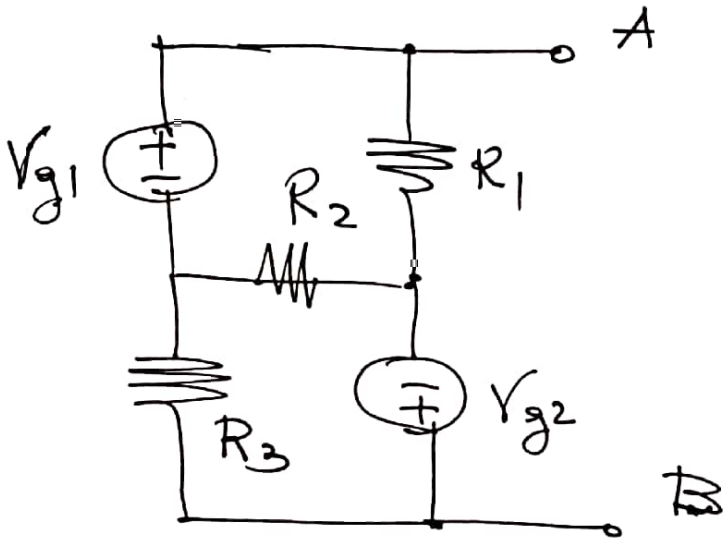
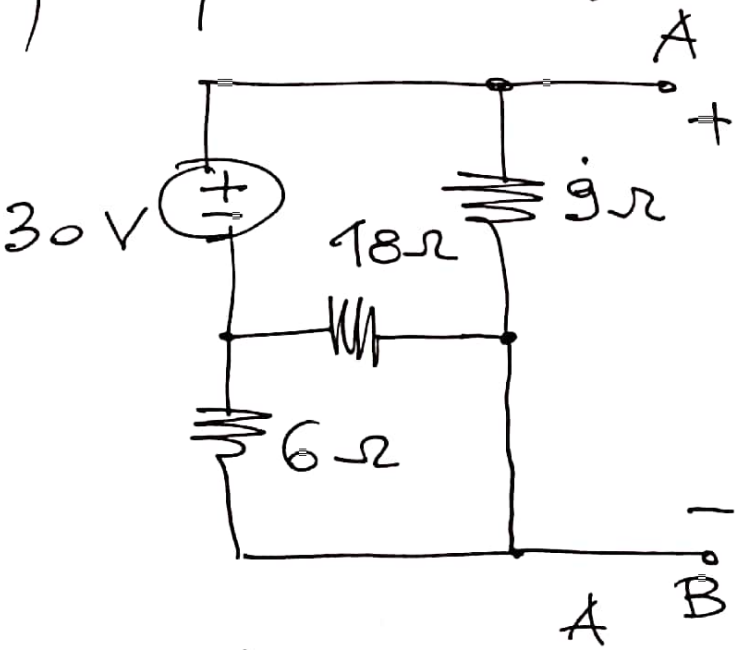
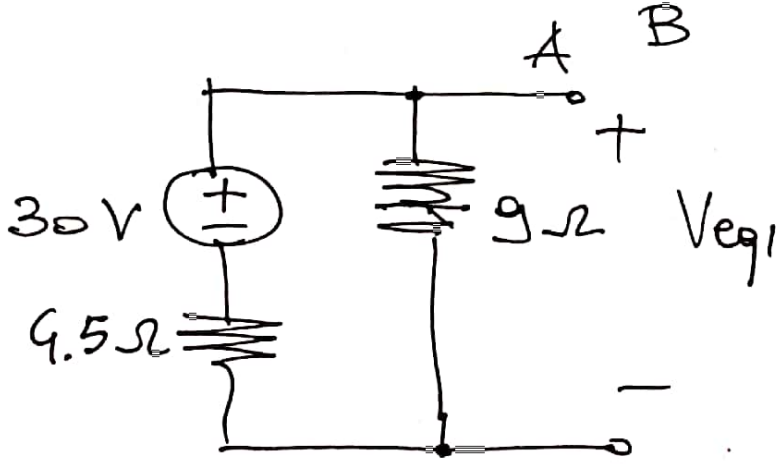
Esempio ? Thevenin, Norton bipolo AB



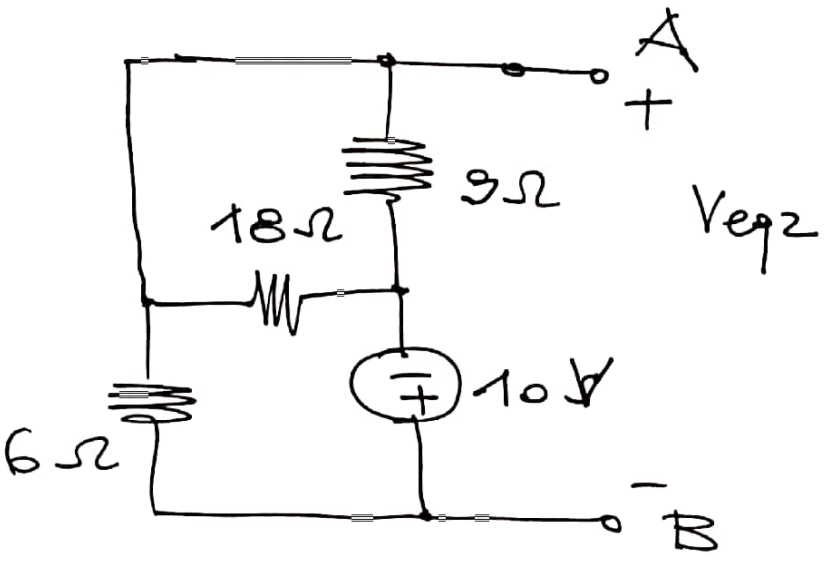
$R_1 = 9\,\Omega$
$R_2 = 18\,\Omega$
$R_3 = 6\,\Omega$
$V_{g1} = 30\,V$
$V_{g2} = 10\,V$

Soluzione Uso p.s.e. per determinare V_{eq}.



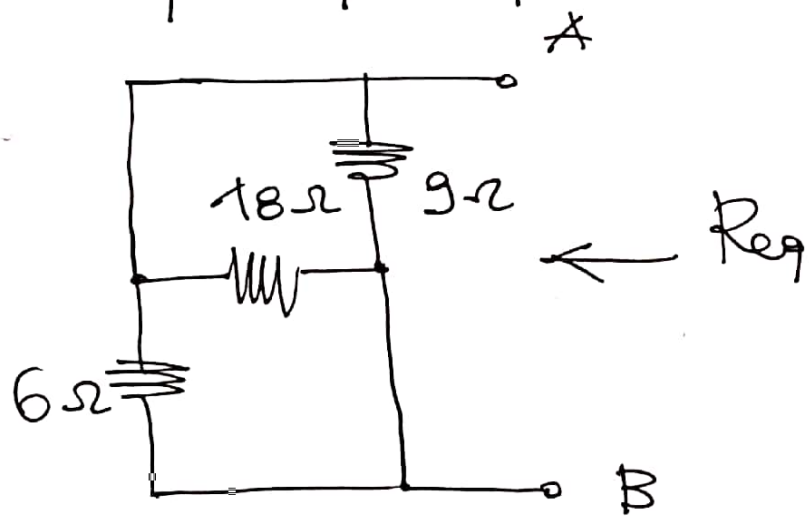


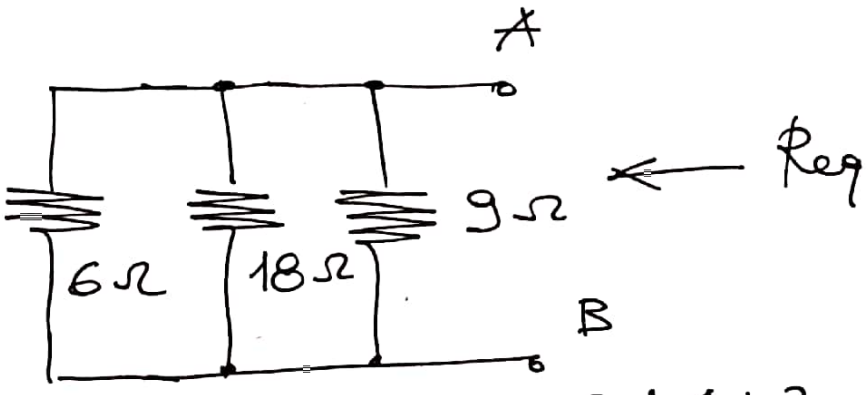
$$V_{eq1} = 30 \times \frac{9}{4.5+9} = 20\,V$$



$$V_{eq2} = -10 \times \frac{6}{6+6} = -5\ V$$

$$V_{eq} = V_{eq1} + V_{eq2} = 15\ V.$$

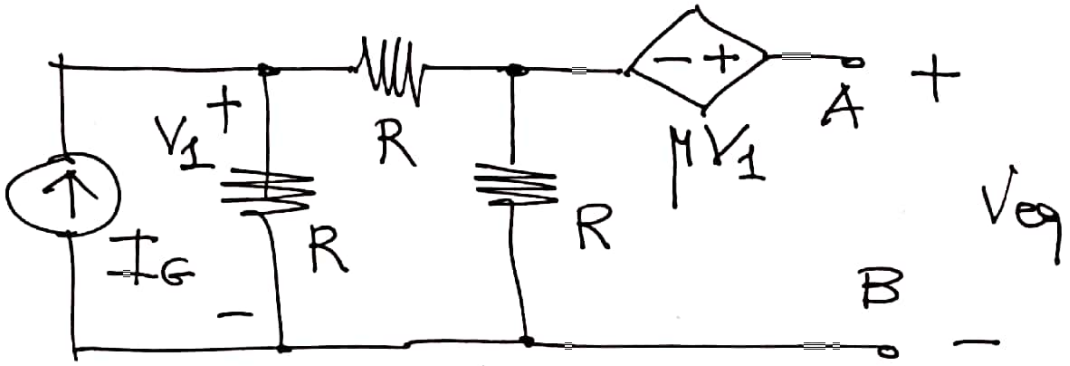




$$G_{eq} = \frac{1}{6} + \frac{1}{18} + \frac{1}{9} = \frac{3+1+2}{18} = \frac{1}{3}\ \Omega^{-1}$$

$$R_{eq} = 3\Omega\ ;\ i_{cc} = G_{eq} V_{eq} = 5\ A.$$

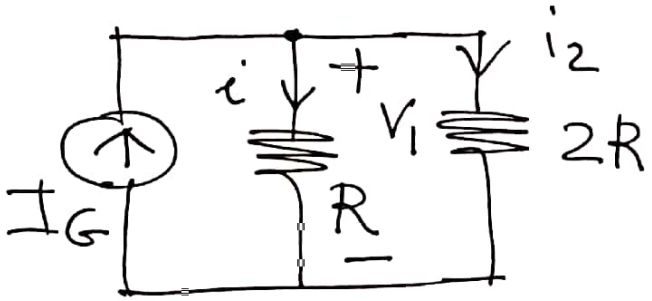
Esempio ? Thevenin, Norton bipolo AB



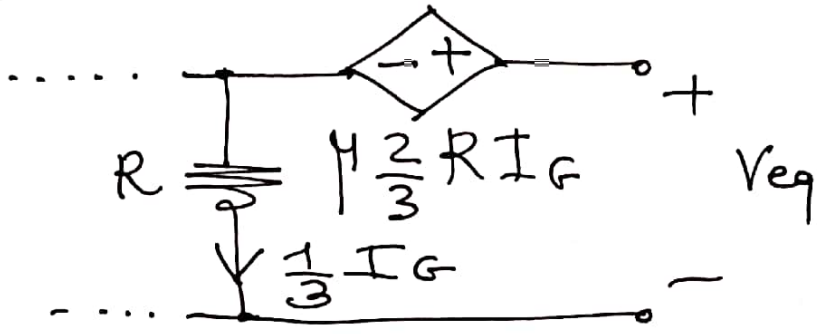
Soluzione Utilizziamo la definizione di V_{eq} e R_{eq}.

Usando partitore di corrente

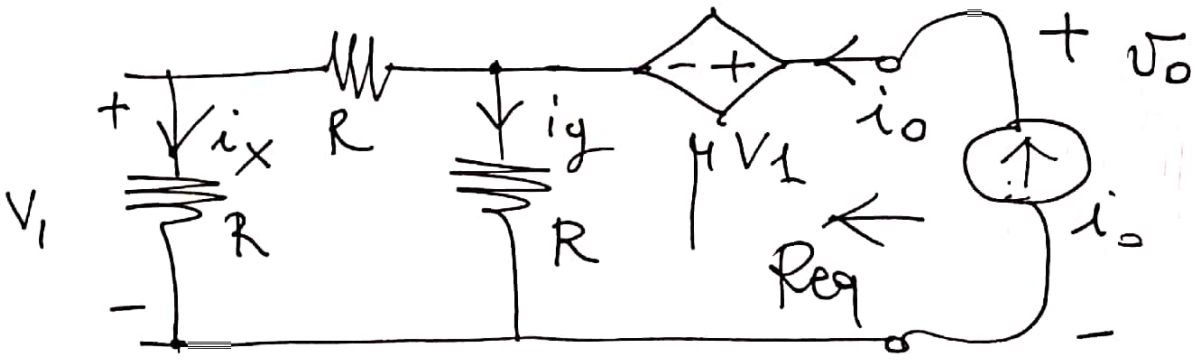
$$i_1 = \frac{2}{3} I_G, \quad i_2 = \frac{1}{3} I_G$$



quindi $V_1 = \frac{2}{3} R I_G$.



$$V_{eq} = \frac{2}{3} \mu R I_G + \frac{1}{3} R I_G$$



Partitore di corrente:

$$i_x = \frac{1}{3} i_o \Rightarrow V_1 = \frac{1}{3} R i_o$$

$$i_y = \frac{2}{3} i_o \Rightarrow$$

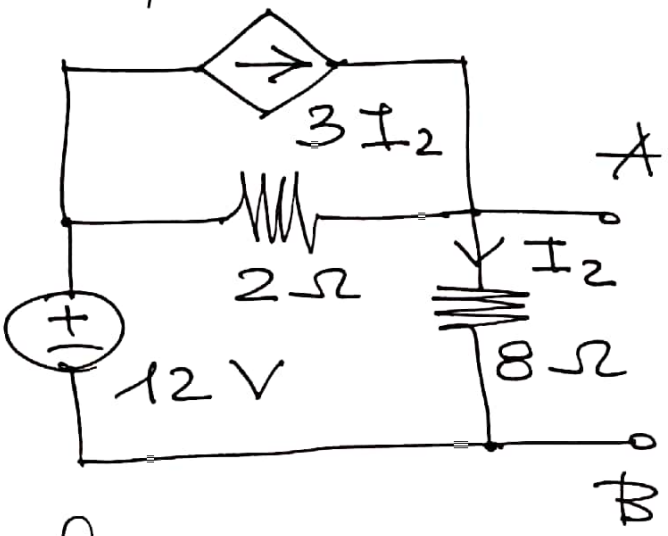
$$v_o = \mu V_1 + R i_y = \frac{1}{3}\mu R i_o + \frac{2}{3} R i_o$$

$$\Rightarrow R_{eq} = \frac{v_o}{i_o} = \frac{1}{3}\mu R + \frac{2}{3} R .$$

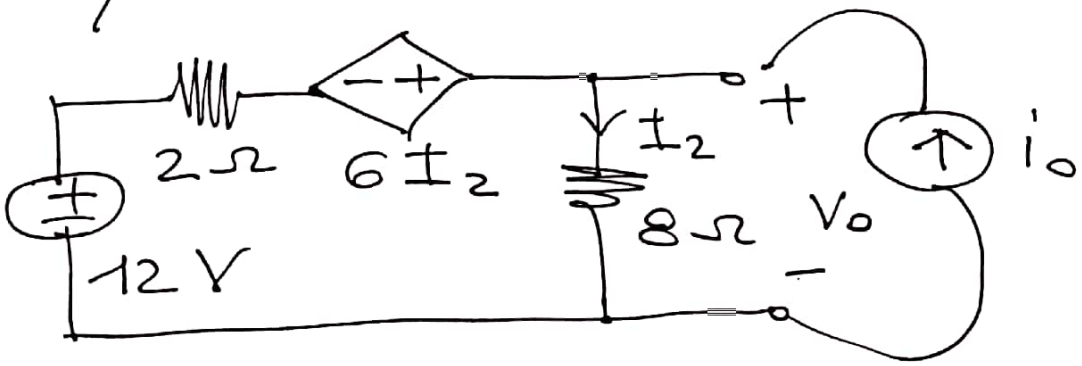
Infine:

$$i_{c.c.} = \frac{v_{eq}}{R_{eq}} = I_G \frac{1+2\mu}{2+\mu} .$$

Esempio ? Thevenin, Norton bipolo AB



Soluzione



$$I_2 = \frac{V_o}{8}$$

Millmann: $$V_o = \frac{\frac{12 + 6 \times \frac{V_o}{8}}{2} + i_o}{\frac{1}{2} + \frac{1}{8}} =$$

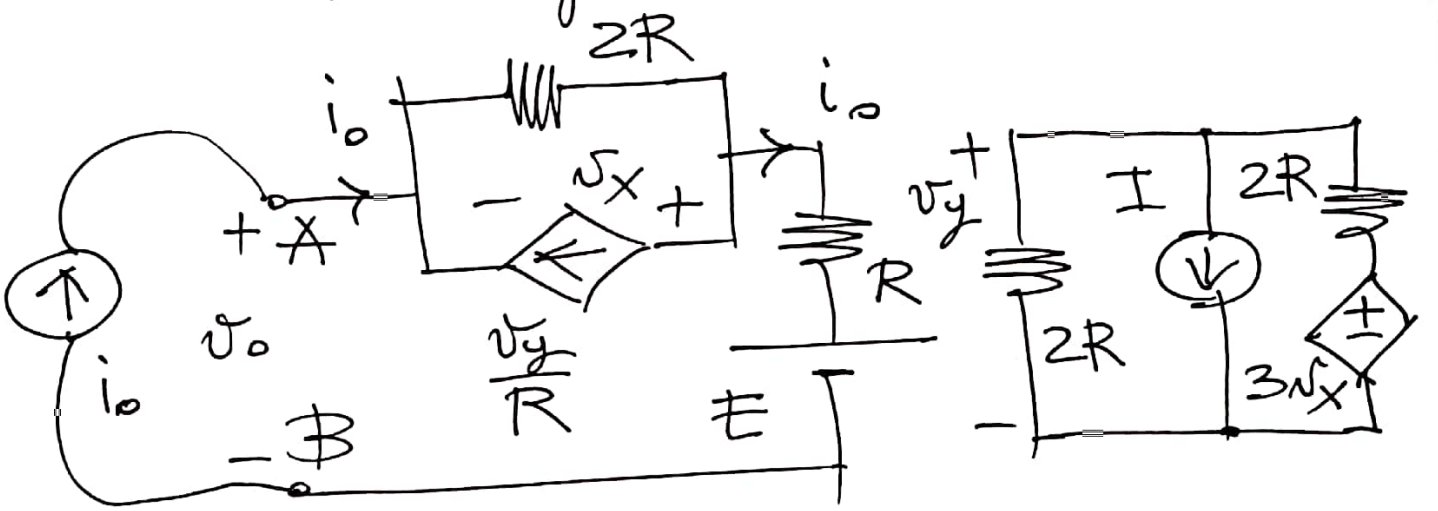
$$= \frac{6 + \frac{3}{8} V_o + i_o}{\frac{5}{8}} =$$

$$= \frac{48 + 3V_o + 8i_o}{5}$$

$$5V_o = 48 + 3V_o + 8i_o \; ; \; 2V_o = 48 + 8i_o$$

$$V_o = \underbrace{24}_{V_{eq}} + \underbrace{4 i_o}_{R_{eq}} \; ; \; i_{c.c.} = \frac{V_{eq}}{R_{eq}} = 6\,A.$$

Esempio ? Thevenin bipolo AB con metodo "rapido".



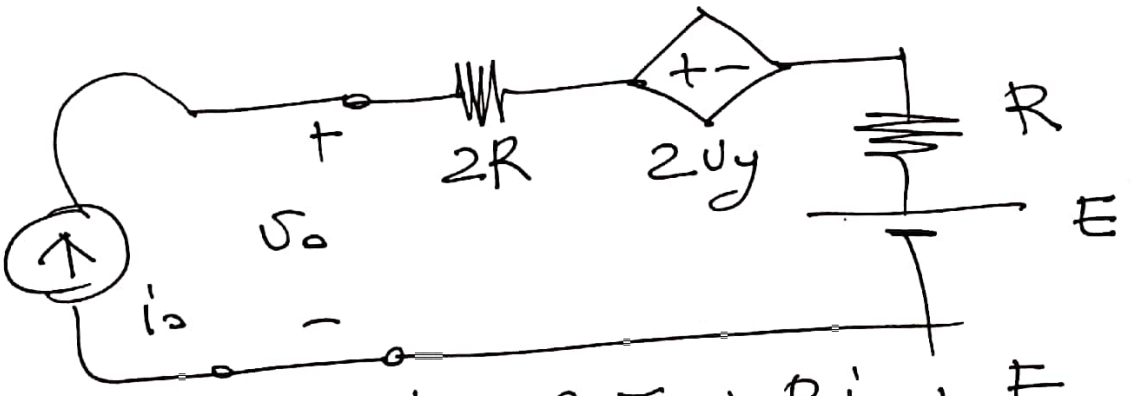
Soluzione

$$v_o = -v_x + Ri_o + E \Rightarrow$$

$$v_x = -v_o + Ri_o + E$$

Millmann: $$v_y = \frac{\frac{3v_x}{2R} - I}{\frac{1}{2R} + \frac{1}{2R}} = \frac{3}{2}v_x - RI$$

$$\Rightarrow v_y = -\frac{3}{2}v_o + \frac{3}{2}Ri_o + \frac{3}{2}E - RI$$



$$v_o = 2Ri_o + 2v_y + Ri_o + E$$

Sostituendo v_y ottengo

$$v_o = \underbrace{\frac{3}{2}R}_{R_{eq}} i_o + \underbrace{E - \frac{R}{2}I}_{V_{eq}}$$