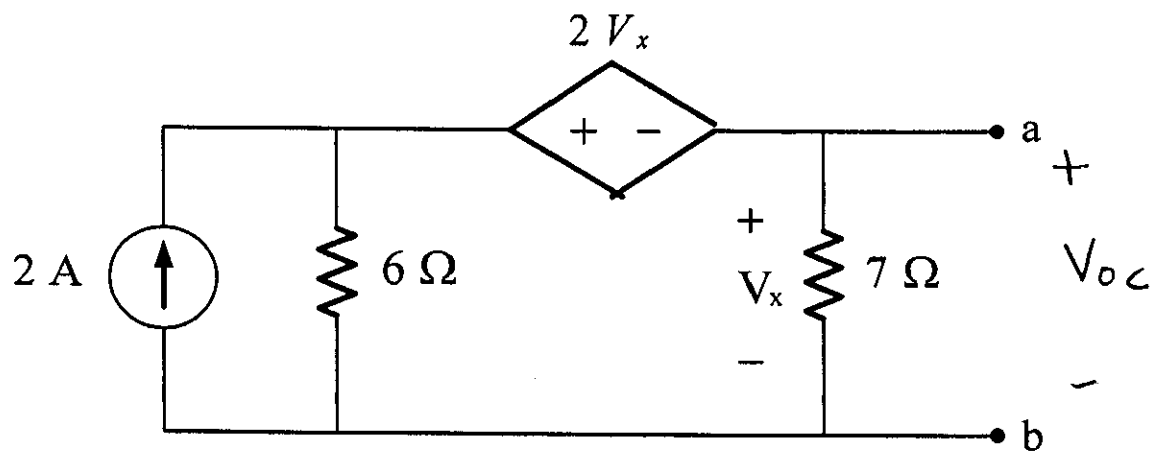
EE 201-01-Winter 2011(102)
QZ1

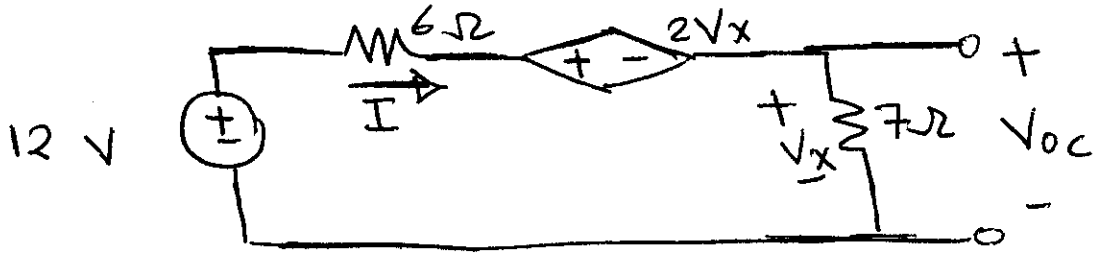
Sec	Ser	ID	Name



For the circuit shown above, find Thevenin equivalent between terminals **a** and **b** ?

Finding V_{oc}

method ① Source Transformation



KVL $\quad -12 + 6I + 2V_x + V_x = 0$

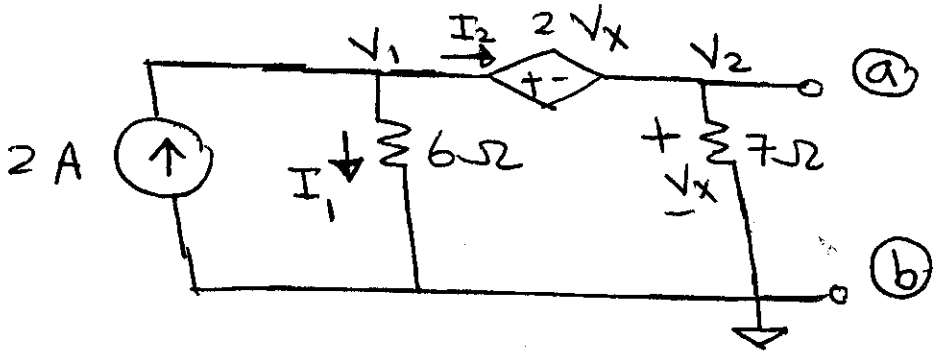
$$I = \frac{V_x}{7}$$

$$\Rightarrow -12 + 6\left(\frac{V_x}{7}\right) + 3V_x = 0$$

$$\Rightarrow \quad V_x = \frac{28}{9} = V_{oc}$$

continue ⇒

method (2) Nodal Method



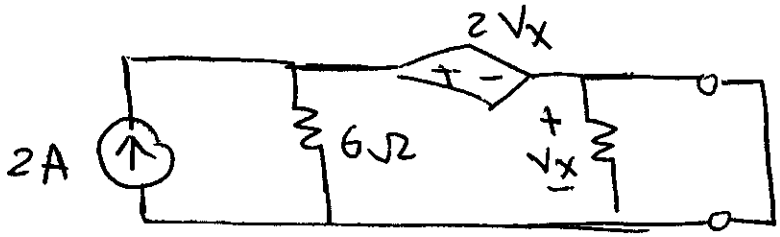
$$V_2 = V_x \qquad V_1 - V_2 = 2V_x \Rightarrow V_1 = 3V_x$$

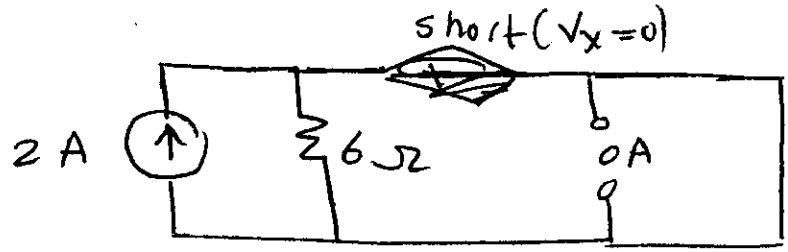
KCL $$2 = I_1 + I_2 = \frac{V_1}{6} + \frac{V_2}{7} = \frac{3V_x}{6} + \frac{V_x}{7}$$

$$\Rightarrow V_x = \frac{28}{9}\,V = V_{oc}$$

Finding R_{th}

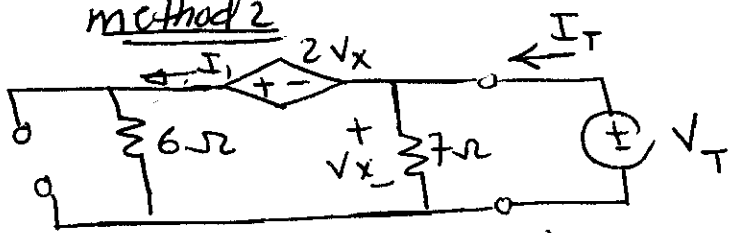
method 1 Find $I_{sc} \Rightarrow R_{th} = \frac{V_{oc}}{I_{sc}}$





$$\Rightarrow R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{28/9}{2} = \frac{14}{9}\,\Omega$$

method 2



KVL $$-2V_x + 6I_1 - V_x = 0$$

$$V_x = V_T$$

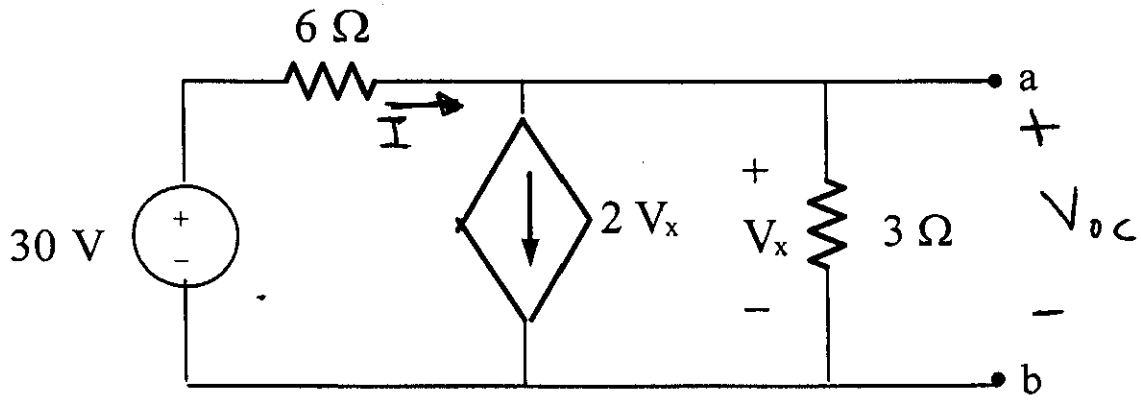
$$\Rightarrow I_1 = \frac{V_T}{2}$$

KCL $$I_T = \frac{V_x (= V_T)}{7} + I_1 = \frac{V_T}{7} + \frac{V_T}{2} = \frac{9}{14} V_T$$

$$\Rightarrow R_{th} = \frac{V_T}{I_T} = \frac{14}{9}\,\Omega$$

EE 201-02-Winter 2011(102)
QZ1

Sec	Ser	ID	Name	KEY



For the circuit shown above, find Thevenin equivalent between terminals **a** and **b** ?

$$V_{oc} = V_x$$

KCL $\quad I = 2V_x + \frac{V_x}{3}$

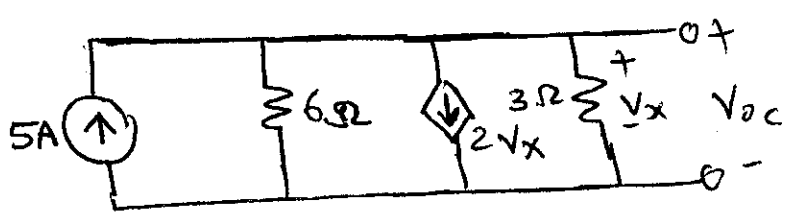
KVL $\quad -30 + 6I + V_x = 0$

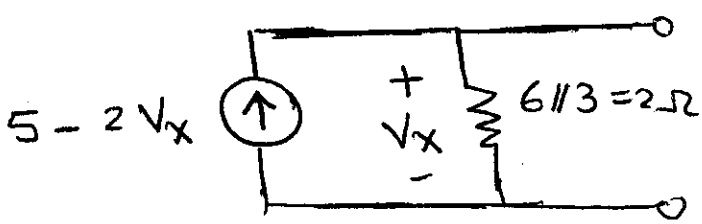
$$-30 + 6\left[2V_x + \frac{V_x}{3}\right] + V_x = 0$$

$$\Rightarrow \quad V_x = 2V = V_{oc}$$

another solution

source transformation



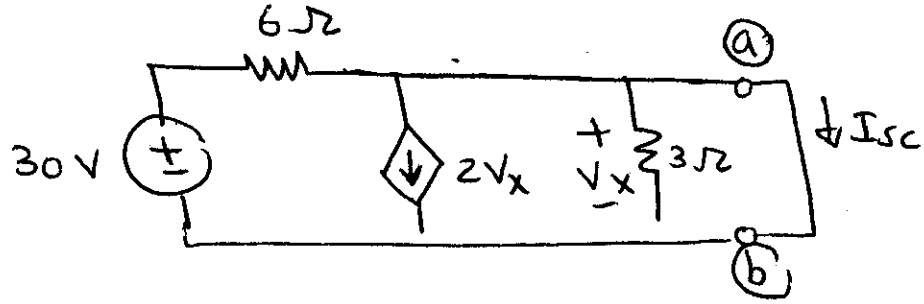


$$V_x = 2(5 - 2V_x)$$

$$\Rightarrow \quad V_x = 2V = V_{oc}$$

Finding R_{th}

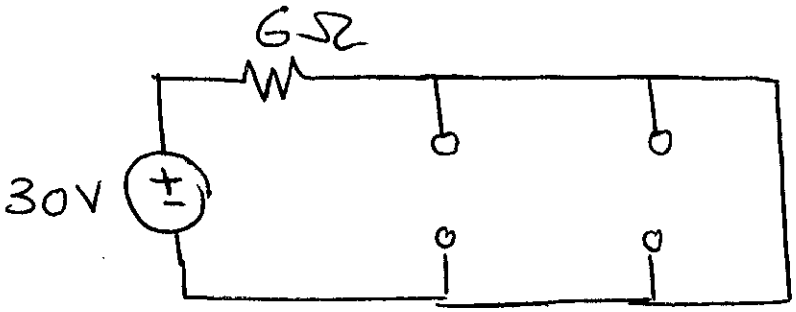
method 1 Find $I_{sc} \Rightarrow R_{th} = \frac{V_{oc}}{I_{sc}}$



short a,b $\Rightarrow V_x = 0$

$\Rightarrow I_{3\Omega} = \frac{V_x}{3} = 0A$ (open)

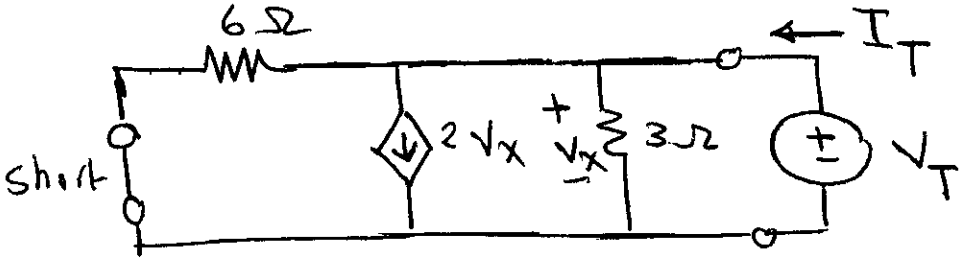
$2V_x = 0 \Rightarrow$ open



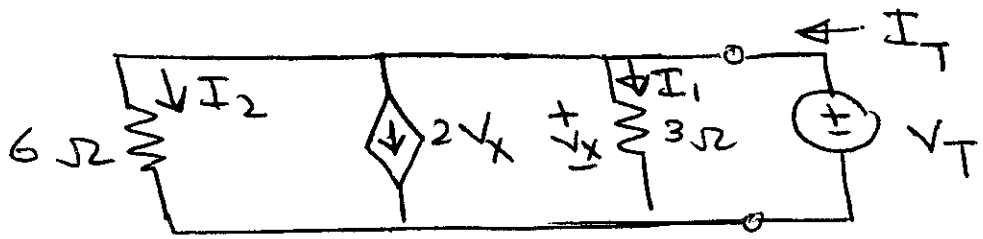
$I_{sc} = \frac{30}{6} = 5A$

$\Rightarrow R_{th} = \frac{V_{oc}}{I_{sc}} = \frac{2}{5}\Omega$

method 2 deactivate independent sources
apply test voltage



$R_{th} = \frac{V_T}{I_T}$



$V_x = V_T$

$$I_T = I_1 + 2V_x + I_2 = \frac{V_x}{3} + 2V_x + \frac{V_x}{6}$$

$$= \frac{V_T}{3} + 2V_T + \frac{V_T}{6}$$

Solve for $\frac{V_T}{I_T} = R_{th} = \frac{2}{5}\Omega$