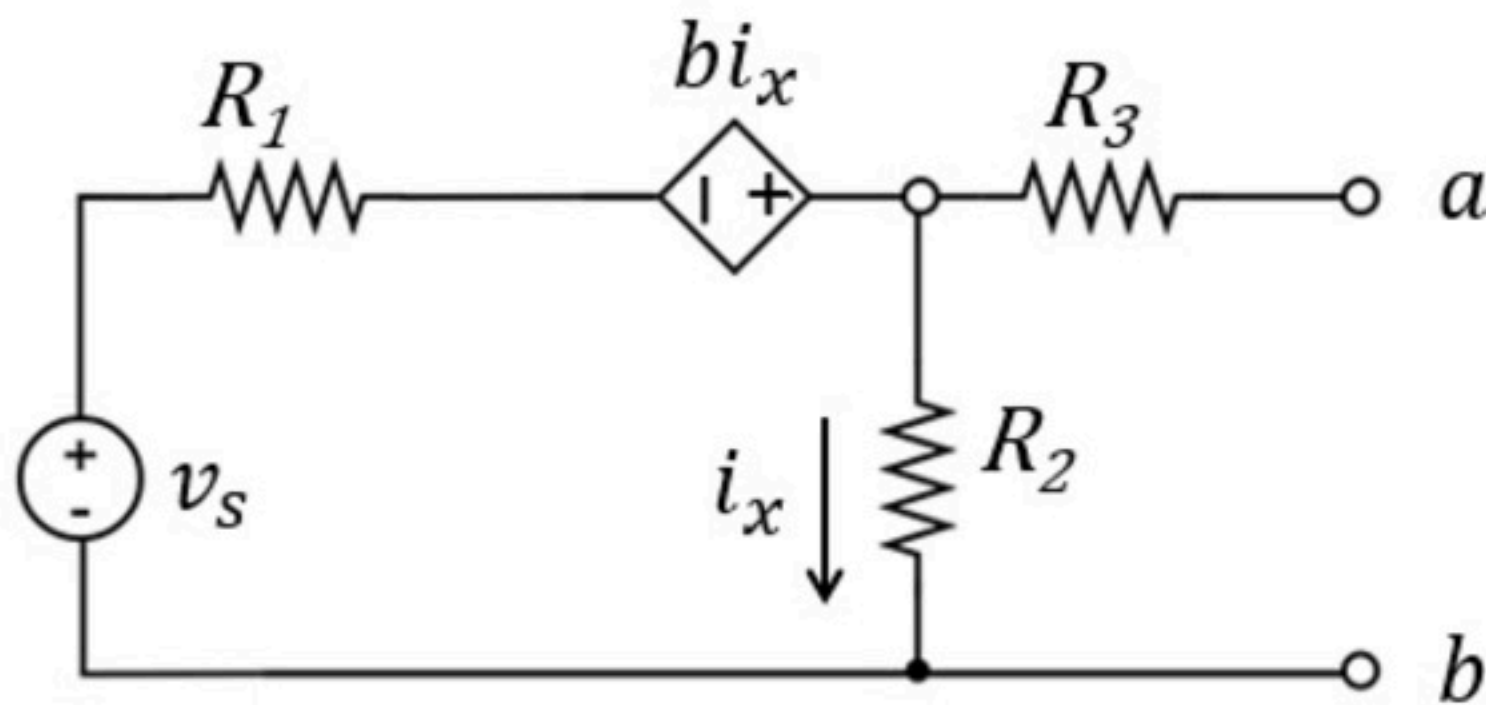
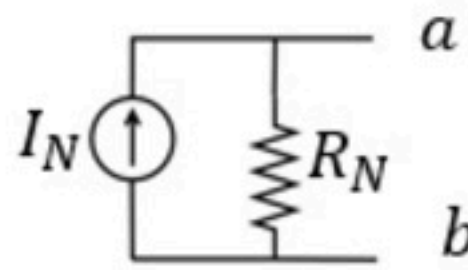


Circuit theorems 005

Problem has been graded.

Find the Norton equivalent model of this circuit, as seen between a and b.



Given Variables:

R_1 : 2 ohm

R_2 : 6 ohm

R_3 : 3 ohm

v_s : 18 V

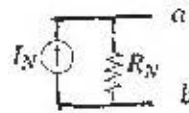
b : 6 V/A

Calculate the following:

I_N (A) :

R_N (ohm) :

Find the Norton equivalent model of this circuit, as seen between a and b.



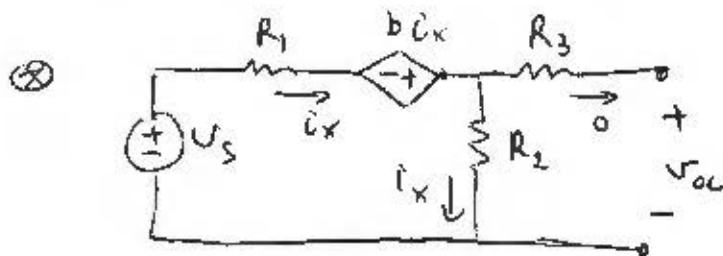
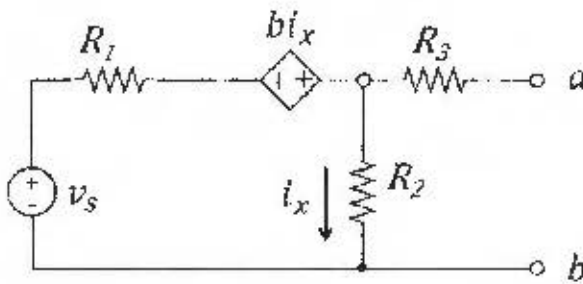
$$R_1 = 2 \text{ ohm}$$

$$R_2 = 4 \text{ ohm}$$

$$R_3 = 4 \text{ ohm}$$

$$v_s = 12 \text{ V}$$

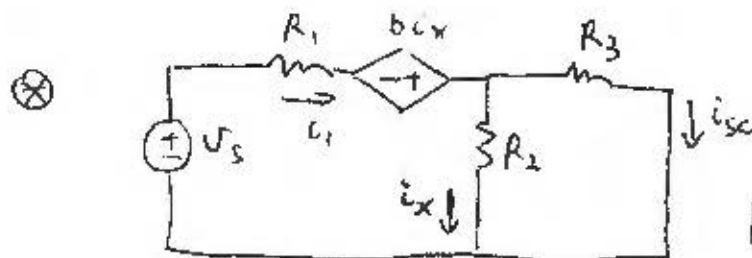
$$b = 2 \text{ A/V}$$



$$\text{KVL: } v_s - R_1 i_x + b i_x - R_2 i_x = 0$$

$$12 - 2i_x + 2i_x - 4i_x = 0$$

$$i_x = 3 \text{ A} \Rightarrow v_{oc} = R_2 i_x = 12 \text{ V}$$



$$i_x = \frac{R_3}{R_2 + R_3} i_1 = \frac{4}{8} i_1 \Rightarrow i_x = \frac{i_1}{2}$$

$$\text{KVL: } v_s - R_1 i_1 + b i_x - R_2 i_x = 0$$

$$12 - 2 \cdot 2 \cdot i_x + 2 \cdot i_x - 4 i_x = 0$$

$$6 i_x = 12 \Rightarrow i_x = 2 \text{ A}$$

$$i_{sc} = i_1 - i_x = 2 \text{ A}$$

$$v_{oc} = 12 \text{ V}$$

$$i_{sc} = 2 \text{ A}$$

\Rightarrow

$$\boxed{I_N = 2 \text{ A}}$$

$$R_N = \frac{v_{oc}}{i_{sc}} = 6 \Omega \Rightarrow \boxed{R_N = 6 \Omega}$$