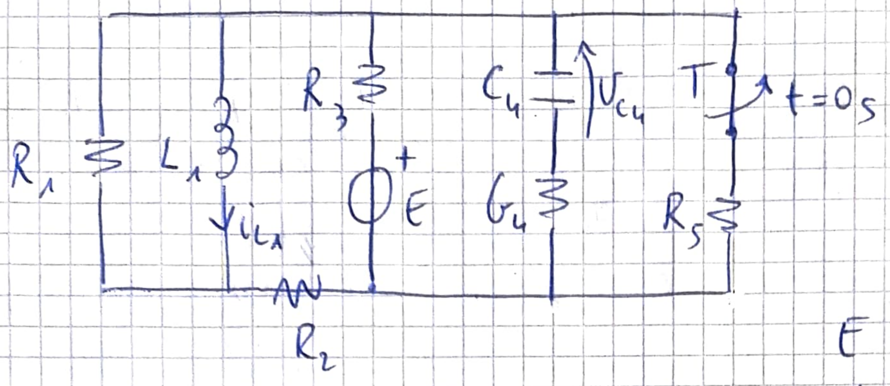
ESERCIZIO SU TRANSITORIO - METODO DI ISPEZIONE



DATI:

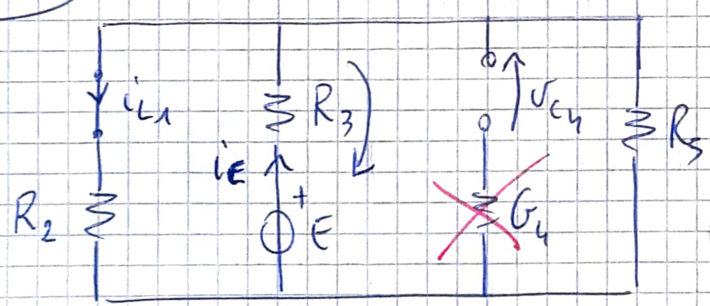
$R_1 = R_5 = 2\,\Omega$
$R_2 = 1\,\Omega$
$R_3 = 8\,\Omega$
$G_4 = 2\,S$
$E = 16\,V$
$L_1 = 1\,mH \quad C_4 = 1\,\mu F$

$t = 0^-$: RETE A REGIME

DETERMINARE:

$P_E(0^-)$ 1pt, $W_{L_1}(0^-)$ 1pt., $W_{C_4}(0^-)$ 1pt.
$P_E(0^+)$ 2pt, $\frac{di_{L_1}}{dt}(0^+)$ 2pt.
$P_E(\infty)$ 1pt, $W_{L_1}(\infty)$ 1pt., $W_{C_4}(\infty)$ 1pt.

$t = 0^-$



$$i_E(0^-) = \frac{E}{\frac{R_2 R_5}{R_2 + R_5} + R_3} = 1{,}846\,A$$

$$\Rightarrow P_E(0^-) = i_E(0^-) \cdot E = 29{,}5\,W$$

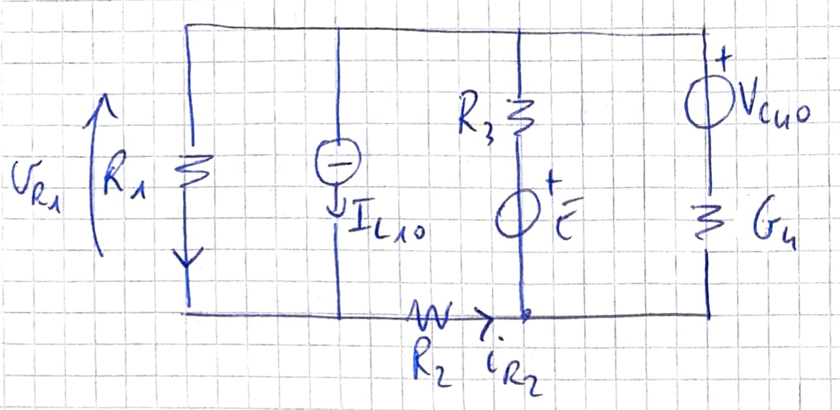
PARTITORE DI CORRENTE:

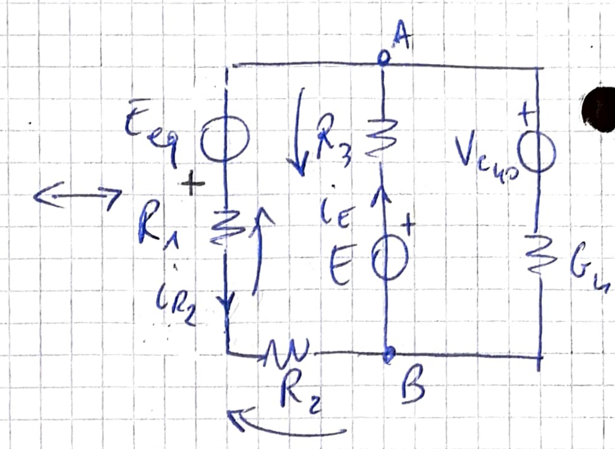
$$i_{L_1}(0^-) = i_E(0^-) \frac{R_5}{R_5 + R_2} = 1{,}231\,A$$

$$\Rightarrow W_{L_1}(0^-) = \frac{1}{2} L_1 (1{,}231)^2 = 0{,}758\,mJ$$

LKT: $v_{C_4}(0^-) = E - R_3 i_E(0^-) = 1{,}232\,A \Rightarrow W_{C_4}(0^-) = \frac{1}{2} C_4 v_{C_4}(0^-)^2 = 0{,}759\,\mu J$

$t = 0^+$





$$E_{eq} = R_1 I_{L10} = 2,462\ V$$

MILLMAN : $$v_{AB} = \frac{\frac{E}{R_3} - \frac{E_{eq}}{R_1+R_2} + V_{C40} G_4}{\frac{1}{R_1+R_2} + \frac{1}{R_3} + G_4} = 1,481\ V$$

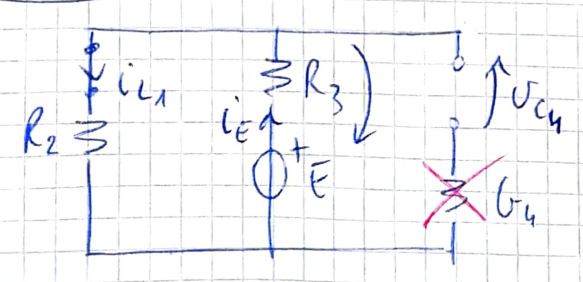
$$i_E(0^+) = \frac{E - v_{AB}}{R_3} = 1,815\ A \Rightarrow p_E(0^+) = E\, i_E(0^+) = 29,0\ W$$

$$i_{R_2} = \frac{v_{AB} + E_{eq}}{R_1 + R_2} = 1,314\ A$$

$$\Rightarrow v_{L1}(0^+) = v_{R_1} = R_1 \left(i_{R_2} - I_{L10} \right) = 0,166\ V$$

$$\Rightarrow \left.\frac{di_{L1}}{dt}\right|_{0^+} = \frac{v_{L1}(0^+)}{L_1} = 166\ A/s$$

$t = \infty$



$$i_E(\infty) = \frac{E}{R_2 + R_3} = 1,778\ A$$

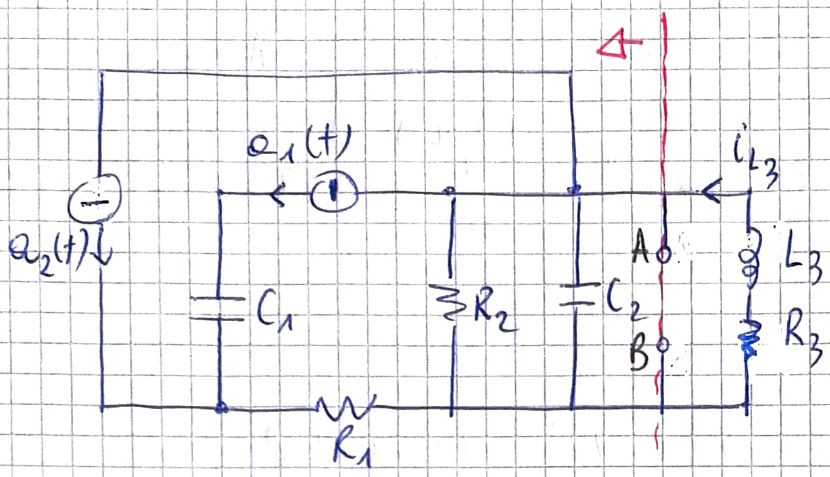
$$\Rightarrow p_E(\infty) = i_E(\infty) \cdot E = 28,4\ W$$

$$i_{L1}(\infty) = i_E(\infty) = 1,778\ A \Rightarrow W_{L1}(\infty) = \frac{1}{2} L_1 (1,778)^2 = 1,58\ mJ$$

$$v_{C4}(\infty) = E - i_E(\infty) R_3 = 1,776\ V$$

$$\Rightarrow W_{C4}(\infty) = \frac{1}{2} C_4 (1,776)^2 = 1,58\ mJ$$

ESERCIZIO SU REGIME SINUSOIDALE



DATI:

$C_1 = 1mF = C_2$; $L_3 = 1mH$
$R_1 = 1\,\Omega$
$R_2 = 2\,\Omega$; $R_3 = 1\,\Omega$
$a_1(t) = 2\cos(2t + 90°)$ A
$a_2(t) = 2\sin(2t - 120°)$ A

DETERMINARE CIRCUITO EQ. DI NORTON TRA I TERMINALI A & B (SINISTRA)

$\rightarrow$ LA CORRENTE DI NORTON INCIDE SUL NODO A

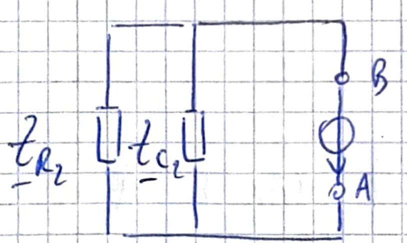
$a_2(t) = 2\cos(2t - 210°)$ A

$\underline{A_1} = \sqrt{2}\,\angle 90°$ (A) ; $\underline{A_2} = \sqrt{2}\,\angle -210°$ (A) $\quad (\Leftarrow 2 \cdot 0.5\ pt.)$

$\omega = 2$ rad/s

$\underline{Z}_{C_1} = \underline{Z}_{C_2} = -500j$ (Ω) ; $\underline{Z}_{R1} = 1\,\Omega$; $\underline{Z}_{R_2} = 2\,\Omega$
$\underline{Z}_{L_3} = j0{,}002$ (Ω) ; $\underline{Z}_{R_3} = 1\,\Omega$ $\quad (\Leftarrow 6 \cdot 0.5\ pt.)$

$\boxed{\underline{Y}_{eq}}$

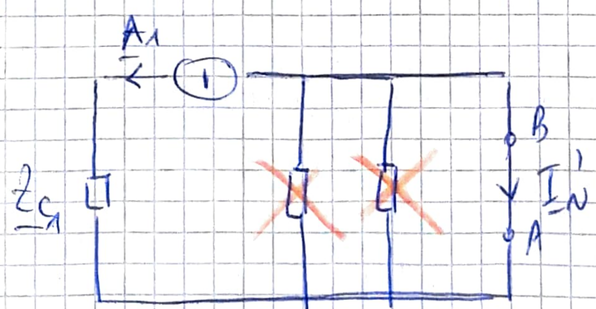


$$\underline{Z}_{eq} = \underline{Z}_{R_2} \,//\, \underline{Z}_{C_2} = \frac{\underline{Z}_{R_2}\underline{Z}_{C_2}}{\underline{Z}_{R_2} + \underline{Z}_{C_2}}$$

$$\Rightarrow \underline{Y}_{eq} = \underline{Z}_{eq}^{-1} = 0{,}5 + 0{,}002j \ (\text{S})$$
(1 pt.)

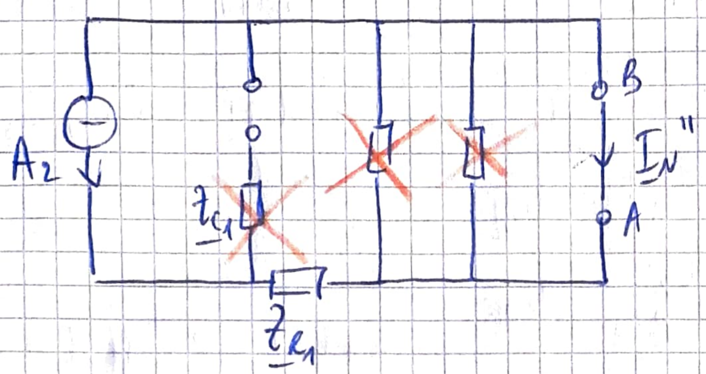
$\boxed{\underline{I}_N} \rightarrow$ SOVRAPPOSIZIONE DEGLI EFFETTI :

$\rightarrow$ $a_1 \neq 0$



$$\underline{I}_N' = -\underline{A}_1 = -\sqrt{2}\,\angle 90° \ \text{A}$$
(1 pt.)

$\rightarrow$ $Q_2 \neq 0$



$\Rightarrow \underline{I}_N'' = -\underline{A}_2 = -\sqrt{2}\ \angle -210^\circ$ A

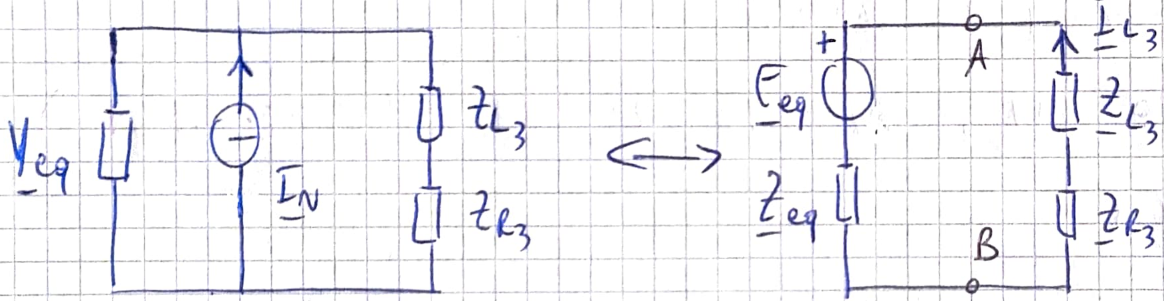
(1pt.)

$$\Rightarrow \underline{I}_N = \underline{I}_N' + \underline{I}_N'' = -\sqrt{2}\,(1\angle 90^\circ + 1\angle -210^\circ)\ \text{A} = \sqrt{6}\ \angle -60^\circ\ \text{A}$$

(1pt.)

$$\Rightarrow i_N(t) = 3,46 \cos(2t - 60^\circ)\ \text{A}$$

(1pt.)



$$\underline{I}_{L_3} = \frac{\underline{E}_{eq}}{\underline{Z}_{eq} + \underline{Z}_{L_3} + \underline{Z}_{R_3}} = \frac{\underline{I}_N / \underline{Y}_{eq}}{\frac{1}{\underline{Y}_{eq}} + \underline{Z}_{L_3} + \underline{Z}_{R_3}} = 1,63\ \angle 120^\circ\ \text{A}$$

(1pt.)

Reciproco di un numero complesso

$\bar{z} = a + jb \qquad \bar{z}^{-1} = \dfrac{a - jb}{a^2 + b^2}$