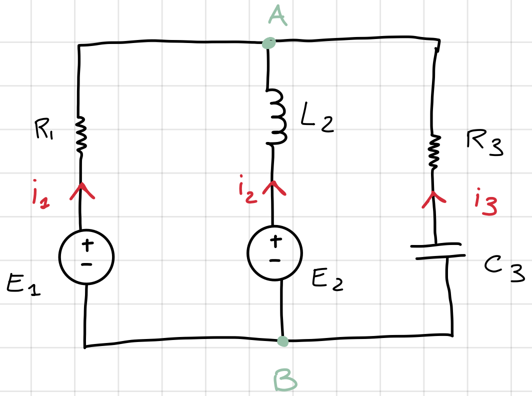


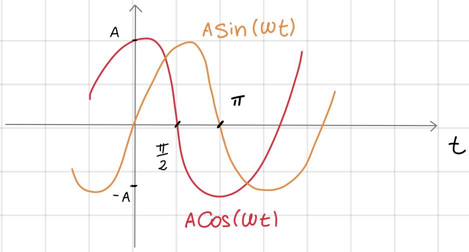
DATI

$E_1 = 10\sin(\omega t)$, $E_2 = 20\sin(\omega t)$ $\omega = 1\,k\,rad/s$

$R_1 = R_3 = 1\,\Omega$, $L_2 = 1\,mH$, $C_3 = 1\,mF$

Q: Trovare i_1, i_2, i_3

Siccome $\sin(\omega t) = \cos(\omega t - \frac{\pi}{2})$



Siccome $E_K \cos(\omega t + \alpha) \rightleftharpoons E_K e^{j\alpha}$

GENERATORI

$\Rightarrow \cdot\ E_1 = 10\sin(\omega t) \rightleftharpoons 10\, e^{-j\frac{\pi}{2}} = 10\left[\cancel{\cos(\tfrac{\pi}{2})}^{0} - j\,\cancel{\sin(\tfrac{\pi}{2})}^{1}\right] = -10j$ $\bar{E}_1$ X

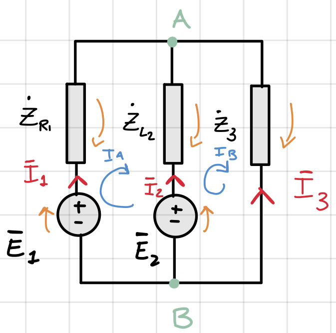
$\cdot\ E_2 = 20\sin(\omega t) \rightleftharpoons 20\, e^{-j\frac{\pi}{2}} = -20j$ $\bar{E}_2$ Y

IMPEDENZE

$R_1 = R_2 = \dot{Z}_{R_1} = \dot{Z}_{R_3} = 1\,\Omega$ A

$L_2 = 1\,mH \rightleftharpoons \dot{Z}_{L_2} = j\omega L_2 = j$ $\dot{Z}_{L_2}$ B H

$C_3 = 1\,mF \rightleftharpoons \dot{Z}_{C_3} = -\dfrac{j}{\omega C_3} = -\dfrac{j}{10^3 \cdot 1\times10^{-3}} = -j$ $\dot{Z}_{C_3}$ C



$\dot{Z}_3 = \dot{Z}_{L_3} + \dot{Z}_{C_3} = 1 + j$ $\dot{Z}_3$ C

CORRENTI DI MAGLIA

$I_A \in M_A \{\bar{E}_1, \dot{Z}_{R_1}, \dot{Z}_{L_2}, \bar{E}_2\}$

$I_B \in M_B \{\bar{E}_2, \dot{Z}_{L_2}, \dot{Z}_3\}$

$$\begin{cases} \bar{I}_1 = \bar{I}_A \\ \bar{I}_2 = \bar{I}_B - \bar{I}_A \\ \bar{I}_3 = -\bar{I}_B \end{cases}$$

$$\boxed{\bar{V} = \dot{Z} \cdot \bar{I}}$$

LKT

$$\begin{cases} -\bar{E}_1 + \bar{V}_{R_1} - \bar{V}_{L_2} + \bar{E}_2 = 0 \\ -\bar{E}_2 + \bar{V}_{L_2} - \bar{V}_3 = 0 \end{cases} \Rightarrow \begin{cases} -\bar{E}_1 + \dot{Z}_{R_1}\bar{I}_1 - \dot{Z}_{L_2}\bar{I}_2 + E_2 = 0 \\ -\bar{E}_2 + \dot{Z}_{L_2}\bar{I}_2 - \dot{Z}_3\bar{I}_3 = 0 \end{cases}$$

$$\Rightarrow \begin{cases} -\bar{E}_1 + \dot{Z}_{R_1}\bar{I}_A - \dot{Z}_{L_2}\bar{I}_B + \dot{Z}_{L_2}\bar{I}_A + E_2 = 0 \\ -\bar{E}_2 + \dot{Z}_{L_2}\bar{I}_B - \dot{Z}_{L_2}\bar{I}_A + \dot{Z}_3\bar{I}_B = 0 \end{cases} \rightarrow -E_2 + \dot{Z}_{L_2}(\bar{I}_B - \bar{I}_A) + \dot{Z}_3\bar{I}_B = 0$$

$$\bar{I}_A = x \qquad \bar{I}_B = y$$

$$\rightarrow \begin{cases} 10j + x - yj + xj - 20j = 0 \\ 20j + xj - yj + x - jx \end{cases} \rightarrow \begin{cases} 10j + x - j(y-x) - 20j = 0 \\ 20j + j(y-x) + y(1-j) = 0 \end{cases}$$

$$\rightarrow \begin{cases} x + jx - jy = 10j \\ \cancel{jy} - jx + y - \cancel{jy} = -20j \end{cases} \rightarrow \begin{cases} x + jx - jy = 10j \\ jx - y = 20j \end{cases}$$

$$y = jx - 20j = j(x-20)$$

$$\rightarrow \underbrace{x + jx + x}_{2x} - 20 = 10j \rightarrow 2x + jx = 10j + 20$$

$$x(2+j) = 10j + 20 \rightarrow x = \frac{10j + 20}{j + 2} = \boxed{10\,A} \quad \bar{I}_A$$

$$\Rightarrow j10 - y = 20j \rightarrow y = 10j - 20j = \boxed{-10j\,A} \quad \bar{I}_B$$

$$\Rightarrow \bar{I}_A = 10\,A \rightleftharpoons \overset{i_1}{i_1(t) = 10\cos(\omega t)}$$

$$\bar{I}_B = -10j \quad \text{ma} \quad i_3 = -I_B \Rightarrow -I_B = 10e^{j\frac{\pi}{2}} \rightleftharpoons \overset{i_3}{i_3(t) = 10\cos(\omega t + \tfrac{\pi}{2})}$$

$$\bar{I}_2 = \bar{I}_B - \bar{I}_A = -10j - 10 = 10\sqrt{2}\,\angle{-\tfrac{3}{4}\pi}$$

$$\Rightarrow \bar{I}_2 \rightleftharpoons \overset{i_2}{i_2(t) = 10\sqrt{2}\cos(\omega t - \tfrac{3}{4}\pi)}$$