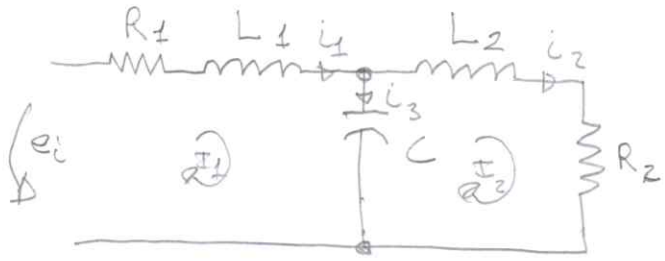
1b)



$$\frac{i_{2(s)}}{E_{i(s)}} = ?$$

$$\begin{cases} e_i = R_1 i_{1(t)} + L_1 \frac{d}{dt} i_{1(t)} + \frac{1}{C}\int i_{1(t)}dt - \frac{1}{C}\int i_{2(t)}\,dt \\ \phi = L_2 \frac{d}{dt} i_{2(t)} + R_2 i_{2(t)} + \frac{1}{C}\int i_{2(t)} - \frac{1}{C}\int i_{1(t)} \\ i_{1(t)} = i_{3(t)} + i_{2(t)} \end{cases}$$

$\mathcal{L}$; valores iniciais nulos.

$$\begin{cases} E_{i(s)} = R_1 I_{1(s)} + L_1 s I_{1(s)} + \frac{1}{C}\frac{1}{s} I_{1(s)} - \frac{1}{sC} I_{2(s)} \\ 0 = L_2 s I_{2(s)} + R_2 I_{2(s)} + \frac{1}{sC} I_{2(s)} - \frac{1}{sC} I_{1(s)} \\ I_{1(s)} = I_{3(s)} + I_{2(s)} \end{cases}$$

$$\begin{cases} E_{i(s)} = \left(R_1 + sL_1 + \frac{1}{sC}\right) I_{1(s)} - \frac{1}{sC} I_{2(s)} \\ \frac{1}{sC} I_{1(s)} = \left(L_2 s + R_2 + \frac{1}{sC}\right) I_{2(s)} \end{cases}$$

$$I_{1(s)} = sC\left(L_2 s + R_2 + \frac{1}{sC}\right) I_{2(s)} = \left(s^2 L_2 C + sR_2 C + 1\right) I_{2(s)}$$

$$E_{i(s)} = \left(R_1 + sL_1 + \frac{1}{sC}\right)\cdot\left(s^2 L_2 C + sR_2 C + 1\right) I_{2(s)} - \frac{1}{sC} I_{2(s)}$$

expand.

$$E_{i(s)} = \left(s^2 R_1 L_2 C + s R_1 R_2 C + R_1 + s^3 L_1 L_2 C + s^2 L_1 R_2 C + sL_1 + sL_2 + R_2 + \frac{1}{sC}\right) I_{2(s)} - \frac{1}{sC} I_{2(s)}$$

$$= \left(s^2 R_1 L_2 C + s R_1 R_2 C + R_1 + s^3 L_1 L_2 C + s^2 L_1 R_2 C + sL_1 + sL_2 + R_2\right) I_{2(s)}$$

$$\frac{I_{2(s)}}{E_{i(s)}} = \frac{1}{s^3 L_1 L_2 C + s^2\left(R_1 L_2 C + L_2 R_2 C\right) + s\left(R_1 R_2 C + L_1 + L_2\right) + R_1 + R_2}$$

u

1b)

$$\begin{pmatrix} E_{i(s)} \\ 0 \end{pmatrix} = \begin{bmatrix} sL_1+R_1+\frac{1}{sC} & -\frac{1}{sC} \\ -\frac{1}{sC} & sL_2+R_2+\frac{1}{sC} \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

$$\begin{pmatrix} E_{i(s)} \\ 0 \end{pmatrix} = \begin{bmatrix} sL_1+R_1+\frac{1}{sC} & -\frac{1}{sC} \\ -1 & s^2L_2C+sR_2C+1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix}$$

$$I_{2(s)} = \frac{\begin{bmatrix} sL_1+R_1+\frac{1}{sC} & E_{i(s)} \\ -1 & 0 \end{bmatrix}}{\begin{bmatrix} sL_1+R_1+\frac{1}{sC} & -\frac{1}{sC} \\ -1 & s^2L_2C+sR_2C+1 \end{bmatrix}}$$

$$= \frac{E_{i(s)}}{(sL_1+R_1+\frac{1}{sC})(s^2L_2C+sR_2C+1)-\frac{1}{sC}}$$

c.a) $s^3L_1L_2C + s^2L_1R_2C + sL_1 + s^2L_2R_1C + sR_1R_2C + R_1 + sL_2 + R_2 + \frac{1}{sC} - \frac{1}{sC}$