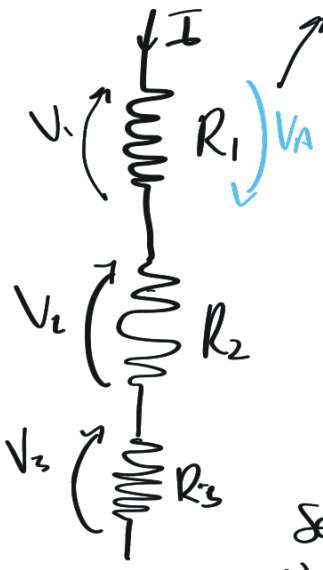
Esercitazione 1



Nulla ci ferma da prender questo, per bisogno riconosere che $V = -V_A$

$V_1 = R_1 I$ $\quad \circ V_A = -R_1 I$

$I = 2A$

$P_1 = 20W$ $\quad P_2 = 32W$ $\quad P_3 = 24W$

↳ (+) perchè assorbito

Sempre dissipative per generatori

V_1, V_2, V_3?

R_1, R_2, R_3?

Sapendo che

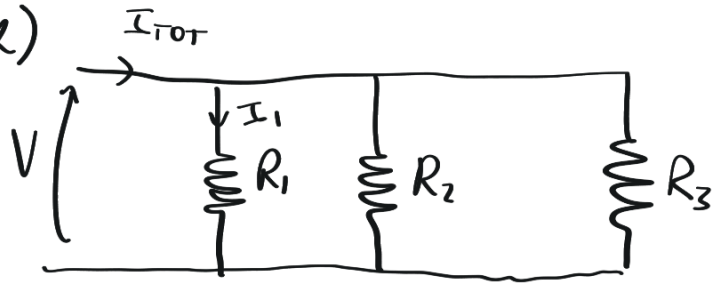
$$P = RI^2 = \frac{V^2}{R} = VI$$

$$V_1 = \frac{P_1}{I} = \frac{20}{2} = 10V \longrightarrow R_1 = \frac{V_1}{I} = 5\Omega = \frac{P_1}{I^2}$$

$$V_2 = \frac{P_2}{I} = \frac{32}{2} = 16V \longrightarrow R_2 = \frac{V_2}{I} = 8V = \frac{P_2}{I^2}$$

$$V_3 = \frac{P_3}{I} = \frac{24}{2} = 12V \longrightarrow R_3 = \frac{V_3}{I} = 6V \cdot \frac{P_3}{I^2}$$

2)



Dati:

$P_1 = 50\,W$

$P_2 = 25\,W$

$P_3 = 20W$

$I_1 = 5A$

R_1, R_2, R_3 ?

$P = VI$

$V = \frac{P_1}{I_1} = \frac{50W}{5A} = 10V$

$I_{TOT} - I_1 - I_2 - I_3 = 0$

$R_1 = \frac{V}{I_1} = \frac{10V}{5A} = 2\Omega$

$R_2 = \frac{V}{I_2} = \frac{10V}{2.5A} = 4\Omega$

$R_3 = \frac{V}{I_3} = \frac{10V}{2A} = 5\Omega$

$I_2 = \frac{P_2}{V} = \frac{25W}{10V} = 2,5A$

$I_3 = \frac{P_3}{V} = \frac{20W}{10V} = 2A$

Si potrebbe trovare anche R_1 per primo e poi trovare il resto, e trova la resistenza di ogni altro con $R = \frac{V^2}{P}$

Ci sono molti modi per calcolare I_{TOT}, con Kirchhoff,

Oppure Metodi:

1) $I_{TOT} = I_1 + I_2 + I_3$

$I_2 = \frac{V}{R_2} = 2,5A$

$I_3 = \frac{V}{R_3} = 2A$

$I_{TOT} = I_1 + I_2 + I_3 = 5 + 2 + 2,5 = 9,5A$

2) $P_{TOT} = P_1 + P_2 + P_3 = 95\,W$

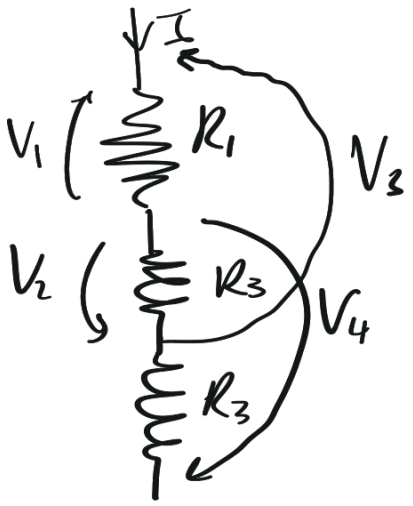
$$I_{TOT} = \frac{P_{TOT}}{V} = \frac{95\,W}{10\,V} = 9{,}5\,A$$

3) $$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$= 1{,}053$

$$I_{TOT} = \frac{V}{R_{eq}} = 9{,}5\,A$$

3)



Dati:

$R_1 = 3\,\Omega$

$R_2 = 2\,\Omega$ $\quad I = 6\,A$

$R_3 = 5{,}1\,\Omega$

$V_1, V_2, V_3, V_4 = ?$

$V_1 = R_1 I = 18\,V$

$V_2 = -2 \cdot 6 = -12\,V$

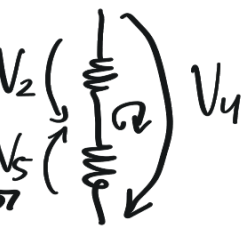
$V_3 = (R_1 + R_2) I = 30\,V$

$V_1 - V_3 - V_2$

$V_3 = V_1 - V_2 = 30\,V$

$V_4 = -(R_2 + R_3) I = -42\,V$

inutile perché V_5 è incognita



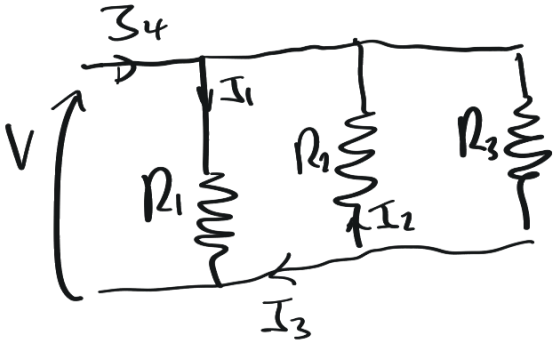
non il metodo

→ $V_4 + V_5 - V_2 = 0$

$V_5 = V_2 - V_4 = 30V$

$= R_3 I = 30V$

4)



$V = 100V$

$R_1 = 10\Omega$

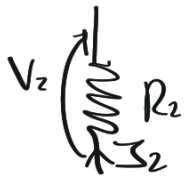
$R_2 = 20\Omega$

$R_3 = 25\Omega$

I_1, I_2, I_3, I_4 ?

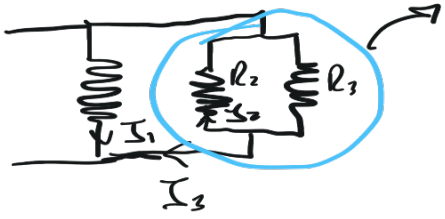
$I_4 = I_4 + I_3$

$I_1 = \frac{V}{R_1} = 10A$



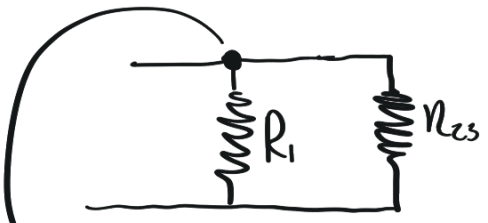
$-V_2 = I_2 R_2$

$I_2 = \frac{-V}{R_2} = \frac{-100}{20} = -5A$



$R_{23} = \frac{R_2 R_3}{R_2 + R_3} = 11,\overline{1111}\,\Omega$

∴

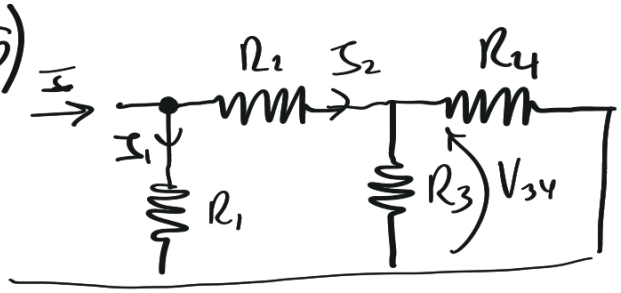


$I_3 = \frac{V}{R_{23}} = 9A$

→ LKC $I_4 - I_1 - I_3 = 0$

↓
dei nodi $I_4 = I_1 + I_3 = 19\,A$

5)



Potenze su resistori
→ la potenza massima

Dati:

$P_1 = 40W$ $\quad V_{34} = ?$

$P_2 = 30W$ $\quad R_1 = ?$

$P_3 = 25W$ $\quad R_2 = ?$

$P_4 = 35W$ $\quad R_3 = ?$

$I = 4\,A$ $\quad R_4 = ?$

$V = ?$

$$P_{TOT} = P_1 + P_2 + P_3 + P_4 = 130W$$

$$V = \frac{P_{TOT}}{I} = 32,5\,V$$

$$P_1 = \frac{V^2}{R_1} \rightarrow R_1 = \frac{V^2}{P_1} = 26,4\,\Omega$$

(Non ci serve per I_1

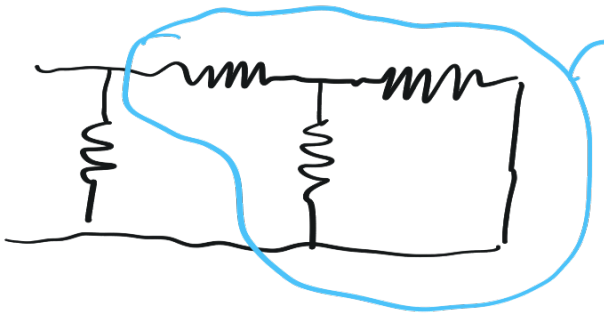
$$I_1 = \frac{P_1}{V} = \frac{V}{R_1} = 1,23\,A$$

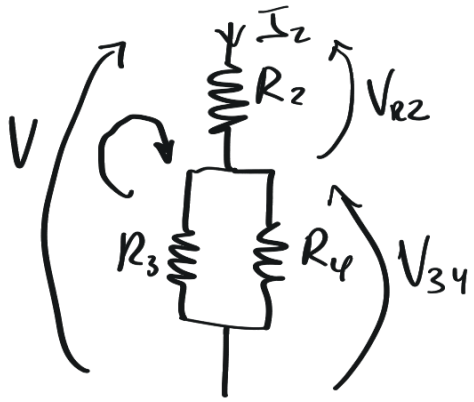
LKC al nodo

$I - I_1 - I_2 = 0$

$I_2 = I - I_1 = 2,77\,A$

Altro metodo per calolare I_2





$P_{234} = P_2 + P_3 + P_4 = 90W$

$P_{234} = V I_2 \rightarrow I_2 = \frac{P_{234}}{V} = 2,76\ A$

$P_2 = \frac{P_2}{I_2^2} = 3,9\ \Omega$

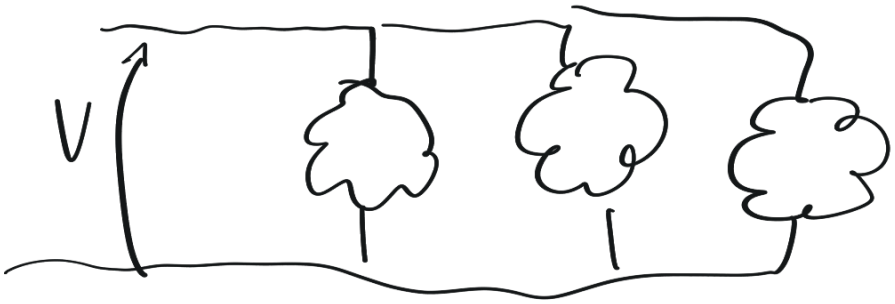
$V_{R2} = R_2 \cdot I_2 = 10,76\ V$

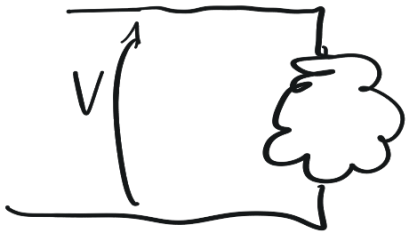
$V - V_{R2} - V_{34} = 0$

$\hookrightarrow V_{34} = V - V_{R2} = 32,5 - 10,76\ V = 21,74\ V$

$P_R = \frac{V_R^2}{R} \rightarrow R = \frac{V_R^2}{P_R}$

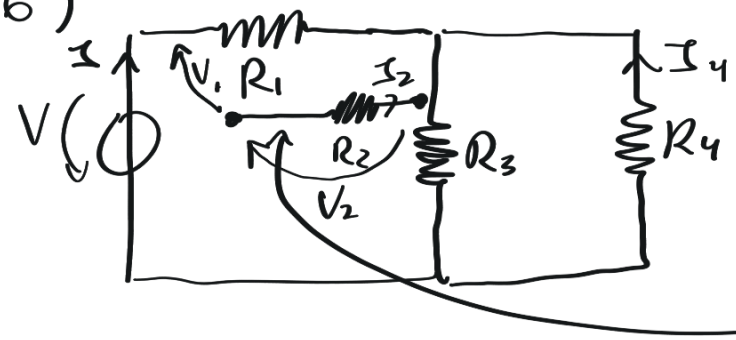
$R_3 = \frac{V_{34}^2}{P_3} = 18,78\ \Omega$ $\quad$ $R_4 = \frac{V_{34}^2}{P_4} = 13,42\ \Omega$





ogni parte in parallelo è risolvibile con la tensione in modo indipendente

6)



Elemento in cui circola nessuna corrente

$R_1 = 5\,\Omega$

$R_2 = 10\,\Omega$

$R_3 = 20\,\Omega$

$R_4 = 30\,\Omega$

$V_1 = 10\,\Omega$

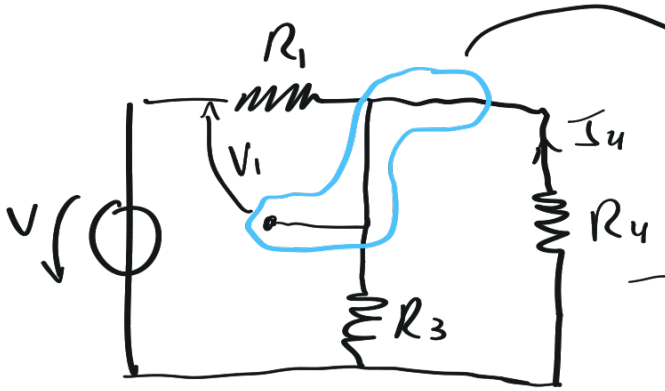
$V = ?$

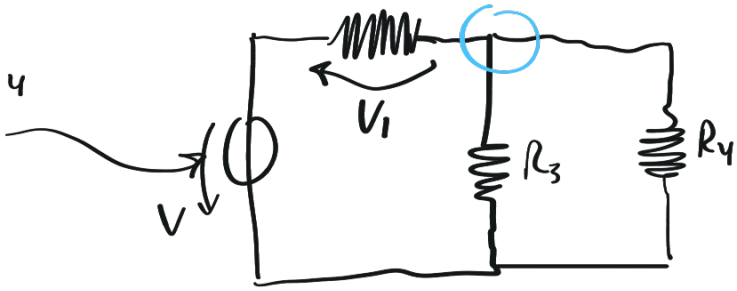
$I_4 = ?$

$I_2 = 0$

$V_2 = R_2 I_2 = 0$

$V_2 = 0$ (R_2) $\equiv$ |



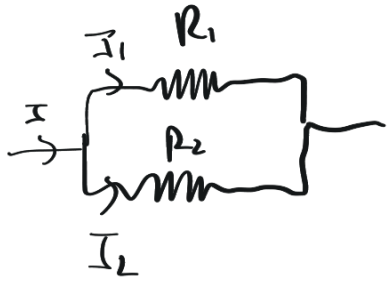


Molti esercizi potranno esser semplificati, alcuni esercizi hanno solo parte risolvibi.

I problemi abbaiano più che mordono

$$V_1 = R_1 I \rightarrow I_1 = \frac{V_1}{R_1} = 2A$$

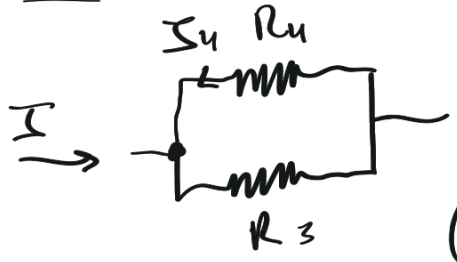
Partitore di Corrente: (Ripasso)



La resistenza dell'altro ramo

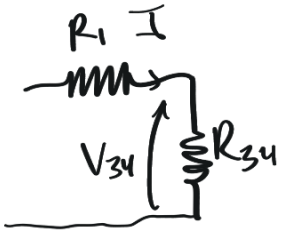
$$I_1 = \frac{R_2}{R_1+R_2} I$$

$$I_2 = \frac{R_1}{R_1+R_2} I$$



$$I_4 = -\frac{R_3}{R_3+R_4} I = -0,8A$$

$$V_{34} = -R_4 \cdot I_4 = 24V$$

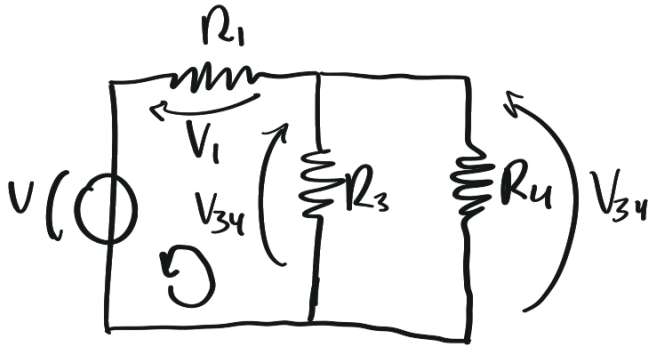


$$R_{34} = \frac{R_3 \cdot R_4}{R_3+R_4} = 12\Omega$$

$$V_{34} = R_{34} I = 24V$$

Stesso risultato, metodi diversi

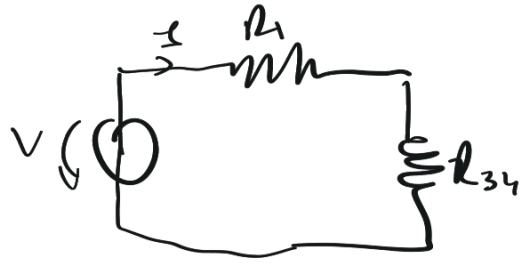
$$I_4 = -\frac{V_{34}}{R_4} = -0,8A$$



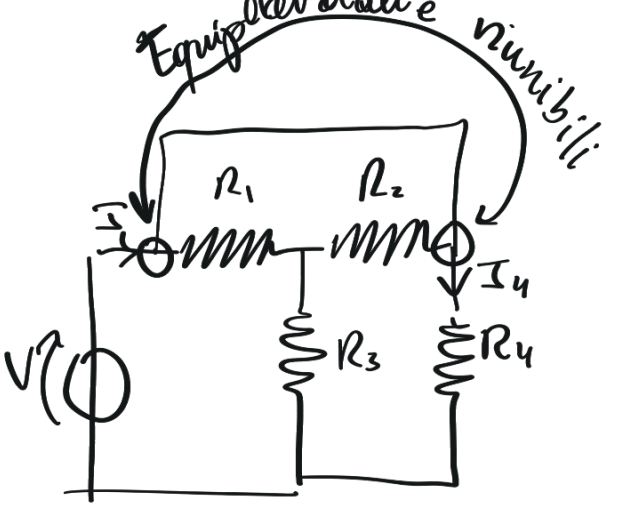
$V + V_1 + V_{34} = 0$

$V = -V_1 - V_{34}$

$V = -10 - 24 = -34V$



$V = -(R_1 + R_{34}) \cdot I = -34$



$R_1 = 60\Omega$

$R_2 = 60\Omega$

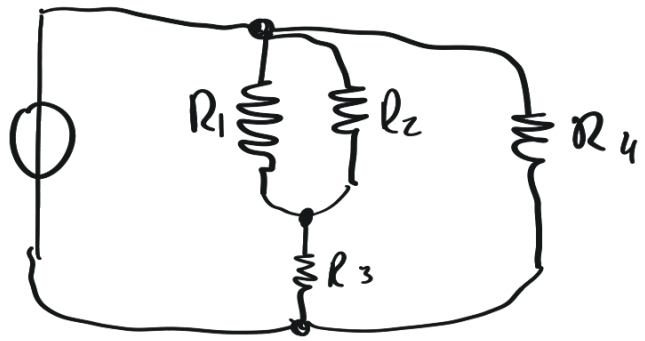
$R_3 = 32\Omega$

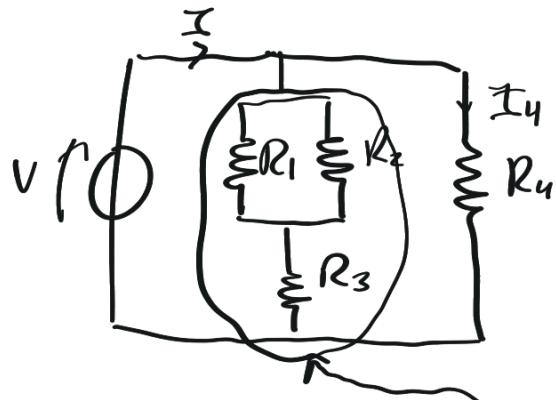
$R_4 = 80\Omega$

$I = 120A$

$V = ?$

$I_4 = ?$

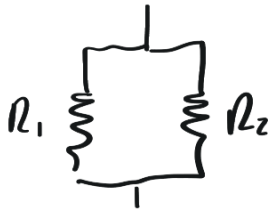




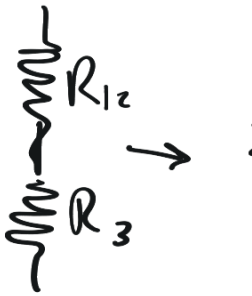
Dato che non sappiamo V dobbiamo tenere

Però possiamo semplificare il più possibile

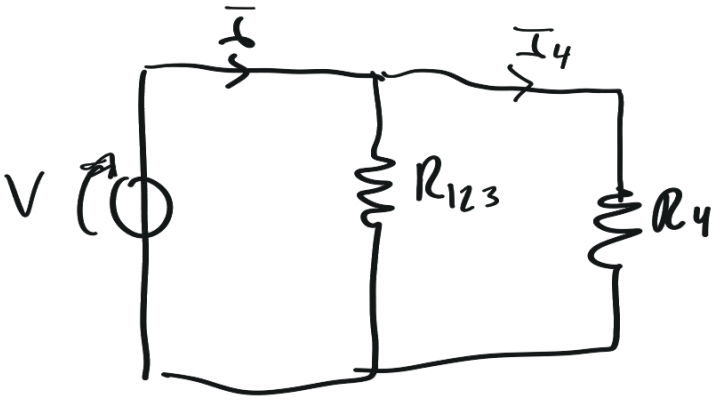
perchè non ci importa cosa accade all'interno



$R_{12} = \frac{R_1 \cdot R_2}{R_1 + R_2} = 30\Omega$



$$R_{123} = R_3 + R_{12} = 62\,\Omega$$



$$I_4 = \frac{R_{123}}{R_{123} + R_4} \cdot \bar{I} = 52{,}4\,A$$

$$V = R_4 I_4 = 4.192\,V$$