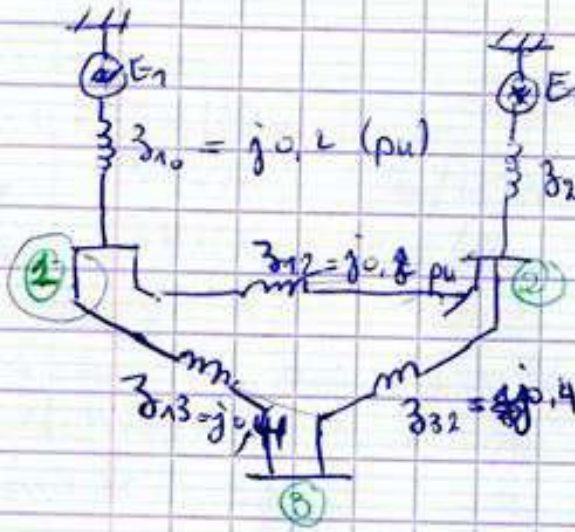
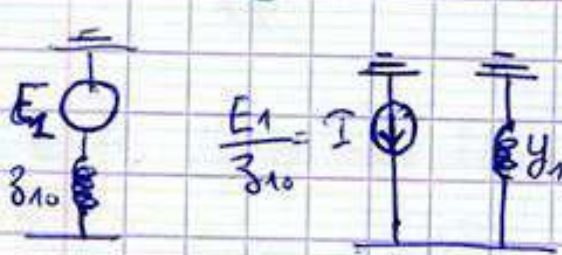
08/12/2015

Ex: 10

Déterminer La ~~Tension~~ Matrice addmitance de la circuit électri suivant :





$$[Y] = \begin{bmatrix} Y_{11} & Y_{12} & Y_{13} \\ Y_{21} & Y_{22} & Y_{23} \\ Y_{31} & Y_{32} & Y_{33} \end{bmatrix}$$

$-y_{12}$ $-y_{21}$

$y_{11} = y_{10} + y_{12} + y_{13}$

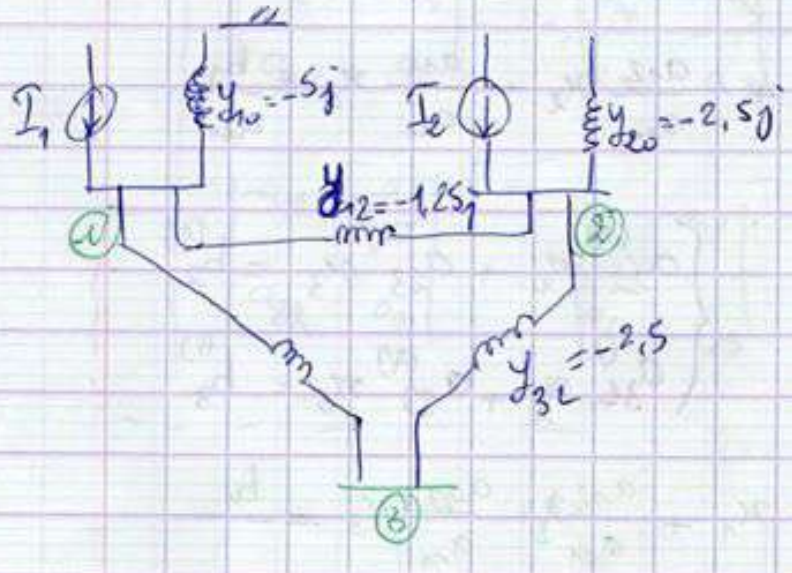
$y_{22} = y_{20} + y_{12} + y_{32}$

$$\begin{cases} Y_{ii} = \sum y_{ij} & i = 1,2,\dots,n \\ & j = 1,\dots,n \\ Y_{ij} = -y_{ij} & i \neq j \end{cases}$$

$$Y_{11} = y_{10} + y_{12} + y_{13}$$
$$= (-5 - 1{,}25 - 2{,}5)j$$
$$= -8{,}75\,j$$

$$[Y] = \begin{bmatrix} \frac{-1}{j0{,}8} & -\frac{1}{j0{,}8} & \frac{-1}{j0{,}4} \\ 1{,}25j & \frac{5}{j0{,}8} & 2{,}5j \\ 2{,}5j & -\frac{1}{j0{,}4} & \frac{2}{j0{,}4} \end{bmatrix}$$

$$[y] = \begin{bmatrix} -j8{,}75 & j1{,}25 & j2{,}5 \\ 1{,}25j & -j6{,}25 & j2{,}5 \\ 2{,}5j & j2{,}5 & -j5 \end{bmatrix}$$



Suit Ex 3.10

- Calculer les Tensions V_1, V_2, V_3 si $\dot{I}_1 = 1,1$ pu
$\dot{I}_2 = -j\,1,25$

et une charge au noeud (3) qui absorbe un courant
$\dot{I}_3 = +j\,1.0$ pu

$$[Y] = [V] \cdot [I]$$

Méthode d'élimination de Gauss :

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1 \\ a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2 \\ a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3 \end{cases} \Rightarrow \text{diviser par } a_{11}$$

Exprimé à l'exemple

$$x_1 + \frac{a_{12}}{a_{11}}x_2 + \frac{a_{13}}{a_{11}}x_3 = \frac{b_1}{a_{11}}$$

$$\begin{cases} a_{22}^{(1)}x_2 + a_{23}^{(1)}x_3 = b_2^{(1)} \\ a_{32}^{(1)}x_2 + a_{33}^{(1)}x_3 = b_3^{(1)} \end{cases}$$

$$\begin{cases} x_1 + \frac{a_{12}}{a_{11}}x_2 + \frac{a_{13}}{a_{11}}x_3 = \frac{b_1}{a_{11}} \\ x_2 + \frac{a_{23}^{(1)}}{a_{22}^{(1)}}x_3 = \frac{b_2^{(1)}}{a_{22}^{(1)}} \\ a_{33}^{(2)}x_3 = b_3^{(2)} \end{cases}$$

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$$[Y][V] = [I]$$

$$\Leftrightarrow [V] = [Y]^{-1}[I] = [Z][I]$$

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}^{-1}$$

$$= \frac{1}{\Delta} \begin{vmatrix} \begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} & - \begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix} & \begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix} \\ - \begin{vmatrix} a_{12} & a_{13} \\ a_{32} & a_{33} \end{vmatrix} & \begin{vmatrix} a_{11} & a_{13} \\ a_{31} & a_{33} \end{vmatrix} & - \begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix} \\ \begin{vmatrix} a_{12} & a_{13} \\ a_{22} & a_{23} \end{vmatrix} & - \begin{vmatrix} a_{11} & a_{13} \\ a_{21} & a_{23} \end{vmatrix} & \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} \end{vmatrix}$$

$$\Delta = a_{11}\begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} - a_{12}\begin{vmatrix} a_{21} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} + a_{13}\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$$

$$\Delta = -8{,}25j(-31{,}25 + 6{,}25) - 1{,}25(6{,}25 + 6{,}25) + 2{,}5j(-3{,}125 - 15{,}625)$$

$$\Delta = 206{,}25j - 15{,}625j - 46{,}87j$$

$$\Delta = 143{,}75j$$

$$Z = \frac{1}{\Delta}$$

$$\frac{1}{\Delta} \cdot \begin{vmatrix} -25 & 12{,}5 & -18{,}75 \\ 12{,}5 & -35 & 23{,}75 \\ -18{,}75 & 25 & -50 \end{vmatrix}$$

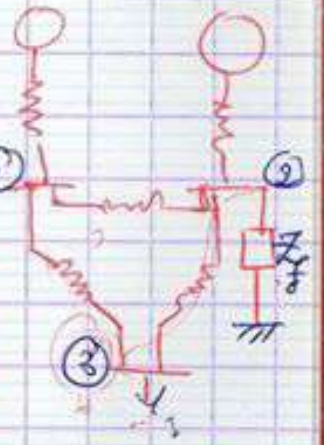
$\Delta = 143{,}75$

$$[Y^{-1}] = [Z]$$

$$Z = \begin{bmatrix} j0,16 & j0,08 & j0,12 \\ j0,08 & j0,24 & j0,16 \\ j0,12 & j0,16 & j0,34 \end{bmatrix}$$

$$I = \begin{bmatrix} -j1,1 \\ -j1,25 \\ j1,0 \end{bmatrix} \Rightarrow [Z][I] = \begin{bmatrix} -0,15 \\ -0,22 \\ +0,08 \end{bmatrix} = \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix}$$

$$I_3(F) = \frac{V_3(0)}{Z_{33} + \underbrace{Z_f}_{0}}$$



$$V_1(F) = V_1(0) - Z_{13} I_3(F)$$

$$V_2(F) = V_2(0) - Z_{23} I_3(F)$$

$$V_3(F) = V_3(0) - Z_{32} I_2(F)$$