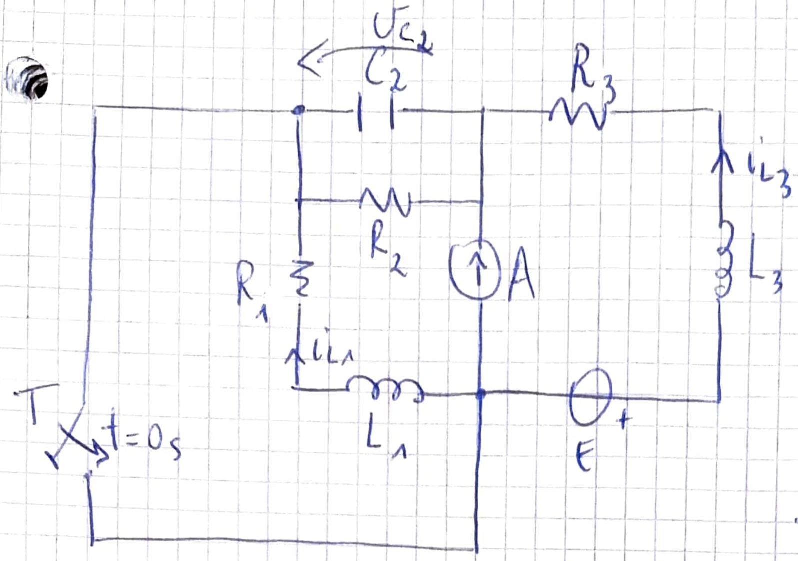
ESERCIZIO SU TRANSITORIO – ISPEZIONE



DATI:

$R_1 = R_2 = 2\,\Omega$

$R_3 = 1\,\Omega$

$L_1 = 1\,mH$

$L_3 = 2\,mH$

$C_2 = 3\,mF$

$A = 2\,A$, $E = 10\,V$

T inizialmente aperto

Rete a regime per $t = 0^-$ s

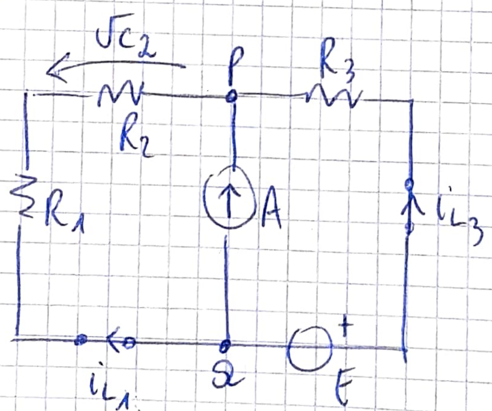
DETERMINARE:

$t = 0^-$: W_{L_1}, W_{C_2}, W_{L_3} (3 pt)

$t = 0^+$: $\frac{di_{L_1}}{dt}$, $\frac{di_{L_2}}{dt}$ (4 pt)

$t \to \infty$: W_{L_1}, W_{C_2}, W_{L_3} (3 pt)

$\boxed{t = 0^-}$



MILLMAN: $v_{PQ} = \dfrac{E/R_3 + A}{\dfrac{1}{R_1+R_2} + \dfrac{1}{R_3}} = 9{,}6\ V$

$\Rightarrow\ i_{L_1} = -\dfrac{v_{PQ}}{R_1+R_2} = -2{,}4\ A$

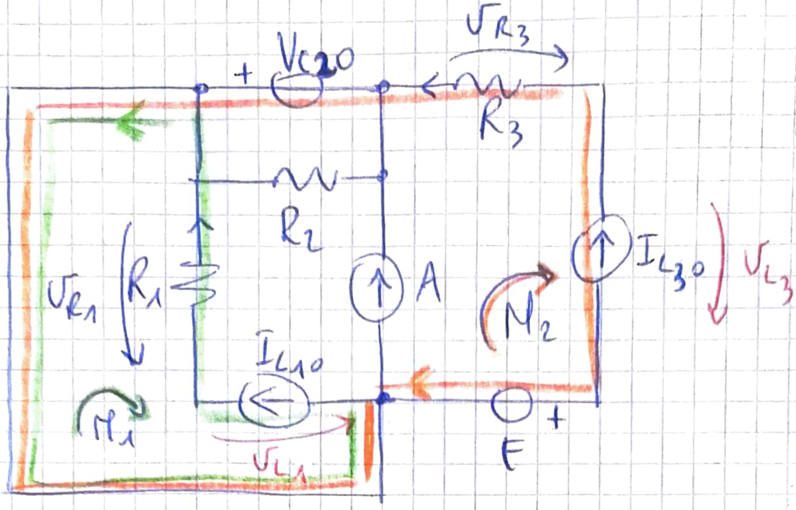
$$\boxed{W_{L_1} = \frac{1}{2} L_1 i_{L_1}^2 = 2{,}88\ mJ}$$

$v_{C_2} = i_{L_1} R_2 = -4{,}8\ V \Rightarrow \boxed{W_{C_2} = \frac{1}{2} C_2 v_{C_2}^2 = 34{,}6\ mJ}$

LKC(P) : $i_{L_3} = -A - i_{L_1} = 0{,}4\ A$

$\Rightarrow \boxed{W_{L_3} = \frac{1}{2} L_3\, i_{L_3}^2 = 0{,}16\ mJ}$

$\boxed{t = 0^+}$



$i_L(0^-) = i_L(0^+) = I_{L0}$

$v_C(0^-) = v_C(0^+) = V_{C0}$

$I_{L10} = -2{,}4\ A$

$I_{L30} = 0{,}4\ A$

$V_{C20} = -4{,}8\ V$

LKT(M_1) : $v_{L_1} = -v_{R_1} = -I_{L10} R_1 = 4{,}8\ V$

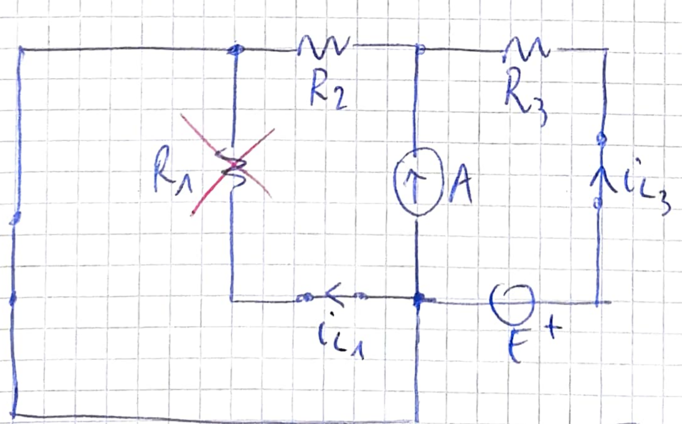
$\Rightarrow \boxed{\frac{di_{L_1}}{dt} = \frac{v_{L_1}}{L_1} = 4800\ A/s}$

LKT(M_2) : $v_{L_3} = E + V_{C20} - v_{R_3} = E + V_{C20} - I_{L30} R_3 = 4{,}8\ V$

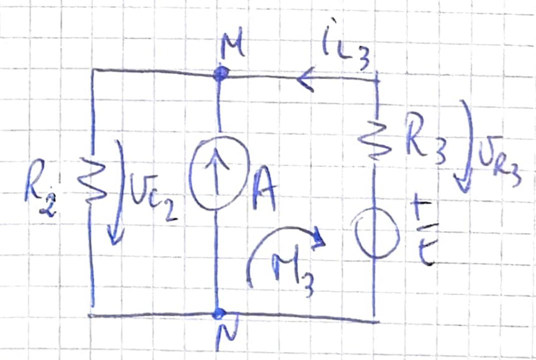
$\Rightarrow \boxed{\frac{di_{L_3}}{dt} = \frac{v_{L_3}}{L_3} = 2400\ A/s}$

$\boxed{t = \infty}$

$i_{L_1} = 0\ A \Rightarrow \boxed{W_{L_1} = 0\ J}$



$\longleftrightarrow$



MILLMAN : $v_{MN} = \dfrac{A + E/R_3}{\frac{1}{R_3} + \frac{1}{R_2}} = 8\ V$

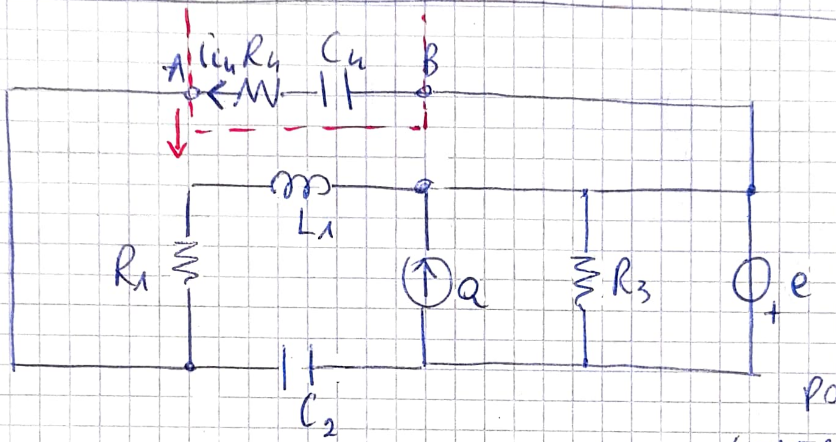
$v_{C_2} = -v_{MN}$ $\Rightarrow \boxed{W_{C_2} = \frac{1}{2} C_2 (-v_{MN})^2 = 96\ mJ}$

$$LKT\,(M_3):\quad V_{R_3} = -V_{MN} + E = 2\,V$$

$$\Rightarrow\quad i_{L_3} = \frac{V_{R_3}}{R_3} = \frac{-V_{MN}+E}{R_3} = 2\,A$$

$$\Rightarrow\quad \boxed{W_{L_3} = \frac{1}{2} L_3\, i_{L_3}^2 = 4\,mJ}$$

ESERCIZIO SU REGIME SINUSOIDALE



DETERMINARE CIRCUITO EQUIVALENTE DI THEVENIN DELLA PARTE DI RETE SOTTO I MORSETTI A & B POLARITÀ POSITIVA DEL GENERATORE EQUIVALENTE IN CORRISPONDENZA DEL NODO A

DATI:

$R_1 = 3\,\Omega$, $L_1 = 3\,mH$, $C_2 = 2\,mF$, $R_3 = 2\,\Omega$, $R_4 = 1\,\Omega$, $C_4 = 3\,mF$

$e(t) = 2\sin(3t + 120°)\,V \longrightarrow e(t) = 2\cos(3t + 30°)\,V$

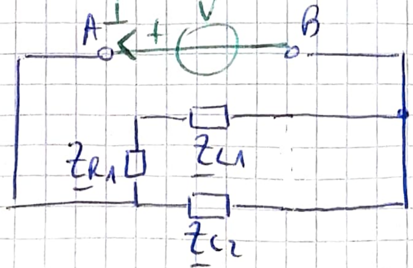
$a(t) = \cos(3t - 15°)\,A$

$$\left.\begin{array}{l} \underline{Z}_{R_1} = 3\,\Omega,\ \underline{Z}_{L_1} = 0{,}009j\,\Omega,\ \underline{Z}_{C_2} = -167j\,\Omega \\ \underline{Z}_{R_3} = 2\,\Omega,\ \underline{Z}_{R_4} = 1\,\Omega,\ \underline{Z}_{C_4} = -111j\,\Omega \end{array}\right\}\ 3\,pt$$

$$\underline{E} = \sqrt{2}\,\angle 30°\,V,\quad \underline{A} = \frac{1}{\sqrt{2}}\,\angle{-15°}\,A \rightarrow 1\,pt$$

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

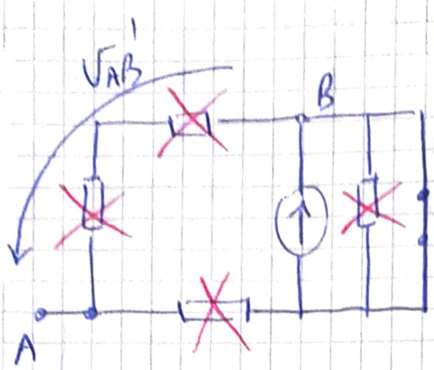
$$\underline{Z}_{eq} = \underline{Z}_{C_2} \,/\!/\, (\underline{Z}_{R_1} + \underline{Z}_{L_1}) = \frac{\underline{Z}_{C_2}(\underline{Z}_{R_1}+\underline{Z}_{L_1})}{\underline{Z}_{C_2} + \underline{Z}_{R_1} + \underline{Z}_{L_1}}$$



$$= 3{,}00 - j\,0{,}0449\ (\Omega)$$

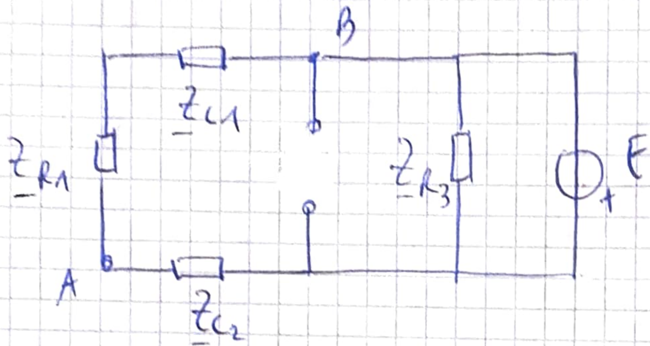
$\underline{V}_{eq}$ SOVRAPPOSIZIONE DEGLI EFFETTI (2pt)

$\underline{A} \neq 0$



$\Rightarrow \underline{V}_{AB}' = 0 \text{ V}$

$\underline{E} \neq 0$



PARTITORE DI TENSIONE : $\underline{V}_{AB}'' = \dfrac{\underline{Z}_{R1} + \underline{Z}_{C1}}{\underline{Z}_{R1} + \underline{Z}_{C1} + \underline{Z}_{C2}} \underline{E}$

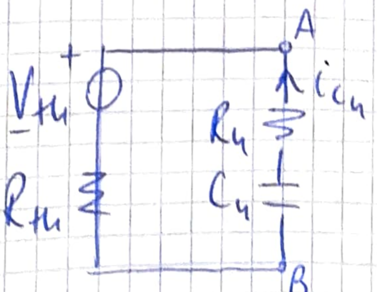
$= -0{,}0124 + j\,0{,}0222 \text{ (V)}$

$\Rightarrow \underline{V}_{AB} = \underline{V}_{AB}' + \underline{V}_{AB}'' = -0{,}0124 + j\,0{,}0222 \text{ (V)}$

POTENZA EROGATA DA GENERATORE $\underline{A}$ (POTENZA COMPLESSA) : (1pt)

$\underline{S}_a = \underline{V}_a \cdot \underline{A}^* = -\underline{E} \cdot \underline{A}^* = -\dfrac{\sqrt{2}}{2} - j\dfrac{\sqrt{2}}{2} \text{ (VA)}$

$\Rightarrow P_a = -\dfrac{\sqrt{2}}{2} \text{ W} \quad , \quad Q_a = -\dfrac{\sqrt{2}}{2} \text{ VAR}$



$\underline{I}_{C4} = -\dfrac{\underline{V}_{th}}{\underline{Z}_{th} + \underline{Z}_{R4} + \underline{Z}_{C4}} = 0{,}204 + 0{,}104j \text{ (mA)}$

(1pt)

$\Rightarrow i_{C4}(t) = 0{,}324 \cos(3t + 27{,}1^\circ) \text{ mA}$

(1pt)