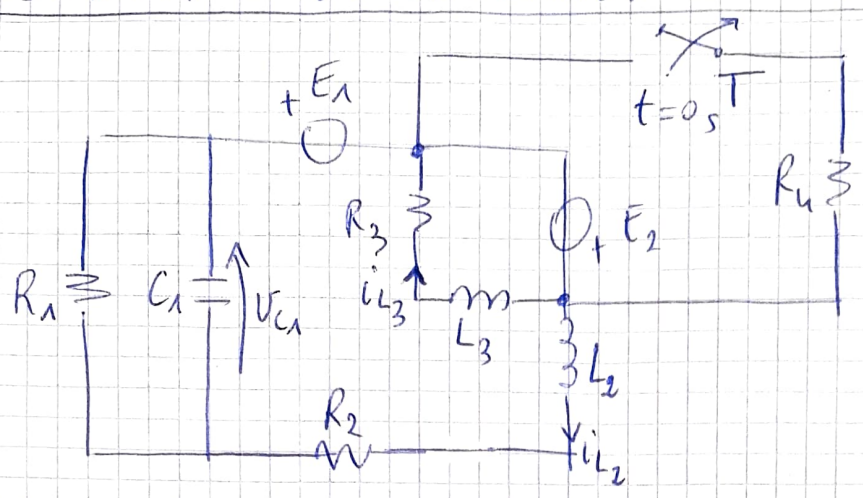
ESERCIZIO SU TRANSITORIO - ISPEZIONE



DATI:

$R_1 = 2\,\Omega$
$R_2 = R_3 = 3\,\Omega$
$R_4 = 1\,\Omega$
$C_1 = 1\,\mu F$
$L_2 = L_3 = 3\,\mu H$
$E_1 = 10\,V$, $E_2 = 16\,V$

T inizialmente chiuso. Rete a regime per $t = 0^-\,s$

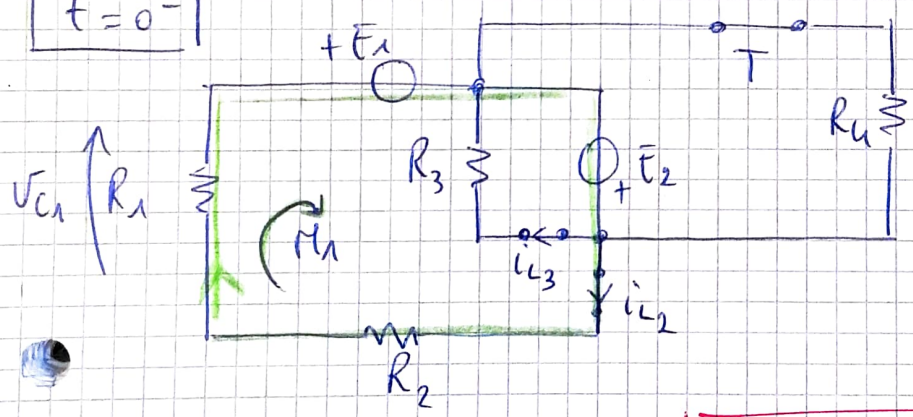
DETERMINARE:

$t = 0^-$: W_{L_3}, W_{L_2}, W_{C_1} (3pt)

$t = 0^+$: $\frac{di_{L_3}}{dt}$, $\frac{di_{L_2}}{dt}$ (4pt)

$t \to \infty$: P_{R_3}, P_{E_1}, Q_{C_1} (3pt)

$t = 0^-$



$$i_{L_3}(0^-) = \frac{E_2}{R_3} \Rightarrow \boxed{W_{L_3}(0^-) = \frac{1}{2} L_3 i_{L_3}^2(0^-) = 42{,}7\ \mu J}$$

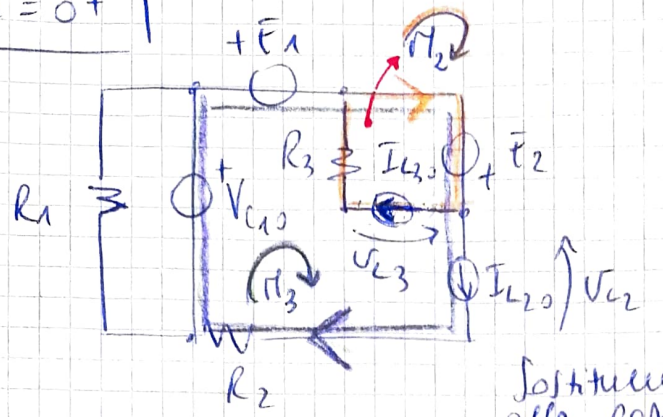
LKT (M_1): $i_{L_2} R_2 + i_{L_2} R_1 - E_2 + E_1 = 0$

$$\Rightarrow i_{L_2}(0^-) = \frac{E_2 - E_1}{R_1 + R_2}$$

$$\Rightarrow \boxed{W_{L_2}(0^-) = \frac{1}{2} L_2 i_{L_2}^2(0^-) = 2{,}16\ \mu J}$$

$$v_{C_1}(0^-) = - i_{L_2}(0^-) R_1 \Rightarrow \boxed{W_{C_1}(0^-) = \frac{1}{2} C_1 v_{C_1}^2(0^-) = 2{,}88\ \mu J}$$

$t = 0^+$



$$i_{L2}(0^-) = i_{L2}(0^+) = I_{L20}$$
$$i_{L3}(0^-) = i_{L3}(0^+) = I_{L30}$$
$$v_{C1}(0^-) = v_{C1}(0^+) = V_{C10}$$

Sostituendo le espressioni di $I_{L20}, I_{L30}, V_{C10}$ nelle regole precedenti:

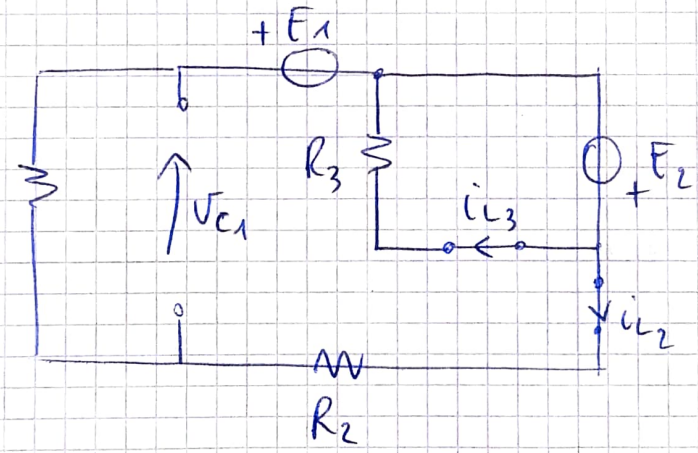
LKT (M_2): $v_{L3} = E_2 - R_3 I_{L30} = E_2 - R_3 \cdot \frac{E_2}{R_3} = 0\ V$

$$\Rightarrow \left| \frac{di_{L3}}{dt}\right|_{0^+} = \frac{v_{L3}}{L_3} = 0 \quad A/s$$

LKT (M_3): $v_{L2} = E_2 - E_1 + V_{C10} - R_2 I_{L20} = E_2 - E_1 - \frac{(E_2 - E_1)(R_1 + R_2)}{R_1 + R_2}$
$= 0\ V$

$$\Rightarrow \left| \frac{di_{L2}}{dt}\right|_{0^+} = \frac{v_{L2}}{L_2} = 0\ A/s$$

$t \to \infty$

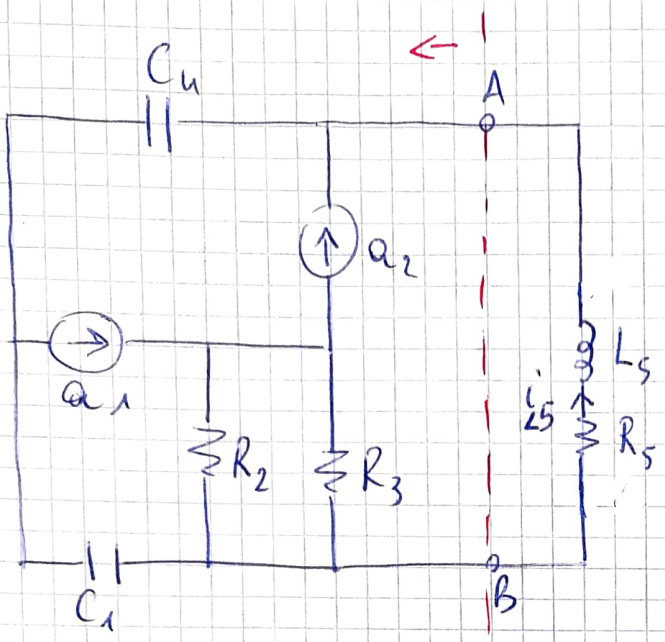


$$i_{L3}(\infty) = \frac{E_2}{R_3} \Rightarrow \left| P_{R_3} = i_{L3}^2 R_3 = 85{,}3\ W \right|$$

$$i_{L2}(\infty) = \frac{E_2 - E_1}{R_1 + R_2} \Rightarrow \left| P_{E_1} = -E_1 i_{L2} = -12\ W \right|$$

$$v_{C1}(\infty) = -R_1 i_{L2} \Rightarrow \left| Q_{C1} = C_1 v_{C1} = -R_1 C_1 i_{L2} = -2{,}4\ mC \right|$$

ESERCIZIO su REGIME SINUSOIDALE



- DETERMINARE CIRCUITO EQUIVALENTE DI THEVENIN DELLA PARTE DI RETE A SINISTRA DEI MORSETTI A & B
- POLARITÀ POSITIVA DEL GENERATORE EQUIVALENTE IN CORRISPONDENZA DEL NODO A

DATI:

$C_1 = 1\,\mu F$, $R_2 = 3\,\Omega$, $R_3 = 1\,\Omega$, $C_4 = 3\,\mu F$, $R_5 = 2\,\Omega$, $L_5 = 1\,mH$

$q_1(t) = 2\cos(3t + 60°)\ A$

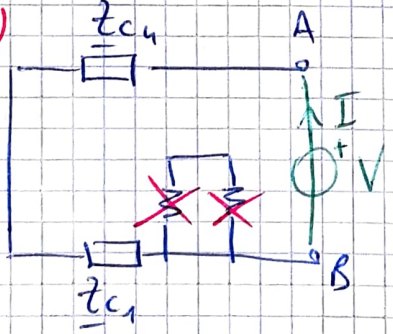
$q_2(t) = \sin(3t + 15°)\ A \rightarrow q_2(t) = \cos(3t - 75°)\ A$

$\underline{Z}_{C_4} = -333j\ \Omega$, $\underline{Z}_{R_2} = 3\,\Omega$, $\underline{Z}_{R_3} = 1\,\Omega$

$\underline{Z}_{C_4} = -111j\ \Omega$, $\underline{Z}_{R_5} = 2\,\Omega$, $\underline{Z}_{L_5} = 0{,}003j\ \Omega$ } 3 pt

$\underline{A}_1 = \sqrt{2}\,\angle 60°\ A$, $\underline{A}_2 = \frac{1}{\sqrt{2}}\,\angle -75°\ A$ → 1 pt

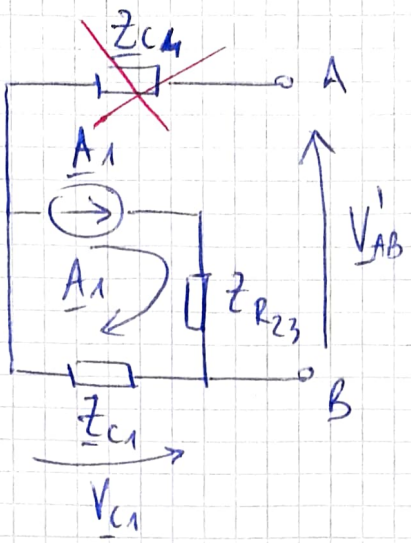
$\underline{Z}_{eq}$ (1 pt)



$\underline{Z}_{eq} = \underline{Z}_{C_1} + \underline{Z}_{C_4} = -444j\ \Omega$

V_{eq} — SOVRAPPOSIZIONE DEGLI EFFETTI (2 pt)

$A_1 \neq 0$

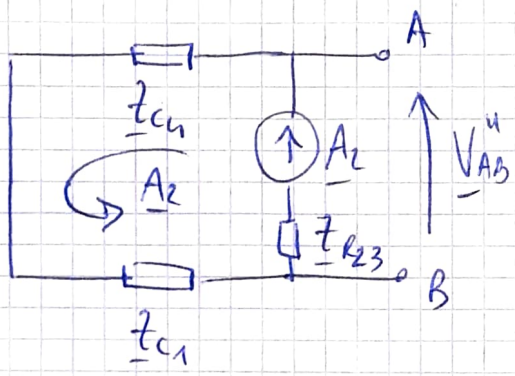


$$\underline{Z}_{R_{23}} = \underline{Z}_{R_2} /\!/ \underline{Z}_{R_3}$$

$$\underline{V}'_{AB} = -\underline{V}_{C_1} = -\underline{A}_1 \cdot \underline{Z}_{C_1}$$

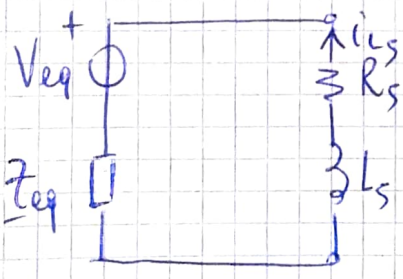
$$= 471 \angle 150° \text{ V}$$

$A_2 \neq 0$



$$\underline{V}''_{AB} = \underline{A}_2 \cdot (\underline{Z}_{C_1} + \underline{Z}_{C_4}) = -303 - j\,81{,}3 \quad (\text{V})$$

$$\Rightarrow \underline{V}_{AB} = \underline{V}'_{AB} + \underline{V}''_{AB} = 727 \angle 168° \text{ V}$$



$$\underline{I}_{L_S} = -\frac{\underline{V}_{eq}}{\underline{Z}_{th} + \underline{Z}_{R_S} + \underline{Z}_{L_S}} = 1{,}64 \angle 77{,}7° \text{ A} \quad (1\text{ pt})$$

$$\Rightarrow i_S(t) = 2{,}32 \cos(3t + 77{,}7°) \text{ A} \quad (1\text{ pt})$$

POTENZA DISSIPATA DAL RESISTORE R_S : (1 pt)

$$P_{R_S} = R_S I_{L_S}^2 = 5{,}38 \text{ W}$$

$$Q_{R_S} = 0 \text{ VAR}$$