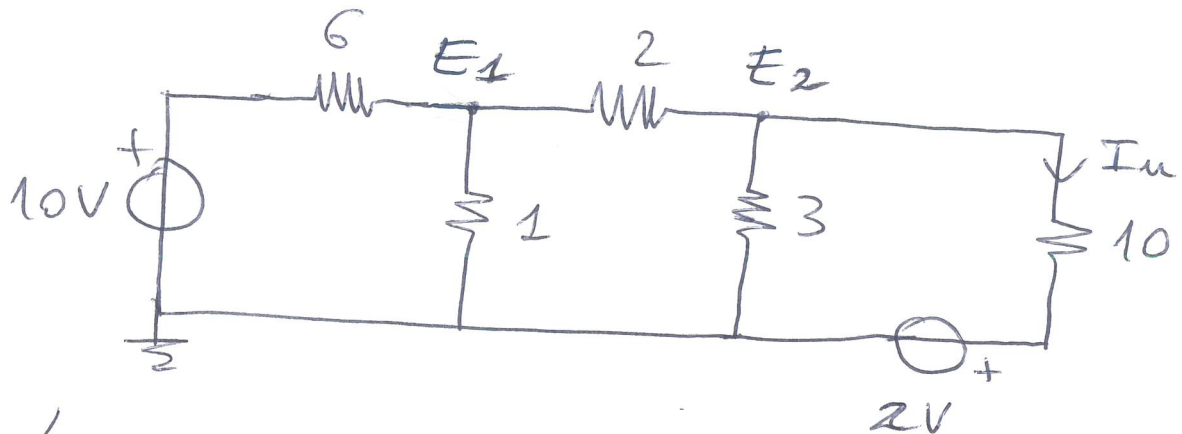


ANALISI AI MODI

1)



$$\begin{cases} \frac{E_1 - 10}{6} + \frac{E_1}{1} + \frac{E_1 - E_2}{2} = 0 \\ \frac{E_2 - E_1}{2} + \frac{E_2}{3} + \frac{E_2 - 2}{10} = 0 \end{cases}$$

$$\begin{cases} E_1 \left(\frac{1}{6} + 1 + \frac{1}{2} \right) - \frac{E_2}{2} = \frac{10}{6} \\ -\frac{E_1}{2} + E_2 \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{10} \right) = \frac{2}{10} \end{cases}$$

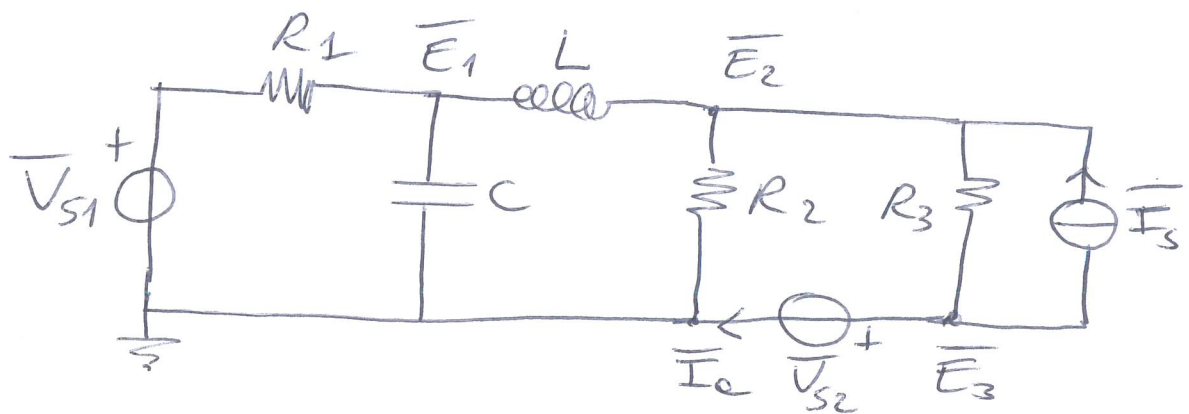
$$G^{nod} = \begin{bmatrix} \frac{5}{3} & -\frac{1}{2} \\ -\frac{1}{2} & \frac{14}{15} \end{bmatrix} \quad \underline{I_s} = \begin{bmatrix} \frac{5}{3} \\ \frac{1}{5} \end{bmatrix}$$

$$\begin{cases} E_1 = 1.268 \text{ V} \\ E_2 = 0.894 \text{ V} \end{cases}$$

$$I_u = \frac{E_2 - 2}{10} = -0.11 \text{ A}$$

ANALISI AI NODI

c)



MNA

$$\frac{\bar{E}_1 - \bar{V}_{s1}}{R_1} + \bar{E}_1 j\omega C + \frac{\bar{E}_1 - \bar{E}_2}{j\omega L} = 0$$

$$\frac{\bar{E}_2 - \bar{E}_1}{j\omega L} + \frac{\bar{E}_2}{R_2} + \frac{\bar{E}_2 - \bar{E}_3}{R_3} = \bar{I}_s$$

$$\frac{\bar{E}_3 - \bar{E}_2}{R_3} + \bar{I}_e = -\bar{I}_s$$

$$\bar{E}_3 = \bar{V}_{s2}$$

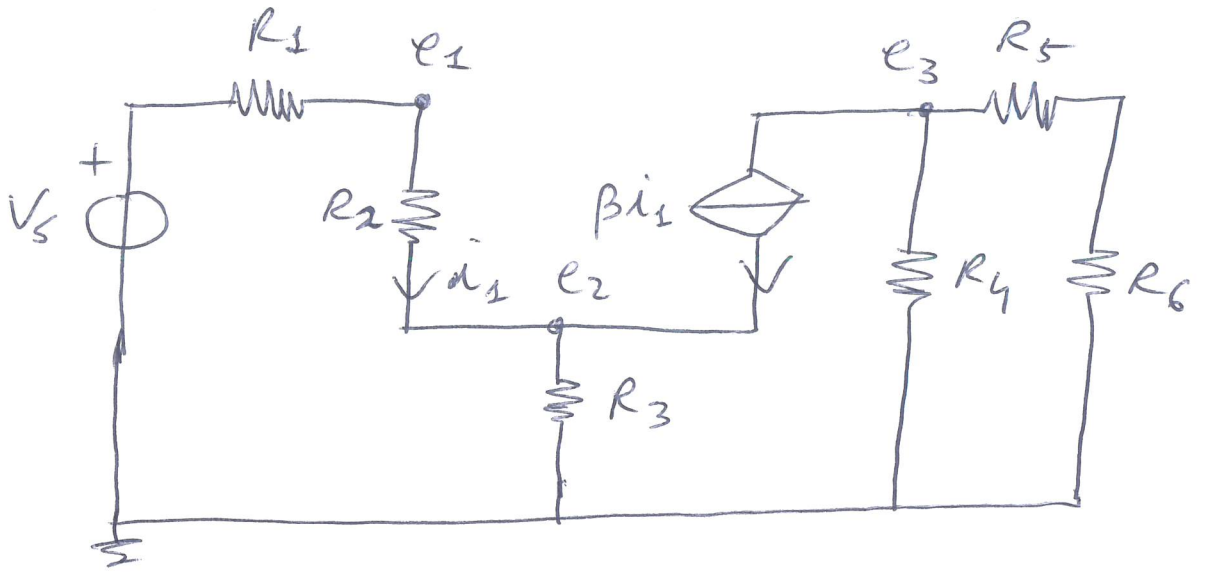
FORMA RIDOTTA

$$\frac{\bar{E}_1 - \bar{V}_{s1}}{R_1} + \bar{E}_1 j\omega C + \frac{\bar{E}_1 - \bar{E}_2}{j\omega L} = 0$$

$$\frac{\bar{E}_2 - \bar{E}_1}{j\omega L} + \frac{\bar{E}_2}{R_2} + \frac{\bar{E}_2 - \bar{V}_{s2}}{R_3} = \bar{I}_s$$

ANALISI AI NODI

6B)



$$\frac{e_1 - V_s}{R_1} + \frac{e_1 - e_2}{R_2} = 0$$

$$\frac{e_2 - e_1}{R_2} + \frac{e_2}{R_3} - \beta i_1 = 0$$

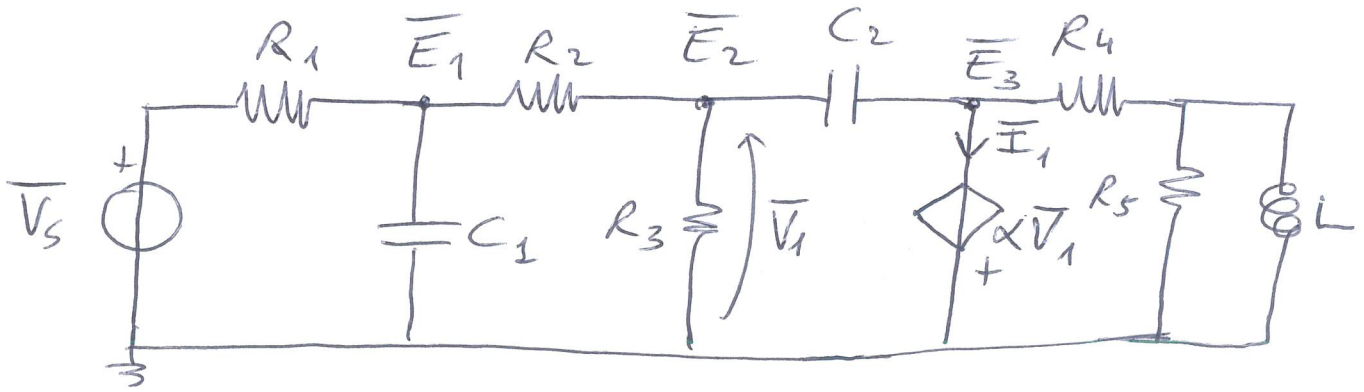
$$\beta i_1 + \frac{e_3}{R_4} + \frac{e_3}{R_5 + R_6} = 0$$

$$i_1 = \frac{e_1 - e_2}{R_2}$$

NODI PURO

ANALISI AI NODI

7)



$$\frac{\bar{E}_1 - \bar{V}_s}{R_1} + \frac{\bar{E}_1 - \bar{E}_2}{R_2} + \bar{E}_1 j\omega C_1 = 0$$

$$\frac{\bar{E}_2 - \bar{E}_1}{R_2} + \frac{\bar{E}_2}{R_3} + (\bar{E}_2 - \bar{E}_3) j\omega C_2 = 0$$

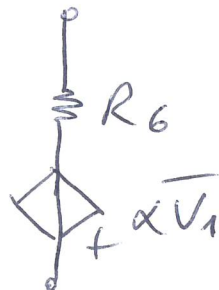
MNA

$$(\bar{E}_3 - \bar{E}_2) j\omega C_2 + \bar{I}_1 + \bar{E}_3 Y_T = 0$$

$$\bar{E}_3 = -\alpha \bar{E}_2 \quad [\bar{V}_1 = \bar{E}_2]$$

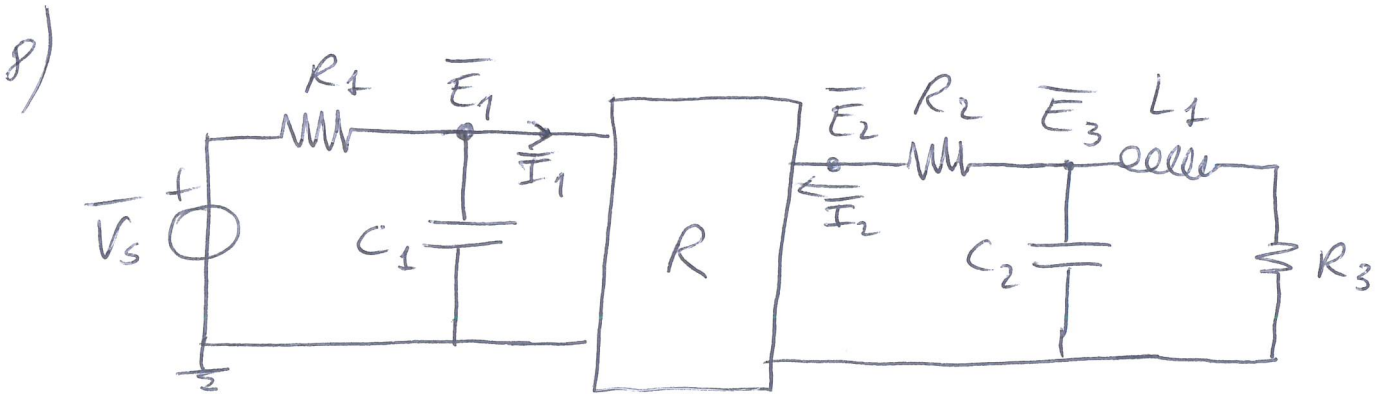
$$Y_T = \left(\frac{R_5 j\omega L}{R_5 + j\omega L} + R_4 \right)^{-1}$$

VARIANTE:



NODI PURO

ANALISI AI NODI



$$R = \begin{bmatrix} 6 & 3 \\ 12 & 6 \end{bmatrix} \quad \det R = 0 \\ \Rightarrow \nexists G$$

$$\frac{\bar{E}_1 - \bar{V}_s}{R_1} + \bar{E}_1 j\omega C_1 + \bar{I}_1 = 0$$

$$\bar{I}_2 + \frac{\bar{E}_2 - \bar{E}_3}{R_2} = 0$$

$$\frac{\bar{E}_3 - \bar{E}_2}{R_2} + \bar{E}_3 j\omega C_2 + \frac{\bar{E}_3}{R_3 + j\omega L_1} = 0$$

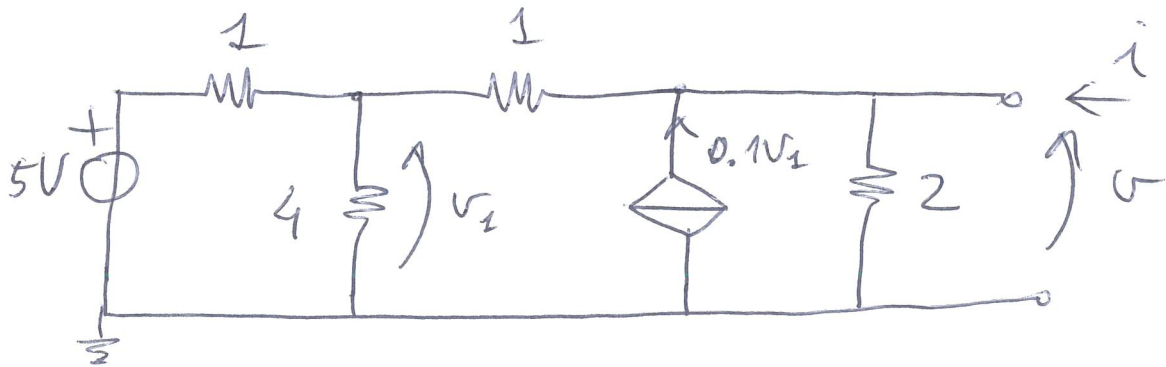
$$\bar{E}_1 = 6\bar{I}_1 + 3\bar{I}_2$$

$$\bar{E}_2 = 12\bar{I}_1 + 6\bar{I}_2$$

MNA

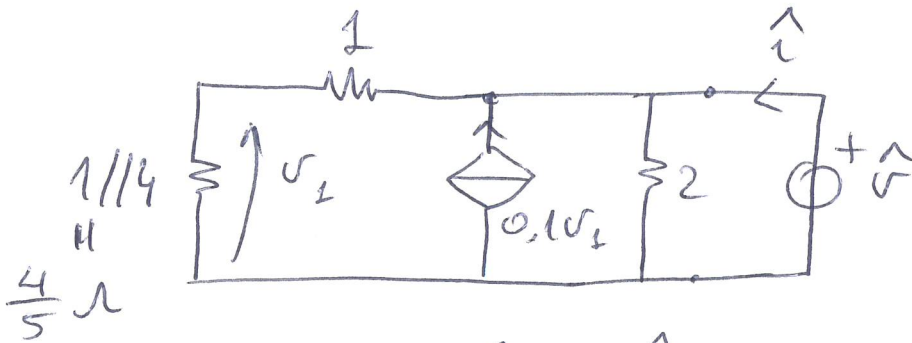
ANALISI AI NODI

10)



$$v_{eq}) \begin{cases} \frac{v_1 - 5}{1} + \frac{v_1}{4} + \frac{v_1 - v_{eq}}{1} = 0 \\ \frac{v_{eq} - v_1}{1} + \frac{v_{eq}}{2} - 0.1v_1 = 0 \end{cases}$$

$$v_{eq} = \frac{220}{91} \text{ V}$$



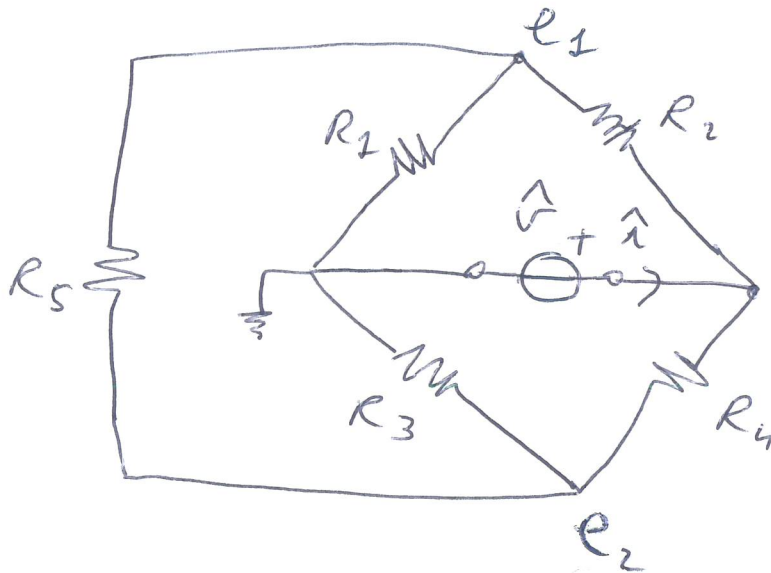
$$Req) \quad \hat{i} = \frac{\hat{v}}{2} + \frac{\hat{v}}{1 + 1/4} - 0.1v_1$$

$$v_1 = \frac{1/4}{1/4 + 1} \hat{v} = \frac{4}{9} \hat{v}$$

$$Req = \frac{\hat{v}}{\hat{i}} = 1.011 \Omega$$

ANALISI AI NODI

11)



$$\begin{cases} \frac{e_1 - e_2}{R_5} + \frac{e_1}{R_1} + \frac{e_1 - \hat{V}}{R_2} = 0 \\ \frac{e_2 - e_1}{R_5} + \frac{e_2}{R_3} + \frac{e_2 - \hat{V}}{R_4} = 0 \end{cases}$$

$$\hat{i} = \frac{\hat{V} - e_1}{R_2} + \frac{\hat{V} - e_2}{R_4}$$

$$R_{eq} = \frac{\hat{V}}{\hat{i}}$$