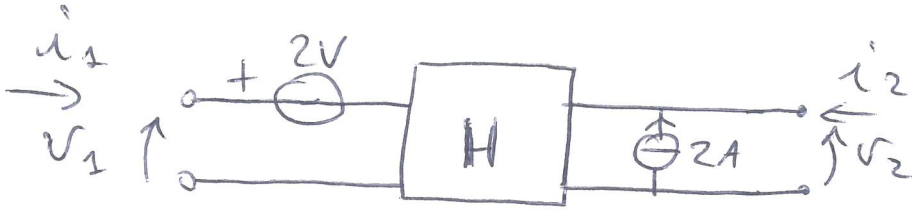
DOPPI-BIPOLI

2)

$$\text{(H)} \quad \begin{bmatrix} v_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} i_1 \\ v_2 \end{bmatrix}$$

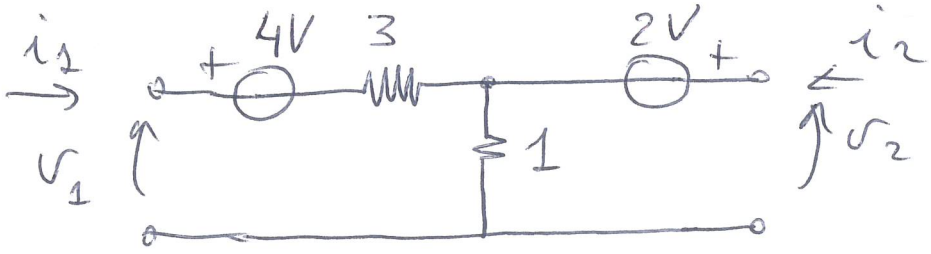


$$\begin{cases} v_1 = 3i_1 + v_2 + 2 \\ i_2 = -i_1 + v_2 - 2 \end{cases}$$

$$v_2 = i_1 + i_2 + 2$$

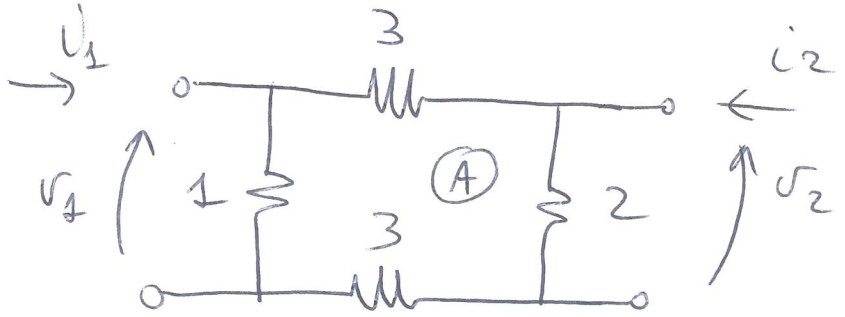
$$v_1 = \underbrace{3i_1 + i_1}_{4i_1} + i_2 + \underbrace{2+2}_{4}$$

$$\begin{cases} v_1 = 4i_1 + i_2 + 4 \\ v_2 = i_1 + i_2 + 2 \end{cases}$$

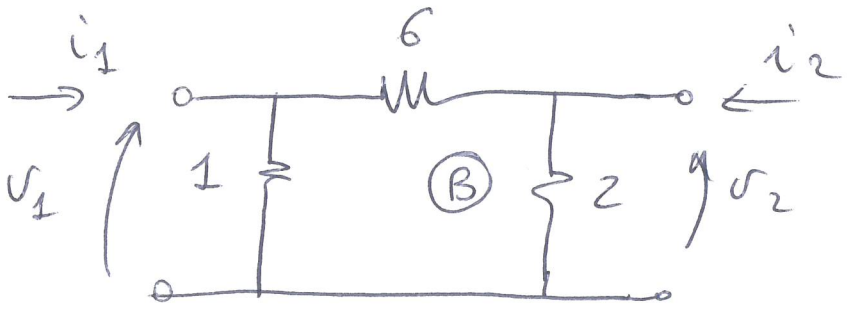


DOPPI - BIPOLI

5)



(D-B IMPROPRIO)



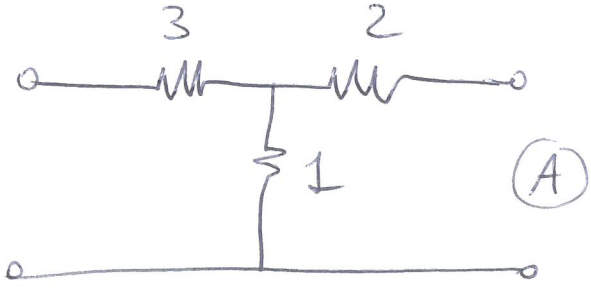
(D-B TRIPOLARE)

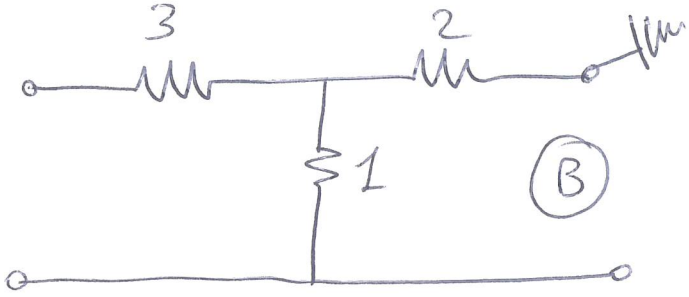
$$G_A = G_B = \begin{bmatrix} 1+\frac{1}{6} & -\frac{1}{6} \\ -\frac{1}{6} & \frac{1}{2}+\frac{1}{6} \end{bmatrix} S$$

$$= \begin{bmatrix} \frac{7}{6} & -\frac{1}{6} \\ -\frac{1}{6} & \frac{2}{3} \end{bmatrix} S$$

DOPPI - BIPOLI

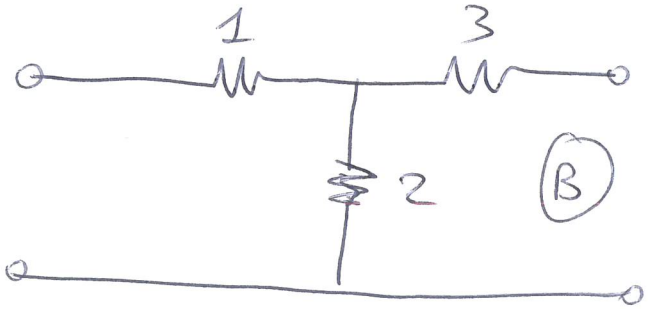
6)





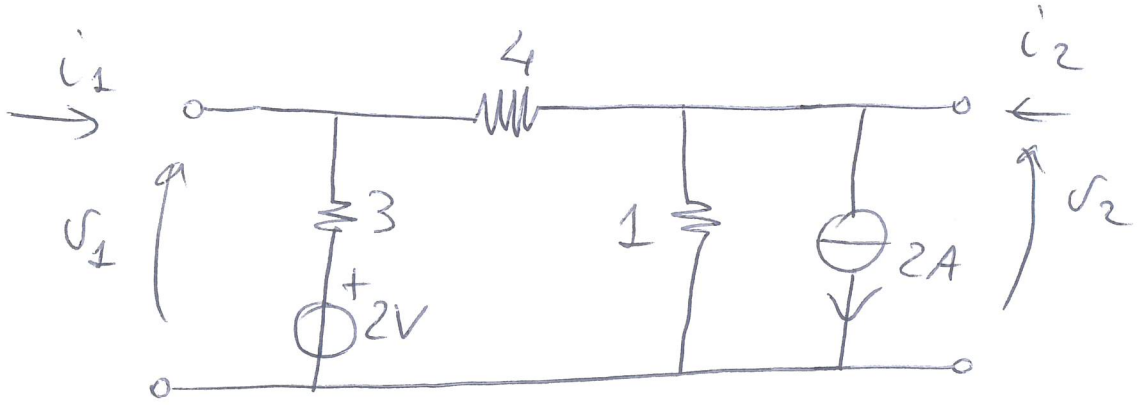
$$R_A = \begin{bmatrix} 4 & 1 \\ 1 & 3 \end{bmatrix} \Omega$$

$$R_B = \begin{bmatrix} 3 & 2 \\ 2 & 5 \end{bmatrix} \Omega$$



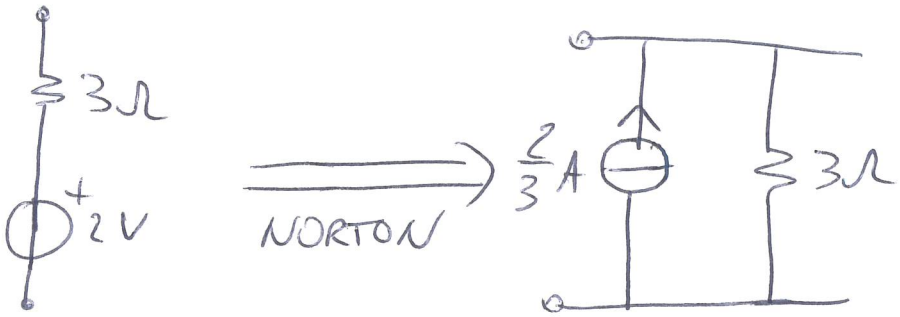
DOPPI - BIPOLI

8)



$$G = \begin{bmatrix} \frac{1}{3}+\frac{1}{4} & -\frac{1}{4} \\ -\frac{1}{4} & 1+\frac{1}{4} \end{bmatrix} S$$

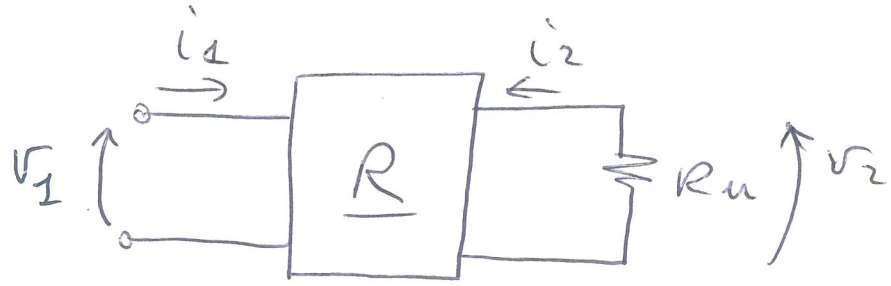
$$= \begin{bmatrix} \frac{7}{12} & -\frac{1}{4} \\ -\frac{1}{4} & \frac{5}{4} \end{bmatrix} S$$



$$\underline{i_S} = \begin{bmatrix} -\frac{2}{3} \\ 2 \end{bmatrix} A$$

DOPPI - BIPOLI

g)



$$R_{ing} = \frac{v_1}{i_1}$$

$$\begin{cases} v_1 = R_{11} i_1 + R_{12} i_2 \\ v_2 = R_{21} i_1 + R_{22} i_2 \end{cases}$$

$$v_2 = -R_u i_2$$

$$R_{21} i_1 + R_{22} i_2 = -R_u i_2$$

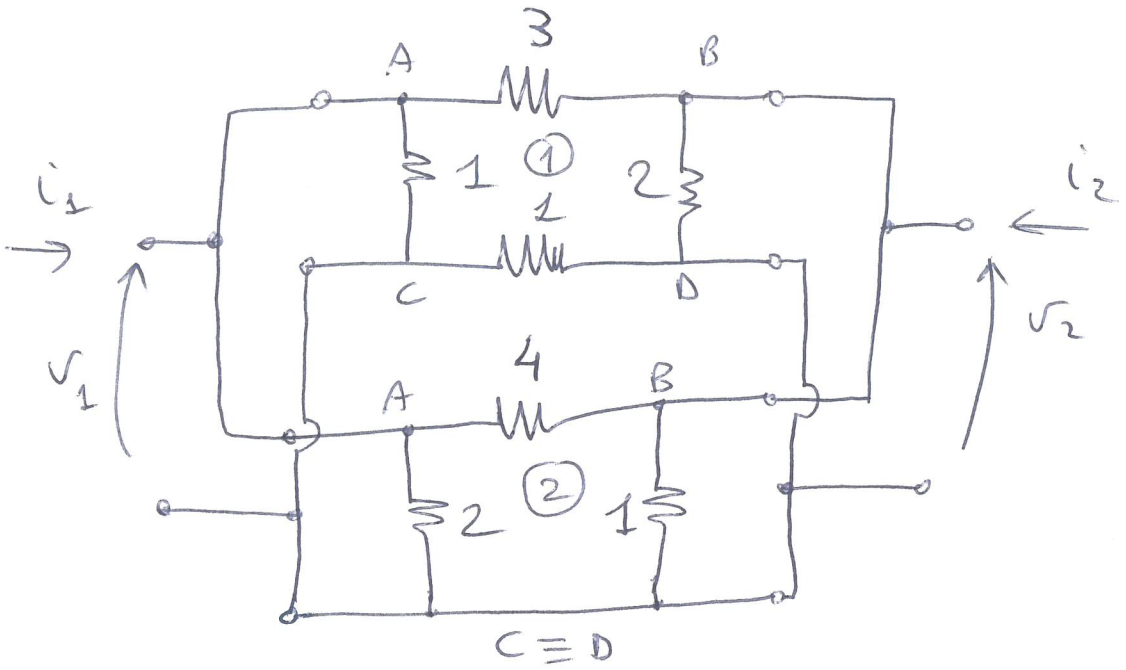
$$i_2 = \frac{-R_{21}}{R_u + R_{22}} i_1$$

$$v_1 = R_u i_1 - \frac{R_{12} R_{21}}{R_u + R_{22}} i_1$$

$$R_{ing} = R_{11} - \frac{R_{12} R_{21}}{R_u + R_{22}}$$

DOPPI - BIPOLI

10)



$$G_1 = \begin{bmatrix} 1+\frac{1}{4} & -\frac{1}{4} \\ -\frac{1}{4} & \frac{1}{2}+\frac{1}{4} \end{bmatrix}$$ (D-B IMPROPRIO)

$$G_2 = \begin{bmatrix} \frac{1}{2}+\frac{1}{4} & -\frac{1}{4} \\ -\frac{1}{4} & 1+\frac{1}{4} \end{bmatrix}$$ (D-B TRIPOLARE)

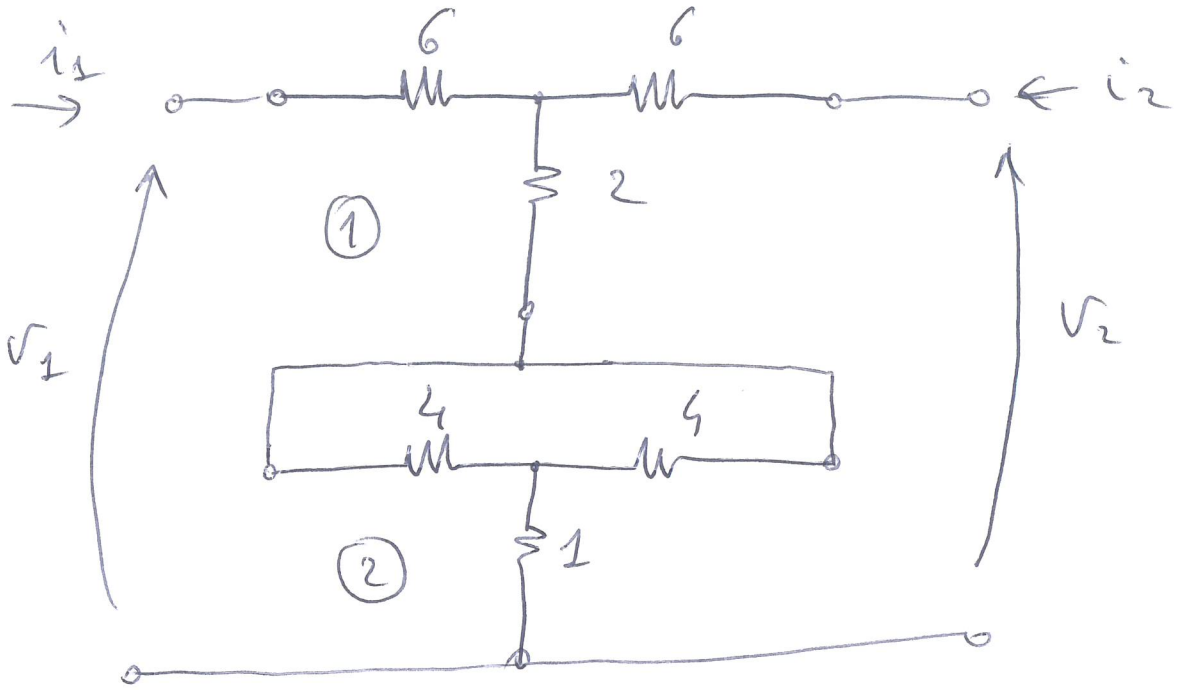
$$G_p \neq G_1 + G_2$$

$$G_1' = \begin{bmatrix} 1+\frac{1}{3} & -\frac{1}{3} \\ -\frac{1}{3} & \frac{1}{2}+\frac{1}{3} \end{bmatrix}$$

$$G_p = G_1' + G_2$$

DOPPI-BIPOLI

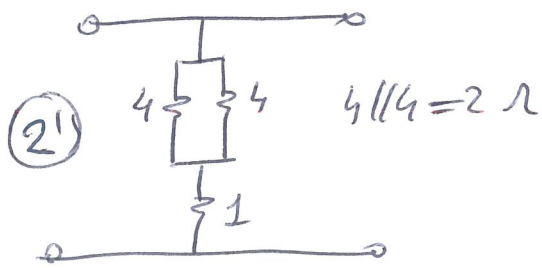
11)



$$R_1 = \begin{bmatrix} 6+2 & 2 \\ 2 & 6+2 \end{bmatrix}$$

$$R_2 = \begin{bmatrix} 4+1 & 1 \\ 1 & 4+1 \end{bmatrix}$$

$$R_S \neq R_1 + R_2$$

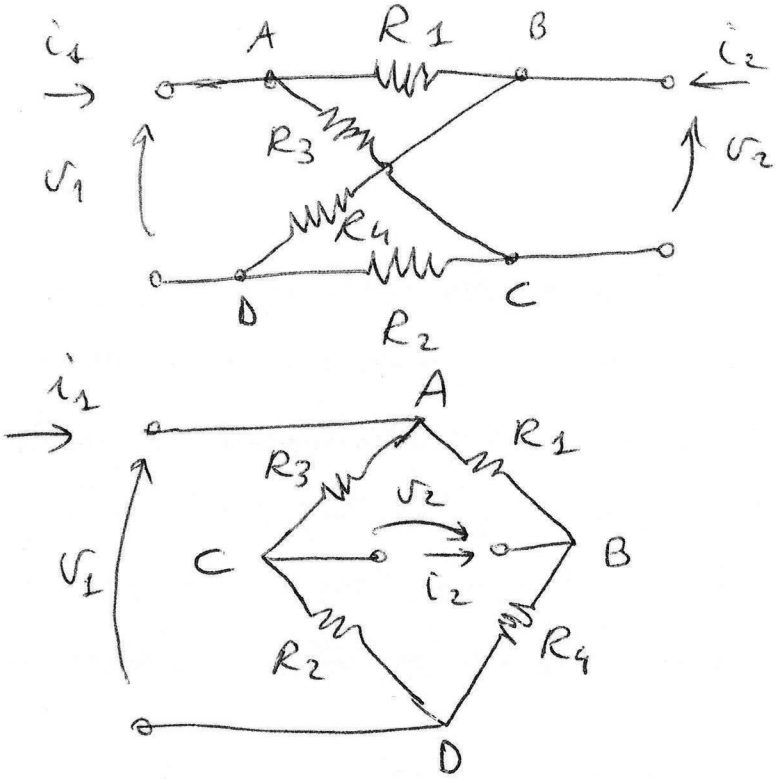


$4 \| 4 = 2\ \Omega$

$$R_2' = \begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix} \Longrightarrow R_S = R_1 + R_2'$$

DOPPI - BIPOLI

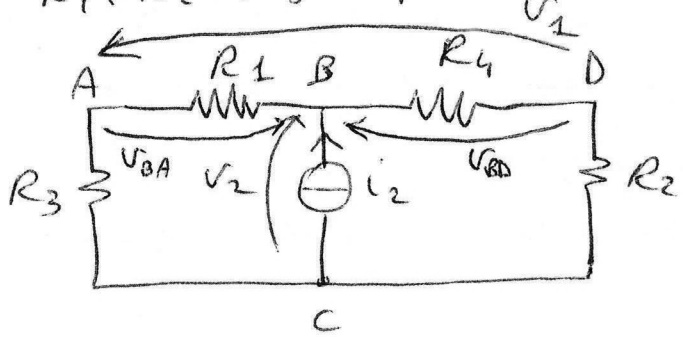
13)



$$R_{11} = \left.\frac{V_1}{i_1}\right|_{i_2=0} = \frac{(R_2+R_3)(R_1+R_4)}{R_1+R_2+R_3+R_4}$$

$$R_{22} = \left.\frac{V_2}{i_2}\right|_{i_1=0} = \frac{(R_1+R_3)(R_2+R_4)}{R_1+R_2+R_3+R_4}$$

$$R_{12} = \left.\frac{V_1}{i_2}\right|_{i_1=0}$$



$$V_2 = V_{BC} = R_{22}\, i_2$$

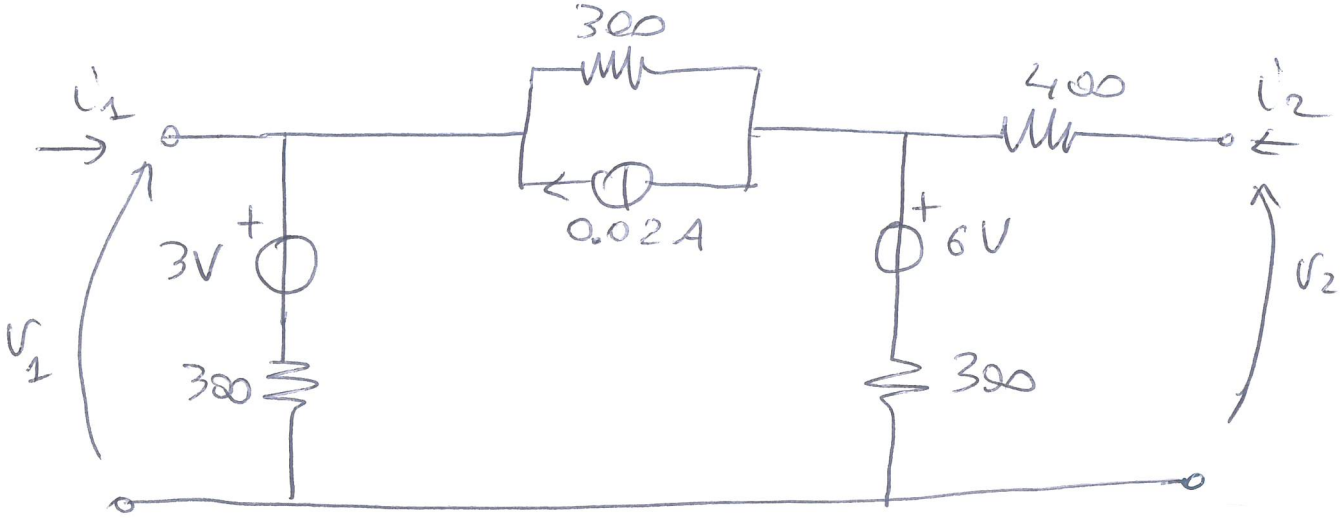
$$V_{BA} = \frac{R_1}{R_1+R_3}(R_{22} i_2) \qquad V_{BD} = \frac{R_4}{R_2+R_4}(R_{22} i_2)$$

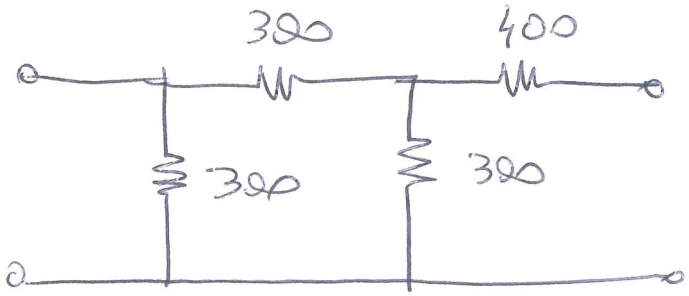
$$R_{12} = \frac{V_1}{i_2} = V_{AD} = V_{BD} - V_{BA} = R_{22}\left[\frac{R_3R_4 - R_1R_2}{(R_1+R_3)(R_2+R_4)}\right] = \frac{R_3R_4 - R_1R_2}{R_1+R_2+R_3+R_4}$$

$(R_{11} = R_{12})$ COND. EQUIL. $\Rightarrow R_1R_2 = R_3R_4$

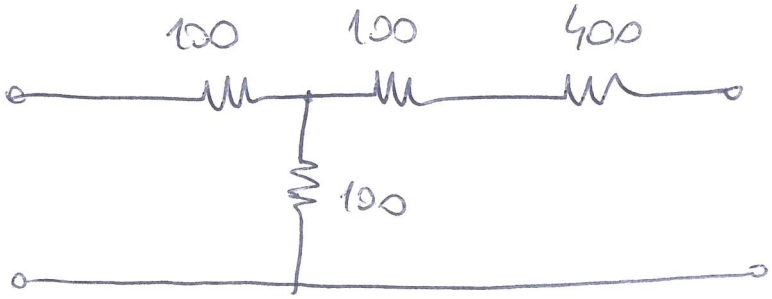
DOPPI - BIPOLI

14)

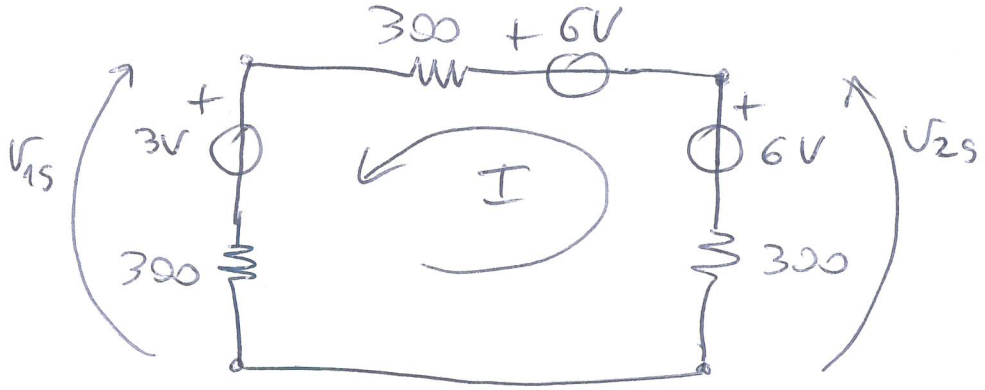




OMOGENEA ASSOCIATA



$$R = \begin{bmatrix} 200 & 100 \\ 100 & 600 \end{bmatrix}$$



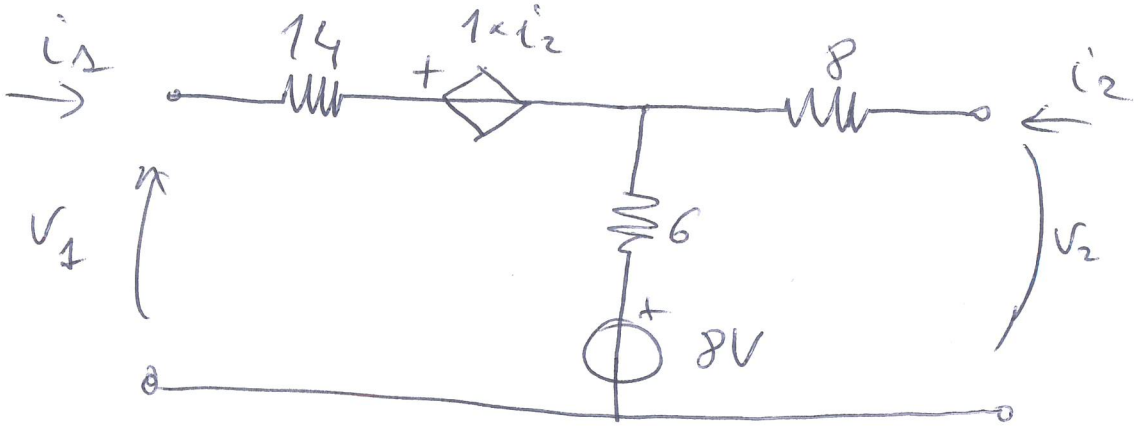
$$\begin{cases} V_{1S} = 6V \\ V_{2S} = 3V \end{cases}$$

DOPPI - BIPOLI

15)

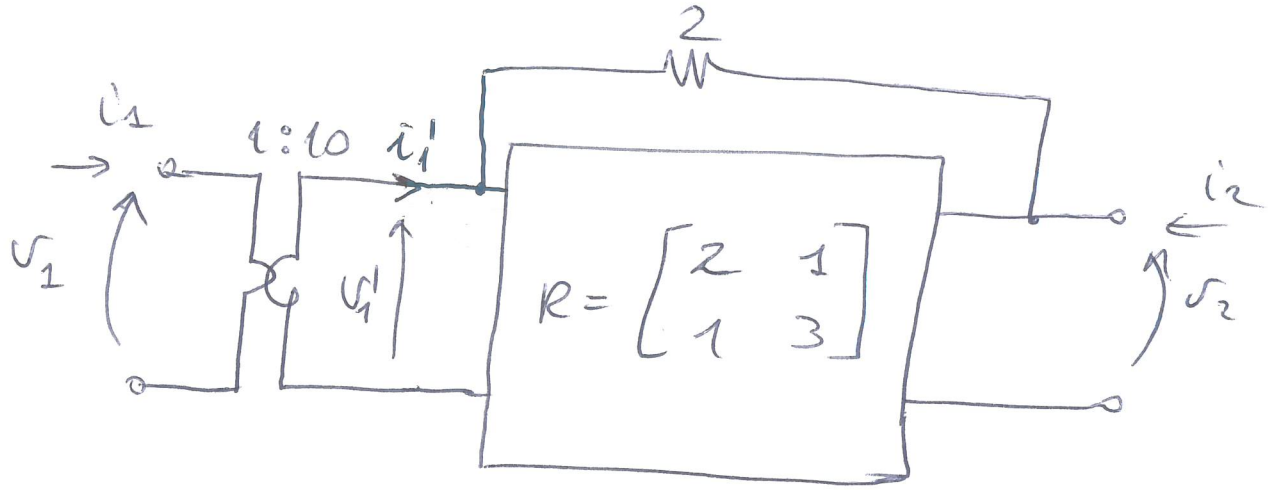
$$\begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} 20 & 7 \\ 6 & 14 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} + \begin{bmatrix} 8 \\ 8 \end{bmatrix}$$

$$\begin{cases} v_1 = 20 i_1 + 6 i_2 + 1 i_2 + 8 \\ v_2 = 6 i_1 + 14 i_2 + 8 \end{cases}$$



DOPPI-BIPOLI

17)



$$G = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}^{-1} = \frac{1}{5}\begin{bmatrix} 3 & -1 \\ -1 & 2 \end{bmatrix}$$

$$G_p = G + \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & \frac{1}{2} \end{bmatrix} = \frac{1}{10}\begin{bmatrix} 11 & -7 \\ -7 & 9 \end{bmatrix}$$

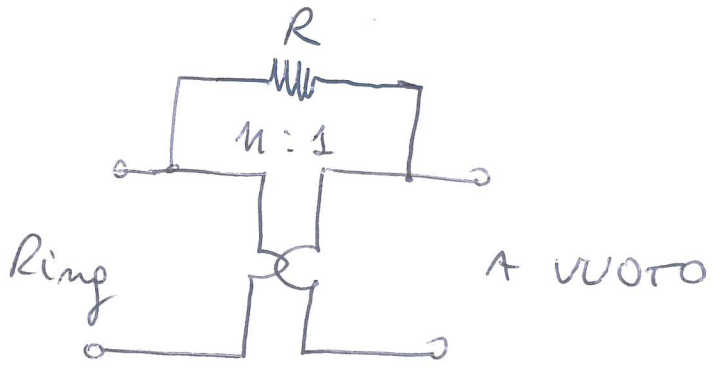
$$\begin{cases} v_1 = \frac{1}{10} v_1' \\ i_1 = 10\, i_1' \end{cases}$$

$$\begin{cases} i_1' = \left(\frac{11}{10}\right) v_1' - \left(\frac{7}{10}\right) v_2 \\ i_2 = \left(-\frac{7}{10}\right) v_1' + \frac{9}{10} v_2 \end{cases}$$

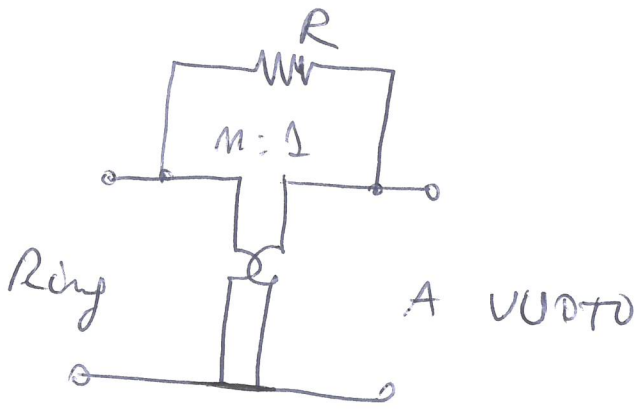
$$\begin{cases} i_1 = \left(\frac{11}{10}\right) 10^2 v_1 - \left(\frac{7}{10}\right) 10 \cdot v_2 \\ i_2 = \left(-\frac{7}{10}\right) 10\, v_1 + \left(\frac{9}{10}\right) v_2 \end{cases}$$

DOPPI - BIPOLI

19)



$Ring = \infty$



$$V_2 = \frac{1}{n} V_1 \Rightarrow \alpha = \frac{1}{n}$$

$$R_1 = \frac{R}{1-\alpha}$$

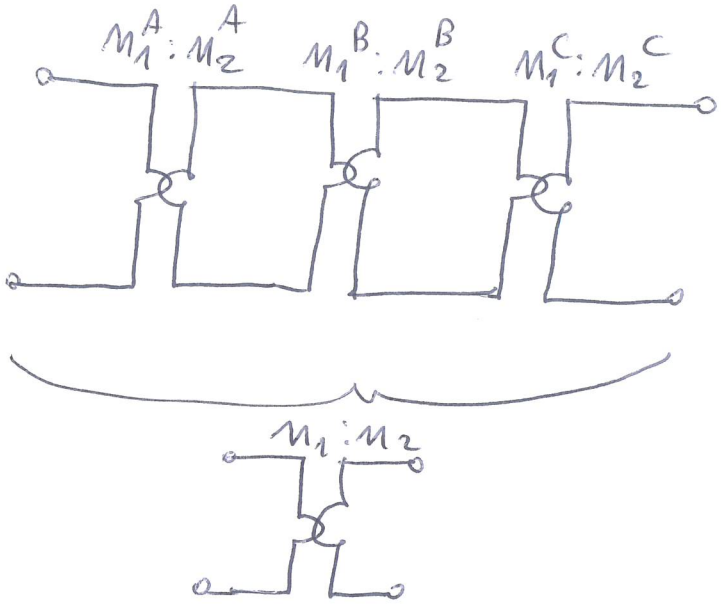
$$R_2 = \frac{R}{1-\frac{1}{\alpha}}$$

$$R_2' = n^2 R_2$$

$$Ring = R_1 // R_2'$$

DOPPI-BIPOLI

20)



$$M_1 = M_1^A \times M_1^B \sim M_1^C$$

$$M_2 = M_2^A \sim M_2^B \times M_2^C$$