

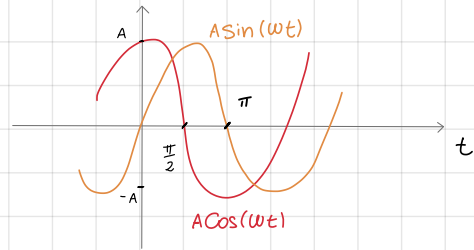
DATI
 $E_1 = 10 \sin(\omega t)$, $E_2 = 20 \sin(\omega t)$ $\omega = 1 \text{ rad/s}$

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

Q: Trovare i_1, i_2, i_3

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

Siccome $E_k \cos(\omega t + \alpha) \Leftrightarrow E_k e^{j\alpha}$



GENERATORI

$\Rightarrow E_1 = 10 \sin(\omega t) \Leftrightarrow 10 e^{-j\frac{\pi}{2}} = 10 [\cos(\frac{\pi}{2}) - j \sin(\frac{\pi}{2})] = -10j \quad \bar{E}_1$

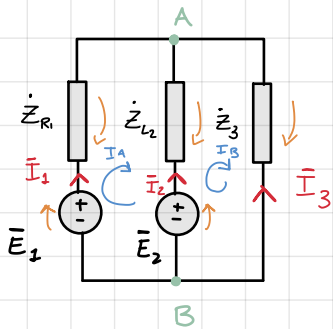
$E_2 = 20 \sin(\omega t) \Leftrightarrow 20 e^{-j\frac{\pi}{2}} = -20j \quad \bar{E}_2$

IMPEDENZE

$R_1 = R_2 = \bar{Z}_{R1} = \bar{Z}_{R3} = 1 \Omega$

$L_2 = 1 \text{ mH} \Rightarrow \dot{\bar{Z}}_{L2} = j\omega L_2 = j \quad \bar{Z}_{L2}$

$C_3 = 1 \text{ mF} \Rightarrow \dot{\bar{Z}}_{C3} = -\frac{j}{\omega C_3} = -\frac{j}{10^3 \cdot 1 \times 10^{-3}} = -j \quad \bar{Z}_{C3}$



$\dot{\bar{Z}}_3 = \dot{\bar{Z}}_{L3} + \dot{\bar{Z}}_{C3} = 1 + j \quad \bar{Z}_3$

CORRENTI DI MAGLIA

$I_A \in M_A \{ \bar{E}_1, \dot{\bar{Z}}_{R1}, \dot{\bar{Z}}_{L2}, \bar{E}_2 \}$

$I_B \in M_B \{ \bar{E}_2, \dot{\bar{Z}}_{L2}, \dot{\bar{Z}}_{C3} \}$

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

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

L K T

$$\begin{cases} -\bar{E}_1 + \bar{V}_{R1} - \bar{V}_{L2} + \bar{E}_2 = 0 \\ -\bar{E}_2 + \bar{V}_{L2} - \bar{V}_{C3} = 0 \end{cases} \Rightarrow \begin{cases} -\bar{E}_1 + \dot{\bar{Z}}_{R1} \bar{I}_1 - \dot{\bar{Z}}_{L2} \bar{I}_2 + \bar{E}_2 = 0 \\ -\bar{E}_2 + \dot{\bar{Z}}_{L2} \bar{I}_2 - \dot{\bar{Z}}_{C3} \bar{I}_3 = 0 \end{cases}$$

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

$$\begin{aligned} \bar{I}_A &= x \\ \bar{I}_B &= y \end{aligned} \rightarrow \begin{cases} 10j + x - yj + xj - 20j = 0 \\ 20j + xj - yj + x - jx = 0 \end{cases} \rightarrow \begin{cases} 10j + x - j(y-x) - 20j = 0 \\ 20j + j(y-x) + y(1-j) = 0 \end{cases}$$

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

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

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

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

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

$$\Rightarrow \bar{I}_A = 10 \text{ A} \Rightarrow \boxed{i_1(t) = 10 \cos(\omega t)} \quad i_1$$

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

$$\bar{I}_2 = \bar{I}_B - \bar{I}_A = -10j - 10 = 10\sqrt{2} \angle \underbrace{-\frac{3}{4}\pi}_{i_2}$$

$$\Rightarrow \bar{I}_2 \Rightarrow \boxed{i_2(t) = 10\sqrt{2} \cos(\omega t - \frac{3}{4}\pi)} \quad i_2$$