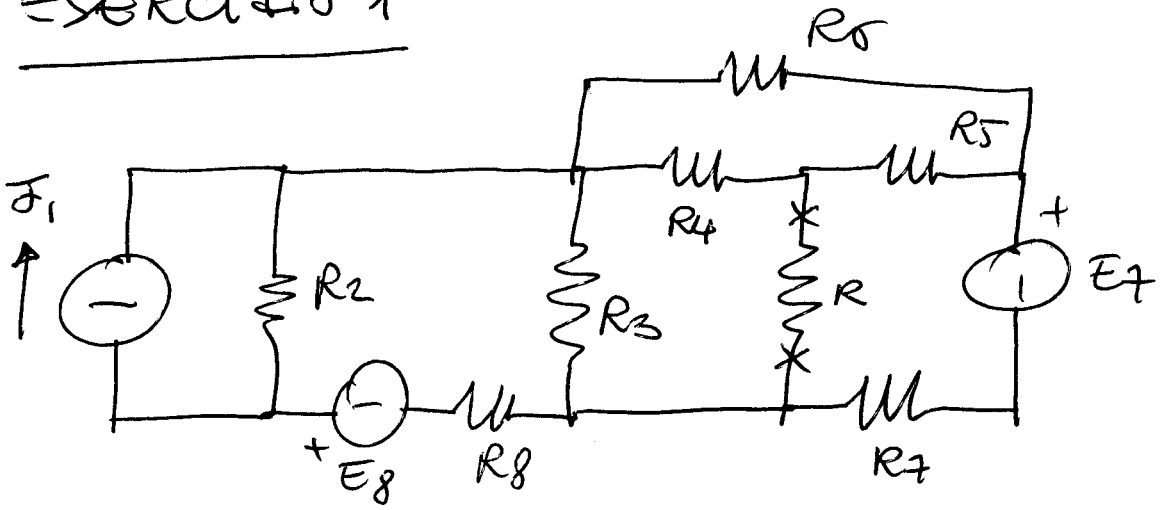
ESERCIZIO 1



$R_4 = R_5 = R_6 = 3\,\Omega$

$R_1 = R_8 = R_2 = 2\,\Omega$

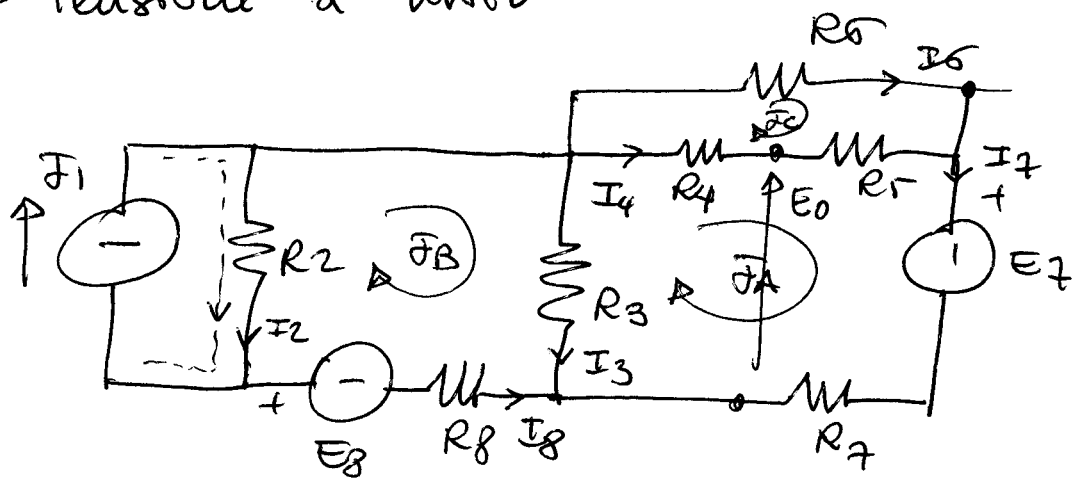
$R_3 = 4\,\Omega$

$E_7 = 4\,V$

$E_8 = 22\,V$

$\bar{J}_1 = 11\,A$

- tensione a vuoto



$I_2 = J_1 - J_B$

$I_8 = -J_B$

$I_3 = J_B - J_A$

$I_4 = J_A - J_C$

$I_6 = J_C$

$I_7 = J_A$

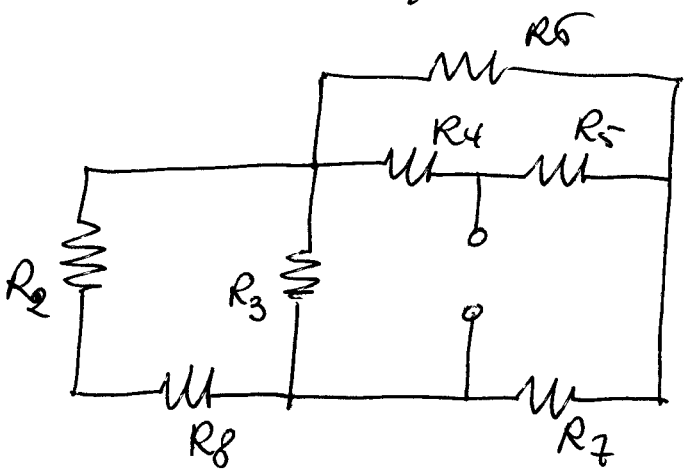
$$\begin{cases} E_8 + R_2(J_1 - J_B) - R_3(J_B - J_A) + R_8(-J_B) = 0 \\ E_7 + (R_4 + R_5)(J_A - J_C) - R_3(J_B - J_A) + R_7 J_A = 0 \\ (R_4 + R_5)(J_A - J_C) = R_5 J_C \end{cases}$$

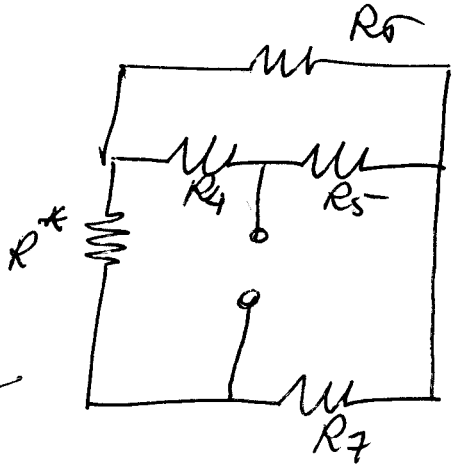
$$\begin{bmatrix} R_3 & (-R_2 - R_3 - R_8) & 0 \\ (R_4 + R_5 + R_3 + R_7) & -R_3 & (-R_4 - R_5) \\ R_4 + R_5 & 0 & -R_4 - R_5 - R_5 \end{bmatrix} \begin{bmatrix} J_A \\ J_B \\ J_C \end{bmatrix} = \begin{bmatrix} -E_8 - R_2 J_1 \\ -E_7 \\ 0 \end{bmatrix}$$

$J_A = 3\,A \qquad J_B = 7\,A \qquad J_C = 2\,A$

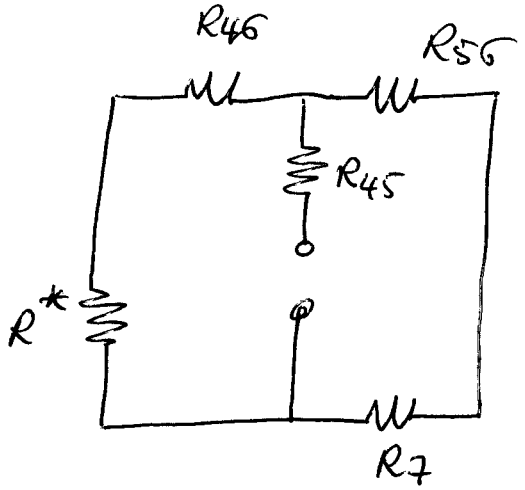
$E_0 = R_5 I_4 + R_7 I_7 + E_7 = 3 \cdot (3-2) + 2 \cdot (3) + 4 = 13\,V$

- Resistenza equivalente:





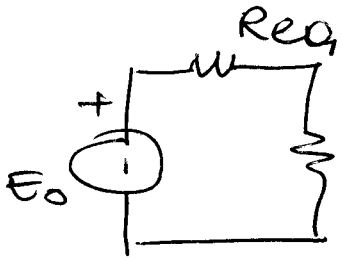
$R^* = (R_2 + R_8) /\!/ R_3 = 2\,\Omega$



$R_{46} = R_{56} = R_{45} = 1\,\Omega$

$R_{eq} = (R_{45} + R^*) /\!/ (R_{56} + R_7) + R_{45} = 2.5\,\Omega$

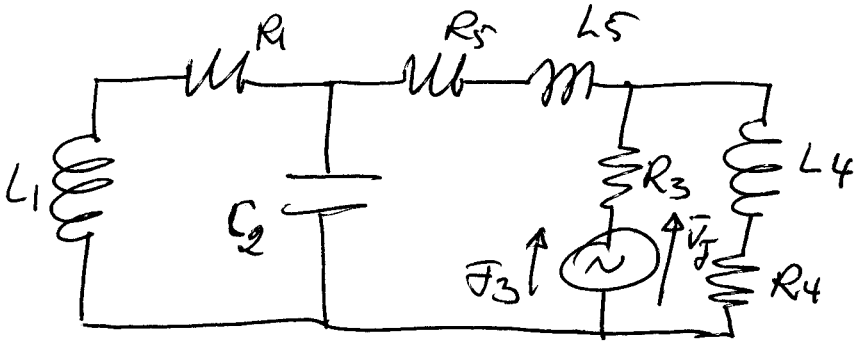
da cui



$R = R_{eq} = 2.5\,\Omega$ per avere il massimo trasferimento di potenza.

$$P_R = R\left(\frac{E_0}{R + R_{eq}}\right)^2 = 2.5\left(\frac{13}{5}\right)^2 = 16.9\ W$$

Esercizio 2



$j_3(t) = 100 \sin\left(10t + \pi/4\right)$

$L_1 = 0.1\ H$ $\quad R_3 = 5\ \Omega$

$L_5 = 0.3\ H$ $\quad R_4 = 3\ \Omega$

$L_4 = 0.2\ H$ $\quad R_5 = 2\ \Omega$

$C_2 = 0.1\ F$

$R_1 = 1\ \Omega$

$$\bar{J}_3 = \frac{100}{\sqrt{2}} e^{j\pi/4} = 50(1+j)$$

$X_1 = 10 \cdot 0.1 = 1\ \Omega$

$X_5 = 3\ \Omega$

$X_4 = 2\ \Omega$

$X_2 = \frac{1}{10 \cdot 0.1} = 1\ \Omega$

$$\dot{Z}_{eq} = \left[(R_1 + jX_1) /\!/ (-jX_2) + R_5 + jX_5\right] /\!/ (R_4 + jX_4) + R_3 = 6.5 + j$$

$$\bar{V}_J = \dot{Z}_{eq} \cdot \bar{J}_3 = 100 \cdot (2.75 + j\,3.75) \cong 465\, e^{j54^\circ}$$

$$\downarrow$$

$$v_J(t) = 465\sqrt{2} \sin\left(10t + 0.938\right) \qquad 0.938\ rad \Leftrightarrow 54^\circ$$