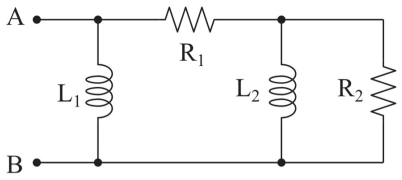
Esercizio n. 1



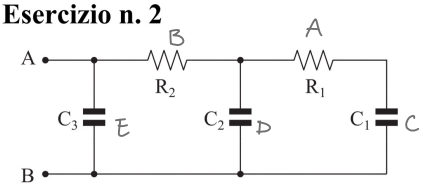
A $R_1 = 4\ \Omega$
B $R_2 = 8\ \Omega$
C $L_1 = 20$ mH
D $L_2 = 8$ mH
$\omega = 1000$ rad/s

Determinare l'impedenza e l'ammettenza del bipolo A-B.

$$\dot{Z}_{AB} = \left[\left(\dot{Z}_{R_2} \parallel \dot{Z}_{L_2} \right) + \dot{Z}_{R_1} \right] \parallel \dot{Z}_{L_1} = 5 + 5j$$

Ammettenza $\quad Y = \dot{Z}_{AB}^{-1} = 0.1 - 0.1j$

Esercizio n. 2



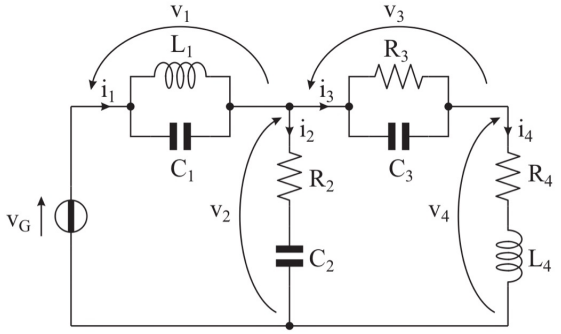
A $R_1 = 40\ \Omega$
B $R_2 = 25\ \Omega$
C $C_1 = 50\ \mu$F
D $C_2 = 10\ \mu$F
E $C_3 = 4\ \mu$F
$\omega = 1000$ rad/s

Determinare l'impedenza e l'ammettenza del bipolo A-B.

$$\dot{Z}_{AB} = \left\{ \left[(A + C) \parallel D \right] + B \right\} \parallel E = 40 - 30j$$

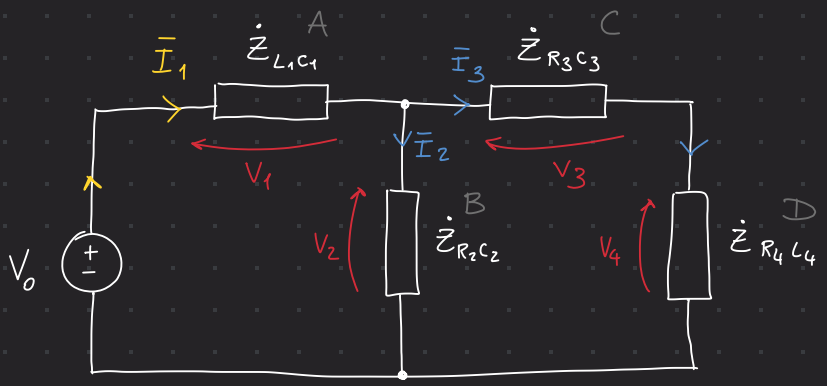
$$Y = 0.016 + 0.012j$$

Esercizio n. 6



$L_1 = 10$ mH
$C_1 = 200\ \mu$F
$R_2 = 10\ \Omega$
$C_2 = 200\ \mu$F
$R_3 = 20\ \Omega$
$C_3 = 100\ \mu$F
$R_4 = 10\ \Omega$
$L_4 = 60$ mH
$v_G(t) = 60\sqrt{2}\cos(500t + \frac{\pi}{4})$ V

Determinare le tensioni e le correnti indicate in figura.



A $\dot{Z}_{L_1C_1} = 10j$
B $\dot{Z}_{R_2C_2} = 10 - 10j$
C $\dot{Z}_{R_3C_3} = 10 - 10j$
D $\dot{Z}_{R_4L_4} = 10 + 30j$

$$\bar{V}_0 = 60\, e^{\frac{\pi}{4}j} = 60\sqrt{2}\left[\cos(\pi/4) + j \sin(\pi/4) \right] = 30 \cdot 2 + 30 \cdot 2j = 60 + 60j \quad (X)$$

$$\bar{I}_0 = \frac{\bar{V}_0}{\bar{Z}_{eq}} = \frac{V_0}{\left[(C+D) \parallel B \right] + A} = 6 + 2j \quad (Y)$$

$12 + 6j$

$$\rightarrow \quad \bar{I}_0 = \bar{I}_1 \quad \Rightarrow \quad \bar{I}_2 = \dot{I}_1 \cdot \frac{Z_{R_3C_3}}{Z_{R_3C_3} + \left(Z_{R_2C_2} + Z_{R_4L_4} \right)} = 2 \cdot 2j \text{ A}$$

C $\qquad$ B + D

$\bar{I}_3 = \bar{I}_1 - \bar{I}_2 = 4 + 4j \text{ A}$

$\bar{I}_4 = 4 + 4j \text{ A}$

$\cos(\theta) = \sin(\theta - \frac{\pi}{2})$

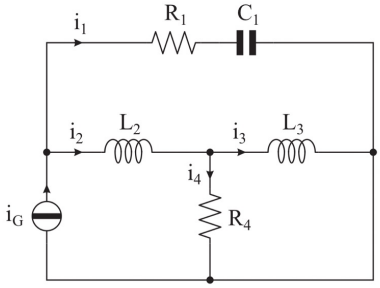
$v_1(t) = 20\sqrt{10}\cos(500t + 1.89)$

$\Rightarrow \bar{V}_1 = \bar{I}_1 \cdot \dot{Z}_{L_1C_1} = -20 + 60j$ $\qquad \bar{V}_2 = -40j \rightleftharpoons v_2(t) = 40\cos(500t - \frac{\pi}{2})$

$\bar{V}_3 = 80\text{V} \rightleftharpoons v_3(t) = 80\cos(500t)$

$\bar{V}_4 = -80 + 160j \text{ V} \rightleftharpoons v_4(t) = 100\cos(500t + 2.498)$

Esercizio n. 7



R1 = 1 Ω
C1 = 100 μF
L2 = 200 μH
L3 = 400 μH
R4 = 2 Ω
$i_G(t) = 10\sqrt{2}\cos(5000t - \frac{3}{4}\pi)$ A

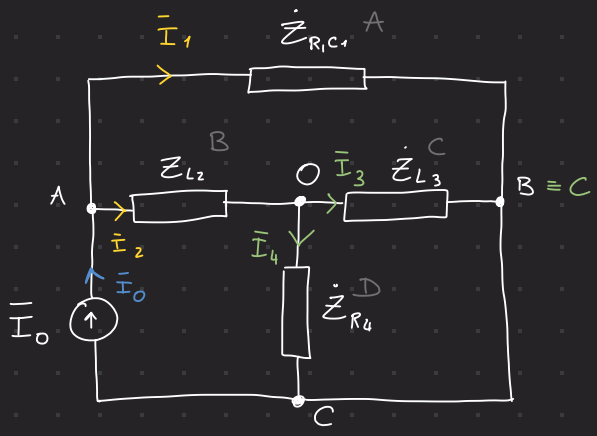
Determinare le correnti indicate in figura e la potenza attiva e reattiva erogata dal generatore.

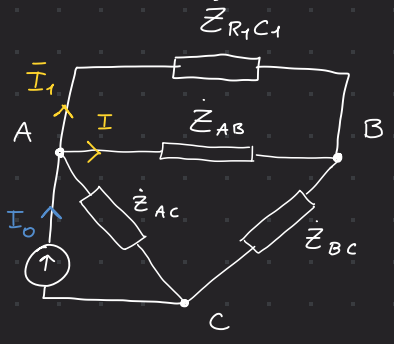
A $\dot{Z}_{R_1C_1} = 1 - 2j\ \Omega$

B $\dot{Z}_{L_2} = 1\ \Omega$

C $\dot{Z}_{L_3} = 2\ \Omega$

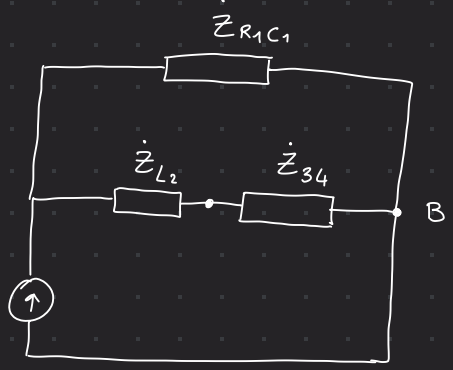
D $\dot{Z}_{L_4} = 2\ \Omega$





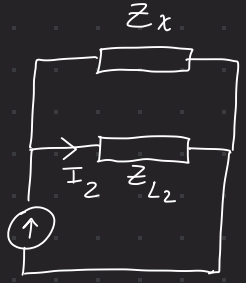
NON SERVE!

$I_0 = 10\sqrt{2}\, e^{-\frac{3}{4}\pi j} = 10\sqrt{2}\left[\cos(\frac{3}{4}\pi) - j\sin(\frac{3}{4}\pi)\right] = 10\sqrt{2}\left[-\frac{\sqrt{2}}{2} - j\frac{\sqrt{2}}{2}\right] = -10 - 10j$



$\bar{I}_2 = I_0 \cdot \frac{A}{A + B + (D \parallel C)} = -8.46 - 2.31j \text{ A}$

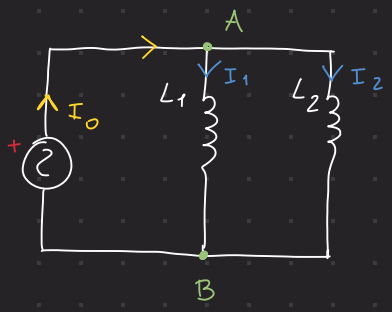
$\bar{I}_1 = \bar{I}_0 \bar{I}_2 = 7.69 - 1.54 \text{ A}$



$\dot{Z}_x = \dot{Z}_{R_1C_1} + (\dot{Z}_{L_3} \parallel \dot{Z}_{R_4}) = 2 - 2j$

$\Rightarrow I_2 = \bar{I}_0 \frac{\dot{Z}_x}{\dot{Z}_x + \dot{Z}_{L_2}} =$

Link al video



Valore Max — Valore efficace

$$i(t) = 2\sin(314t) \rightleftharpoons \bar{I} = \frac{2}{\sqrt{2}} = \sqrt{2} \cong 1.41 \cong 1.41\angle 0$$

$$\dot{Z}_{L_1} = 12.4\,j\,\Omega \qquad \dot{Z}_{L_2} = 3.14\,j\,\Omega$$

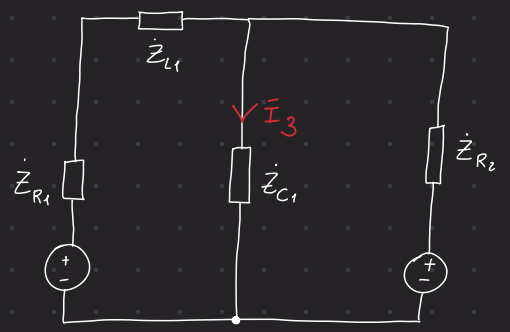
$$I_1 = I_0 \cdot \frac{Z_{L_2}}{Z_{L_2} + Z_{L_1}} = 0.29\ A \quad \rightarrow \quad I_2 = I_0 - I_1 = 1.128\ A$$

Valore Max

$$\bar{I}_1 \rightleftharpoons 0.29 \cdot \sqrt{2}\ \sin(314t)$$

$$\bar{I}_2 \rightleftharpoons 1.128\sqrt{2}\ \sin(314t)$$

Link

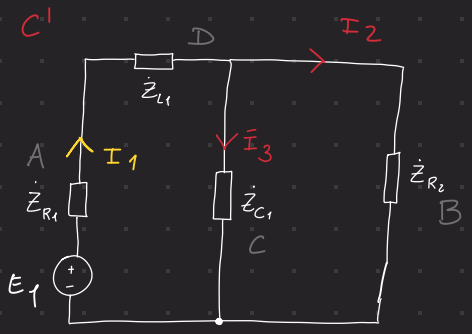


$E_1 = 10 \angle 0^\circ$
$E_2 = 30 \angle 0^\circ$

$R_1 = 10\,\Omega$ $\quad X_{C_1} = 30\,\Omega = -\frac{1}{\omega C}$
$R_2 = 20\,\Omega$ $\quad X_{L_1} = 20\,\Omega = \omega L$

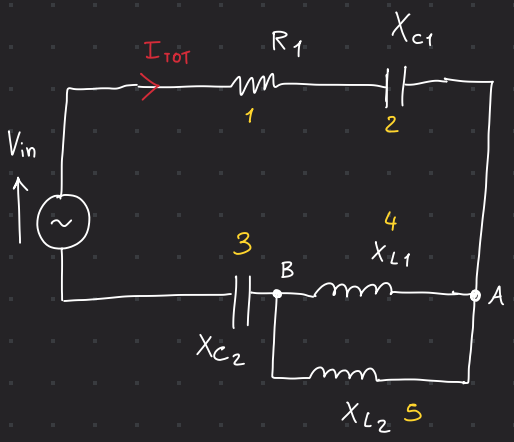
$\dot{Z}_{R_1} = 10$ $\quad \dot{Z}_{C_1} = -\frac{j}{\omega C} = -j30\ \Omega$

$\dot{Z}_{R_2} = 20$ $\quad \dot{Z}_{L_1} = j20\ \Omega$



$\rightarrow \dot{Z}_{eq} = (C \| B) + D + A = 23.85 + 10.77j\ \Omega$

$\rightarrow I_1 = \frac{E_1}{\dot{Z}_{eq}}$



Vin = 70 V

R1 = 50 ohm XC1 = 30 ohm XC2 = 70 ohm XL1 = 60 ohm XL2 = 90 ohm

calcolare la Zeq, il fasore Itot e lo sfasamento tensione-corrente Vin-Itot

1 $\dot{Z}_{R_1} = 50\,\Omega$

2 $\dot{Z}_{C_1} = -j30$ $\Rightarrow$

3 $\dot{Z}_{C_2} = -j70$

4 $\dot{Z}_{L_1} = j60$

5 $\dot{Z}_{L_2} = j90$

$\dot{Z}_{eq}$ $(4 \parallel 5) + 1 + 2 + 3 = 50 - 64j = \boxed{81.21 \angle -52}$ ← gradi

$V = R \cdot I \Rightarrow \dot{I}_{TOT} = \frac{\dot{V}_{in}}{\dot{Z}_{eq}}$ ma $V_{in} = 70\,V \Rightarrow \dot{V}_{in} = 70 \angle 0$

$\dot{Z}_{eq} = 81.2 \angle -52$

$\Rightarrow \dot{I}_{TOT} = \frac{70 \angle 0}{81.2 \angle -52} = \frac{70}{81.2} \angle 0 - (-52) = \boxed{0.86 + \angle 52^\circ}$ ($\dot{I}_{TOT}$)

Sfasamento

$\Rightarrow \phi = |\angle V_{in} - \angle I_{TOT}| = |0 - 52| = \boxed{52^\circ}$

Ans 3