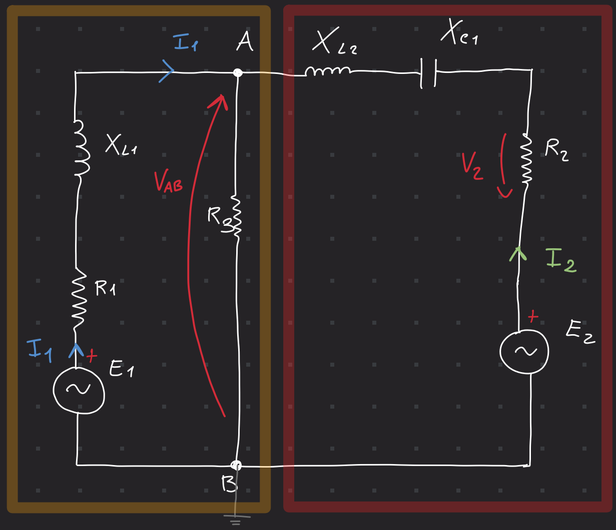
ES 1



$E_1 = 30V$
$E_2 = 20V$

$R_1 = 30\ \Omega$
$R_2 = 10\ \Omega$
$R_3 = 20\ \Omega$

$X_{L1} = 20\ \Omega$
$X_{L2} = 30\ \Omega$
$X_{C1} = 10\ \Omega$

$\rightleftharpoons$

$\dot{E}_1 = 30V$
$\dot{E}_2 = 20V$

$\dot{Z}_1 = 30\ \Omega$
$\dot{Z}_2 = 10\ \Omega$
$\dot{Z}_3 = 20\ \Omega$

$\dot{Z}_{L1} = j20\ \Omega$
$\dot{Z}_{L2} = j30\ \Omega$
$\dot{Z}_{C1} = -j10\ \Omega$

A

$$\Rightarrow \quad E_{th_1} = V_{AB} = \dot{E}_1 \cdot \frac{\dot{Z}_3}{\dot{Z}_3 + \dot{Z}_1 + \dot{Z}_{L1}} = \underbrace{10.35 - 4.14j}_{E_{th_1}} = -21.8 \angle -21.8$$

B

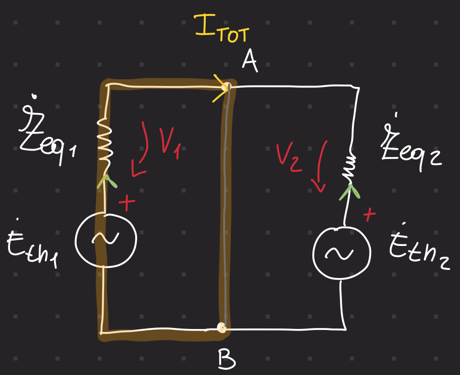
$$\dot{Z}_{eq1} = (\dot{Z}_{C1} + \dot{Z}_1) \parallel \dot{Z}_{R3} = \underbrace{13.1 + 2.76j}_{\dot{Z}_{eq1}}$$

C

$$\Rightarrow \quad E_{th_2} = E_2 = 20$$

D

$$\dot{Z}_{eq2} = \dot{Z}_2 + \dot{Z}_{C1} + \dot{Z}_{L2} = 10 - 10j + 30j = \underbrace{10 + 20j}_{\dot{Z}_{eq2}}$$



$$\dot{V} = \dot{Z} \cdot \dot{I} \Rightarrow \dot{I}_{TOT} = \frac{V_{TOT}}{\dot{Z}_{eq}} = \frac{\dot{E}_{th_1} - \dot{E}_{th_2}}{\dot{Z}_{eq1} + \dot{Z}_{eq2}} =$$

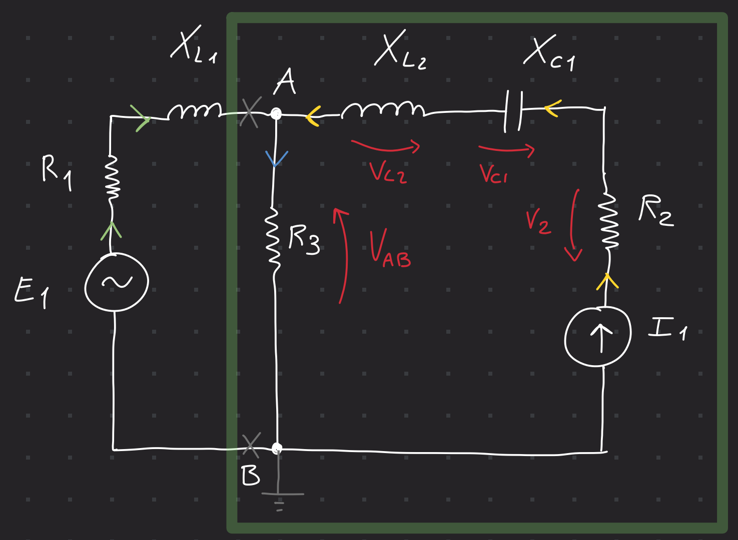
$$= -0.3 + 0.12j \quad I_{TOT}$$

$$\Rightarrow \quad \dot{V}_{AB} = +E_{th_1} - V_1 \Rightarrow \dot{V}_{AB} = (\dot{Z}_{eq1} \cdot \dot{I}_{TOT}) + E_{Th_1} = 14.63 - 4.85j$$

$$\Rightarrow \quad \dot{I}_3 = \frac{\dot{V}_{AB}}{\dot{Z}_{R3}} = 0.73 - 0.24j = \boxed{0.77 \angle -18.35^\circ}$$

Ans

ES 2 Usando Thevenin calcolare la corrente che scorre sulla resistenza R3

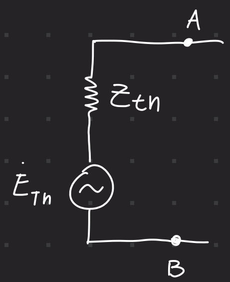


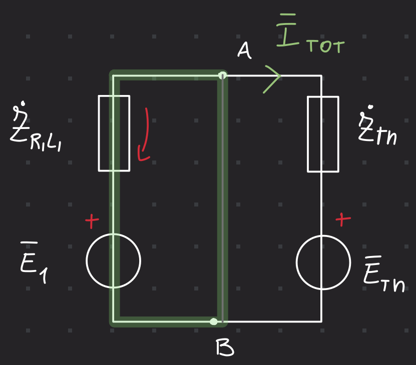
DATI

$\bar{E}_1 = 30 \angle 0°$
$\bar{I}_1 = 0.2 \angle 0°$

$R_1 = 10\,\Omega$ | $Z_{R1} = 10\,\Omega$
$R_2 = 10\,\Omega$ | $Z_{R2} = 10\,\Omega$
$R_3 = 10\,\Omega$ $\Rightarrow$ $Z_{R3} = 10\,\Omega$
$X_{L1} = 20\,\Omega$ | $Z_{L1} = 20j\,\Omega$
$X_{L2} = 10\,\Omega$ | $Z_{L2} = 10j\,\Omega$
$X_{C1} = 30\,\Omega$ | $Z_{C1} = -30j\,\Omega$

- $\dot{Z}_{th} = \dot{Z}_3 = R_3 = 10\,\Omega$
- $\dot{E}_{th} = \bar{V}_{AB} = \dot{Z}_3 \cdot \bar{I}_1 = 2\,V$



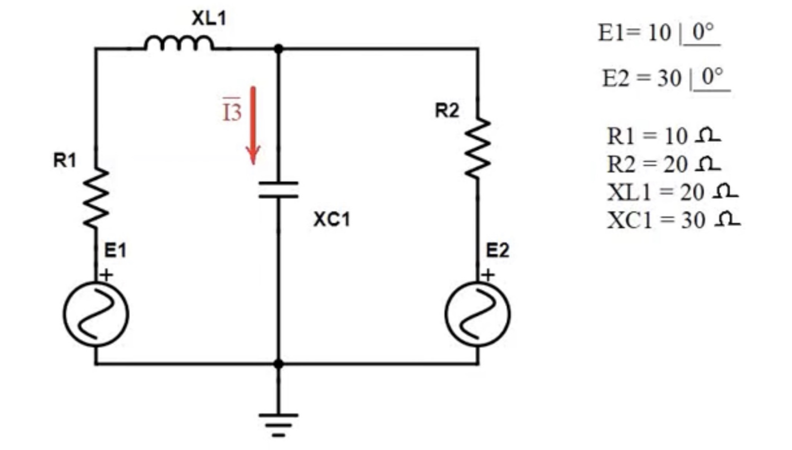


(1) $\bar{E}_1 - \dot{Z}_{R_1L_1} \cdot \bar{I}_{TOT} - V_{AB} = 0$

$$\Rightarrow \bar{I}_{TOT} = \frac{\bar{V}_{TOT}}{\dot{Z}_{eq}} = \frac{\bar{E}_1 - \bar{E}_{Th}}{\dot{Z}_{R_1L_1} + \dot{Z}_{Th}} = 0.7 - 0.7j$$

$\Rightarrow$ (1) $\bar{V}_{AB} = \bar{E}_1 - \dot{Z}_{R_1L_1} \cdot \bar{I}_{TOT} = 9 - 7j\ V$

$$\Rightarrow V = R \cdot I \Rightarrow \bar{I}_3 = \frac{\bar{V}_{AB}}{\dot{Z}_3} = 0.9 - 0.7j\ A = 1.14 \angle -37.88$$



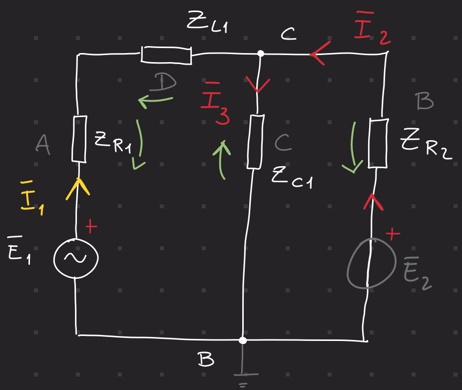
Trovare I3 usando la sovrapposizione degli effetti

A $Z_{R1} = 10\,\Omega$

B $Z_{R2} = 20\,\Omega$

D $Z_{L1} = 20j\,\Omega$

C $Z_{C1} = -30j\,\Omega$

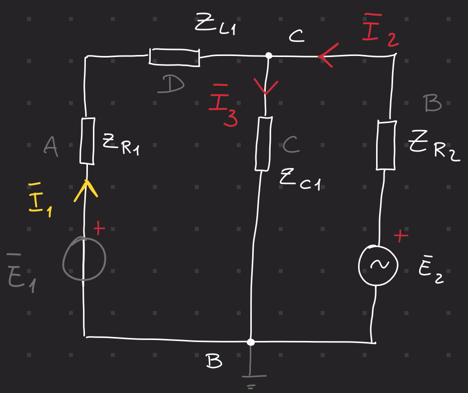


$$\dot{Z}'_{eq} = (C \parallel B) + D + A = 23.84 + 10.77j$$

$$\Rightarrow \bar{I}_1 = \frac{\bar{E}_1}{\dot{Z}_{eq}} = 0.35 - 0.16j$$

$$\Rightarrow \bar{I}_3 = \bar{I}_1 \cdot \frac{\overset{B}{Z_{R2}}}{\underset{B}{Z_{R2}} + \underset{C}{Z_{C1}}} = 0.18 + 0.11j$$

$$= 0.212 \angle{+32} \quad \bar{I}'_3$$



$$\dot{Z}_{eq} = [(A + D) \parallel C] + B = 65 + 15j \ \Omega$$

$$\Rightarrow \bar{I}_2 = \frac{\bar{E}_2}{\dot{Z}_{eq}} = 0.44 - 0.1j$$

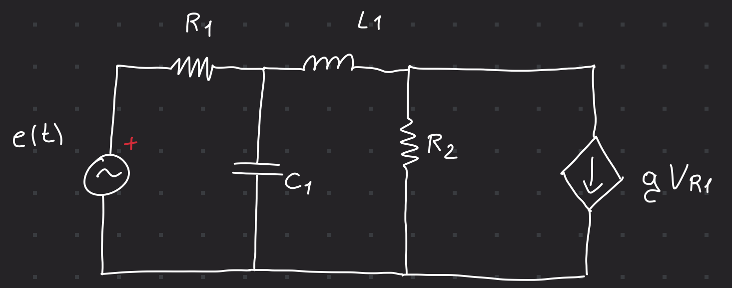
$$\Rightarrow \bar{I}''_3 = \bar{I}_2 \cdot \frac{\overset{D}{Z_{L1}}}{\underset{D}{Z_{L1}} + \underset{C}{Z_{C1}} + \underset{A}{Z_{R1}}} = -0.34 + 0.54j$$

$$= 0.64 \angle{+122} \quad \bar{I}''_3$$

$$\Rightarrow \bar{I}_3 = \bar{I}'_3 + \bar{I}''_3 = -0.16 + 0.65j$$

ES 4 Generatore DIPENDENTE

Trovare la Potenza su L1



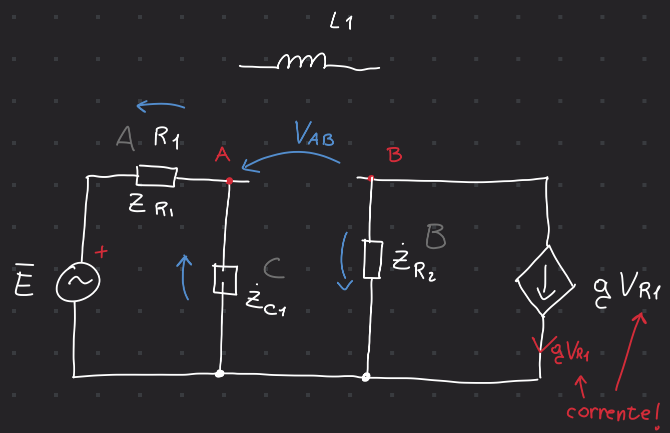
DATI

$e(t) = 200\sqrt{2}\sin(500t)$

$R_1 = R_2 = 50\,\Omega$ $\quad L_1 = 50\,mH$

$C_1 = 20\,\mu F$ $\quad g = 4\,ohm^{-1}$

→ Soluzione Studiare sia la maglia da cui dipende il gen che la maglia del gen DIPENDENTE



$\bar{E} = 200\,e^{0} = 200\,V = 200\angle 0°$

A $\dot{Z}_{R_1} = \dot{Z}_{R_2} = 50\,\Omega$ B

C $\dot{Z}_{C_1} = -\frac{j}{500\cdot 20\times10^{-6}F} = -100j$

D $\dot{Z}_{L_1} = 25j$

Siccome $\bar{V}_{AB} = \bar{V}_A - \bar{V}_B$ $\quad \bar{V}_A = \bar{E}\cdot\frac{C}{C+A} = \underbrace{160-80j}_{\bar{V}_{C_1}}$

$\Rightarrow -\bar{E} + \bar{V}_{R_1} + \bar{V}_{C_1} = 0 \rightarrow \bar{V}_{R_1} = \bar{E} - \bar{V}_{C_1} = \underbrace{40+80j}_{V_{R_1}}$ (ci serviva lui)

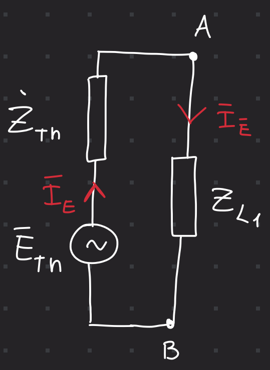
$\Rightarrow \bar{V}_B = \dot{Z}_{R_2}\cdot g\bar{V}_{R_1} = -4\cdot 50\cdot(40+80j) = -8000+16000j$

$\Rightarrow \bar{V}_{AB} = \bar{V}_A - \bar{V}_B = \bar{V}_{Th} = \underbrace{8160+15920j}_{V_{Th}}$ X

$\dot{Z}_{Th} = (A\parallel C) + B = 90-20j$ E

Alla prof esce $4050-2000j$ WTF??

-26



$|\bar{I}_{TOT}| = \frac{|\bar{E}_{Th}|}{|\dot{Z}_{TOT}|} = \frac{17889}{90.138} = 198.46\,A$

BOH...

$\Rightarrow Q_{L_1} = X_{L_1}\cdot\bar{I}_{TOT}^2 = 25\cdot I_{TOT}^2 = 980\times10^3\,W$

A maronn

considero $Z_{Th} = 4050-2000j \Rightarrow |I_{TOT}| = 3.96A$

$\Rightarrow Q_{L_1} = 394\,VAR$