frac{1}{a}(-I_2)(-1) \end{cases} \Rightarrow \begin{cases} V_1 = -V_2 \\ I_{L3} = I_{L4} \end{cases}$$

$I_1 = I_{R1} + I_{R2} + I_{L3}$;

$I_1 = \frac{V_1}{R_1} + \frac{V_1 - V_2}{R_2} + I_{L3}$ ✓

$V_2 = -V_1 \Rightarrow I_1 = \frac{V_1}{R_1} + \frac{V_1 - (-V_1)}{R_2} + I_{L3}$; $I_1 = V_1\left(\frac{1}{R_1} + \frac{2}{R_2}\right) + I_{L3}$ (1)

$I_2 + I_{R2} = I_{L4} + I_{R3}$; $I_2 + \frac{V_1 - V_2}{R_2} = I_{L4} + \frac{V_2}{R_3}$; $I_2 + \frac{V_1 - (-V_1)}{R_2} = I_{L4} - \frac{V_1}{R_3}$

$I_2 = I_{L4} - \frac{V_1}{R_3} - \frac{2V_1}{R_2}$; $I_2 = I_{L4} - V_1\left(\frac{1}{R_3} + \frac{2}{R_2}\right)$ (2)

$Z_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0}$

$I_2 = 0 \Rightarrow (2) \rightarrow 0 = I_{L4} - V_1\left(\frac{1}{R_3} + \frac{2}{R_2}\right)$; $I_{L4} = V_1\left(\frac{1}{R_3} + \frac{2}{R_2}\right)$ (3)

(3) en (1) ($I_{L3} = I_{L4}$) $\rightarrow I_1 = V_1\left(\frac{1}{R_1} + \frac{2}{R_2}\right) + V_1\left(\frac{1}{R_3} + \frac{2}{R_2}\right)$; $I_1 = V_1\left(\frac{1}{R_1} + \frac{4}{R_2} + \frac{1}{R_3}\right)$

$Z_{11} = \left.\frac{V_1}{I_1}\right|_{I_2=0} = \left(\frac{1}{R_1} + \frac{4}{R_2} + \frac{1}{R_3}\right)^{-1} = \left(\frac{1}{1} + \frac{4}{2} + \frac{1}{3}\right)^{-1} \Rightarrow \boxed{Z_{11} = \frac{3}{10}\ [\Omega]}$

NOTA

$Z_{12} = Z_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0}$; $V_1 = -V_2 \Rightarrow Z_{12} = -\left.\frac{V_1}{I_1}\right|_{I_2=0} \Rightarrow Z_{12} = -Z_{11}$

$\therefore \boxed{Z_{12} = Z_{21} = -\frac{3}{10}}$

$Z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0}$; $(I_1 = 0 \Rightarrow (1) \rightarrow I_{13} = -V_1\left(\frac{1}{R_1} + \frac{2}{R_2}\right)$ (4)

(4) en (2), $I_{13} = I_{14} \Rightarrow I_2 = -V_1\left(\frac{1}{R_1} + \frac{2}{R_2}\right) - V_1\left(\frac{1}{R_3} + \frac{2}{R_2}\right)$

$I_2 = -V_1\left(\frac{1}{R_1} + \frac{4}{R_2} + \frac{1}{R_3}\right)$; $-V_1 = V_2 \Rightarrow I_2 = V_2\left(\frac{1}{R_1} + \frac{4}{R_2} + \frac{1}{R_3}\right)$

$Z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0} = \left(\frac{1}{R_1} + \frac{4}{R_2} + \frac{1}{R_3}\right)^{-1} \Rightarrow \boxed{Z_{22} = \frac{3}{10}}$

$\therefore \boxed{Z = \begin{pmatrix} 3/10 & -3/10 \\ -3/10 & 3/10 \end{pmatrix}}$

NOTA