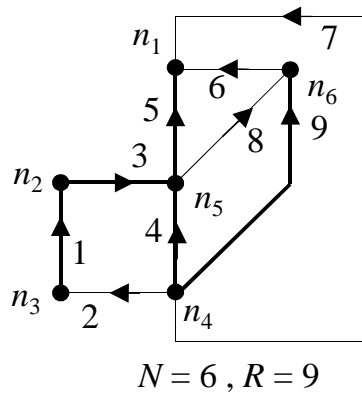


Esercizio 2.1



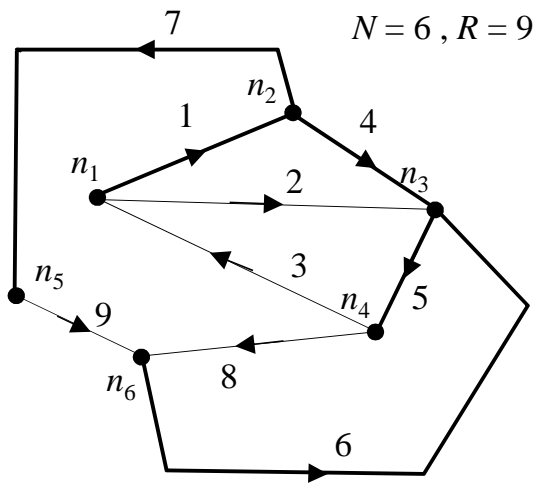
$$\mathbf{T} = \begin{pmatrix} +1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & +1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & +1 & 0 & +1 & 0 & +1 & +1 & -1 & 0 \\ 0 & 0 & 0 & 0 & +1 & +1 & +1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & +1 & +1 \end{pmatrix} \begin{matrix} \leftarrow \mathbf{t}_1 \\ \leftarrow \mathbf{t}_3 \\ \leftarrow \mathbf{t}_4 \\ \leftarrow \mathbf{t}_5 \\ \leftarrow \mathbf{t}_9 \end{matrix}$$

$$\mathbf{L} = \begin{pmatrix} +1 & +1 & +1 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & -1 & +1 & 0 & 0 & +1 \\ 0 & 0 & 0 & -1 & -1 & 0 & +1 & 0 & 0 \\ 0 & 0 & 0 & +1 & 0 & 0 & 0 & +1 & -1 \end{pmatrix} \begin{matrix} \leftarrow \mathbf{l}_2 \\ \leftarrow \mathbf{l}_6 \\ \leftarrow \mathbf{l}_7 \\ \leftarrow \mathbf{l}_8 \end{matrix}$$

$$\begin{pmatrix} i_1 \\ i_2 \\ i_3 \\ i_4 \\ i_5 \\ i_6 \\ i_7 \\ i_8 \\ i_9 \end{pmatrix} = \begin{pmatrix} +1 & 0 & 0 & 0 \\ +1 & 0 & 0 & 0 \\ +1 & 0 & 0 & 0 \\ -1 & -1 & -1 & +1 \\ 0 & -1 & -1 & 0 \\ 0 & +1 & 0 & 0 \\ 0 & +1 & 0 & 0 \\ 0 & 0 & 0 & +1 \\ 0 & +1 & 0 & -1 \end{pmatrix} \begin{pmatrix} i_2 \\ i_6 \\ i_7 \\ i_8 \end{pmatrix}$$

$$\begin{pmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \\ v_7 \\ v_8 \\ v_9 \end{pmatrix} = \begin{pmatrix} +1 & 0 & 0 & 0 & 0 \\ -1 & -1 & +1 & 0 & 0 \\ 0 & +1 & 0 & 0 & 0 \\ 0 & 0 & +1 & 0 & 0 \\ 0 & 0 & 0 & +1 & 0 \\ 0 & 0 & +1 & +1 & -1 \\ 0 & 0 & +1 & +1 & 0 \\ 0 & 0 & -1 & 0 & +1 \\ 0 & 0 & 0 & 0 & +1 \end{pmatrix} \begin{pmatrix} v_1 \\ v_3 \\ v_4 \\ v_5 \\ v_9 \end{pmatrix}$$

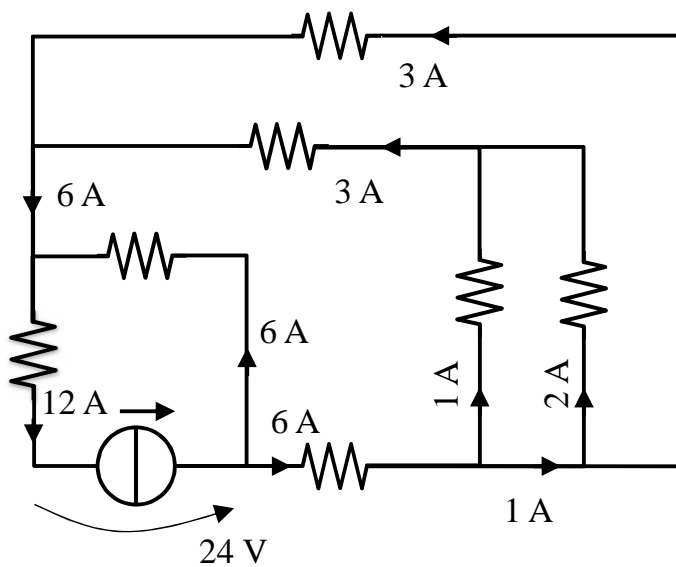
Esercizio 2.2



$$\begin{cases} +i_1 + i_2 - i_3 = 0 & \leftarrow \mathbf{t}_1 \\ +i_4 + i_2 - i_3 = 0 & \leftarrow \mathbf{t}_4 \\ +i_5 - i_3 - i_7 = 0 & \leftarrow \mathbf{t}_5 \\ +i_6 - i_8 - i_9 = 0 & \leftarrow \mathbf{t}_6 \\ +i_7 - i_9 = 0 & \leftarrow \mathbf{t}_7 \end{cases}$$

$$\begin{cases} +v_2 - v_1 - v_4 = 0 & \leftarrow \mathbf{l}_2 \\ +v_3 + v_1 + v_4 + v_5 = 0 & \leftarrow \mathbf{l}_3 \\ +v_8 + v_5 + v_6 = 0 & \leftarrow \mathbf{l}_8 \\ +v_9 - v_4 + v_6 + v_7 = 0 & \leftarrow \mathbf{l}_9 \end{cases}$$

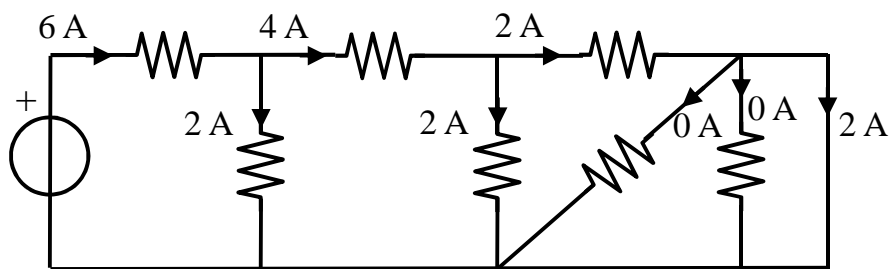
Esercizio 4.1



$$\sum_{h=1}^7 R_h i_h^2 = 268 \text{ W}$$

$$p_{g(e)} = 24 \text{ V} \cdot 12 \text{ A} = 288 \text{ W}$$

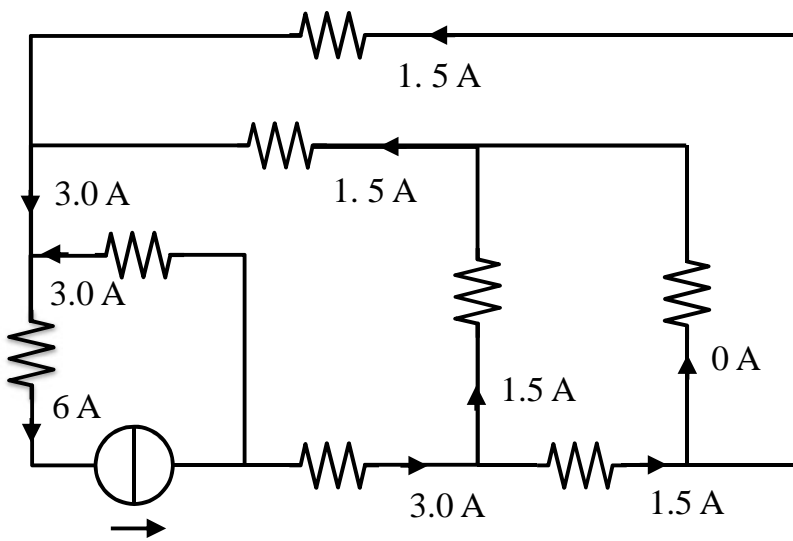
Esercizio 4.2



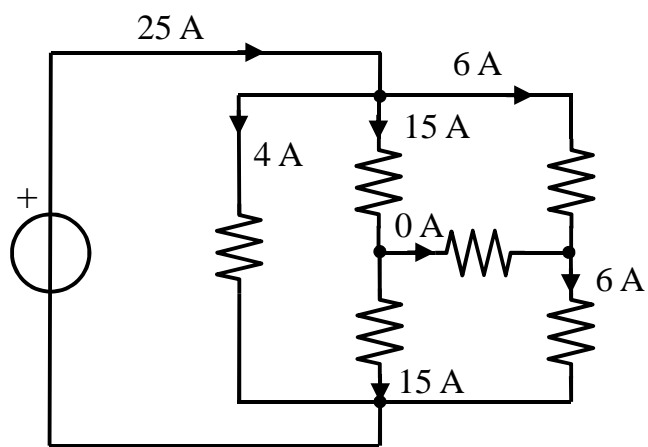
$$P_{g(e)} = 72 \text{ W}$$



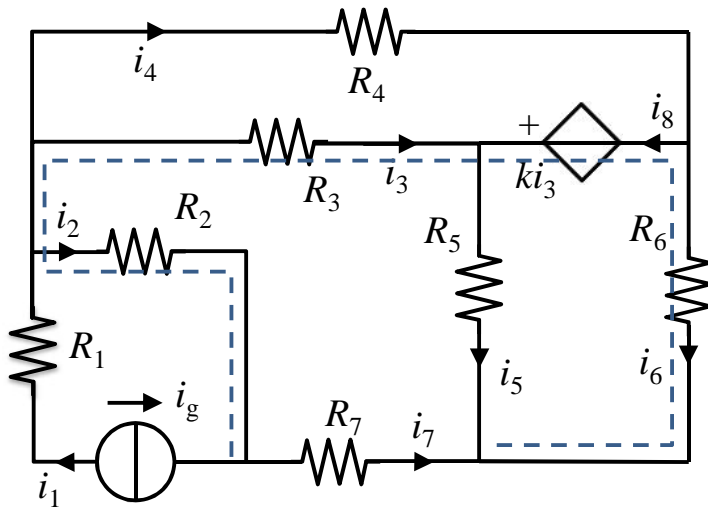
Esercizio 4.3



Esercizio 4.4



Esercizio 4.5



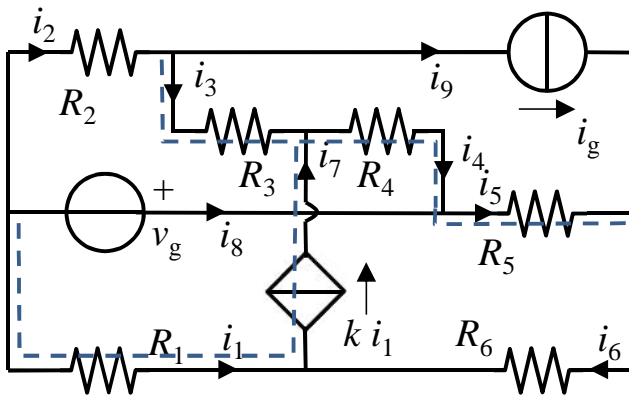
$$\begin{cases} i_2 - i_1 - i_7 = 0 \\ i_3 + i_4 + i_7 = 0 \\ i_6 + i_5 + i_7 = 0 \\ i_8 - i_4 - i_5 - i_7 = 0 \end{cases}$$

$$\begin{cases} v_1 + v_2 = 0 \\ v_4 + v_8 - v_3 = 0 \\ v_5 - v_6 + v_8 = 0 \\ v_7 + v_2 - v_3 - v_6 + v_8 = 0 \end{cases}$$

$$\begin{cases} i_1 = -i_g \\ -R_2 i_2 + v_2 = 0 \\ -R_3 i_3 + v_3 = 0 \\ -R_4 i_4 + v_4 = 0 \\ -R_5 i_5 + v_5 = 0 \\ -R_6 i_6 + v_6 = 0 \\ -R_7 i_7 + v_7 = 0 \\ -k i_3 - v_8 = 0 \end{cases}$$

ramo	1	2	3	4	5	6	7	8
i [A]	-5.00	-2.74	-1.09	-1.18	-0.94	-1.33	2.26	0.15
v [V]	8.21	-8.21	-1.81	-2.35	-1.87	-1.33	4.53	0.54
p_a [W]	-41.05	22.46	1.97	2.77	1.75	1.76	10.25	0.08

Esercizio 4.6

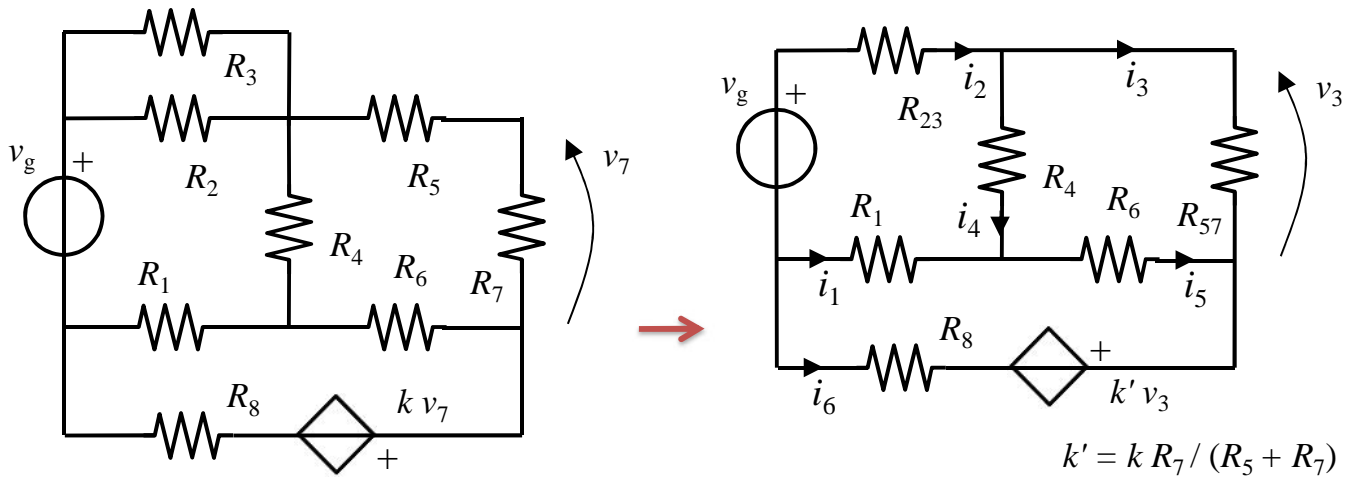


$$\begin{cases} i_1 + i_2 + i_8 = 0 \\ i_3 - i_2 + i_9 = 0 \\ i_4 - i_6 + i_8 + i_9 = 0 \\ i_5 - i_6 + i_9 = 0 \\ i_7 + i_8 + i_2 - i_6 = 0 \end{cases}$$

$$\begin{cases} v_2 + v_3 - v_7 - v_1 = 0 \\ v_6 + v_7 + v_4 + v_5 = 0 \\ v_8 - v_4 - v_7 - v_1 = 0 \\ v_9 - v_5 - v_4 - v_3 = 0 \end{cases}$$

$$\begin{cases} -R_1 i_1 + v_1 = 0 \\ -R_2 i_2 + v_2 = 0 \\ -R_3 i_3 + v_3 = 0 \\ -R_4 i_4 + v_4 = 0 \\ -R_5 i_5 + v_5 = 0 \\ -R_6 i_6 + v_6 = 0 \\ -k i_1 + i_7 = 0 \\ v_8 = -v_g \\ i_9 = i_g \end{cases}$$

Esercizio 4.7



$t = 0 \text{ ms}$

ramo	1	2	3	4	5	6
i [A]	-1.04	1.98	0.85	1.13	0.09	-0.94
v [V]	-2.08	-4.34	2.55	2.26	0.28	-1.79

$t = 0.25 \text{ ms}$

ramo	1	2	3	4	5	6
i [A]	0	0	0	0	0	0
v [V]	0	0	0	0	0	0

$t = 0.5 \text{ ms}$

ramo	1	2	3	4	5	6
i [A]	1.04	-1.98	-0.85	-1.13	-0.09	0.94
v [V]	2.08	4.34	-2.55	-2.26	-0.28	1.79

Esercizio 5.1

$$\mathbf{G} = \begin{pmatrix} 1.21 & -1.14 \\ -1.14 & 1.43 \end{pmatrix}$$

Esercizio 5.2

$$\mathbf{H} = \begin{pmatrix} 1.8 & 0.3 \\ -0.3 & 0.45 \end{pmatrix}$$

Esercizio 5.3

$$\mathbf{R} = \begin{pmatrix} 1 & 0 \\ 4 & 5 \end{pmatrix} \quad \mathbf{H} = \begin{pmatrix} 1 & 0 \\ 0.8 & 0.2 \end{pmatrix}$$

Esercizio 5.4

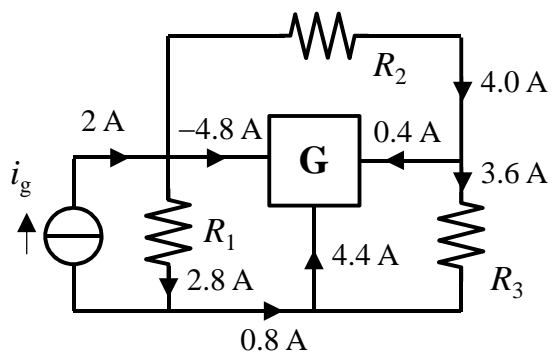
$$\mathbf{G} = \begin{pmatrix} 2.49 & -0.49 \\ -2.49 & 1.49 \end{pmatrix} \quad \mathbf{H}' = \begin{pmatrix} 1.67 & -0.33 \\ 1.67 & 0.67 \end{pmatrix}$$

Esercizio 5.5

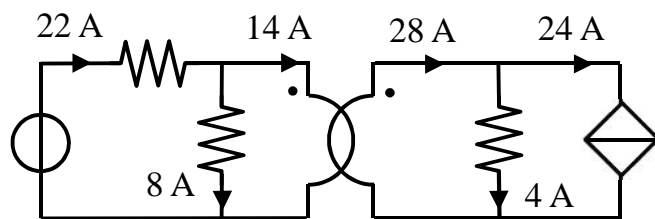
$$\mathbf{H} = \begin{pmatrix} 0.5 & 1 \\ -0.5 & 0 \end{pmatrix} \quad \mathbf{R} \text{ non esiste}$$



Esercizio 5.6



Esercizio 5.7



Esercizio 5.8

