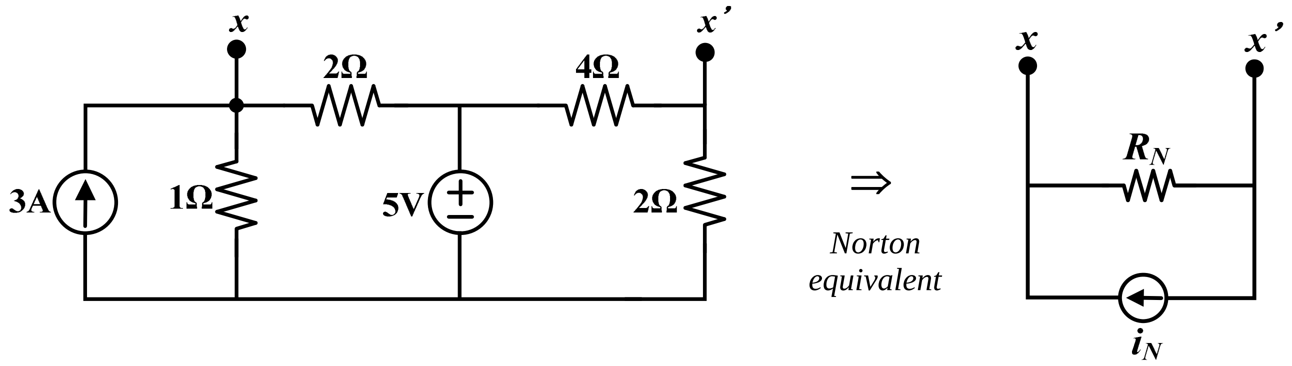
電路學(EE2210)第三次隨堂考

2013年10月9日
時間：15 分鐘
Close Book

學號：______________________________

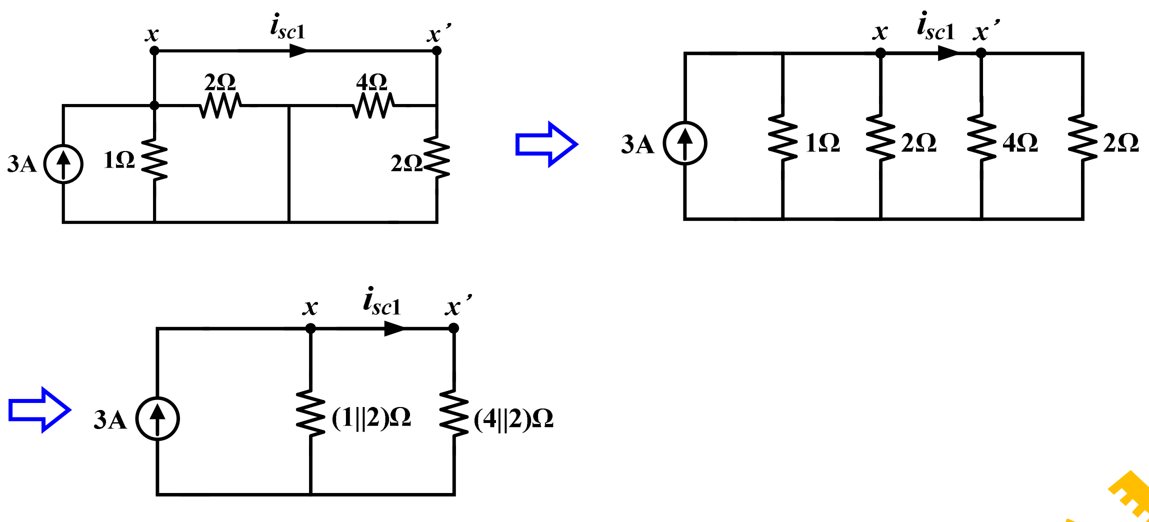
姓名：______________________________

Find the Norton equivalent circuit of the network as shown at the terminals marked *xx'* in the circuit. (100%)



Solution:

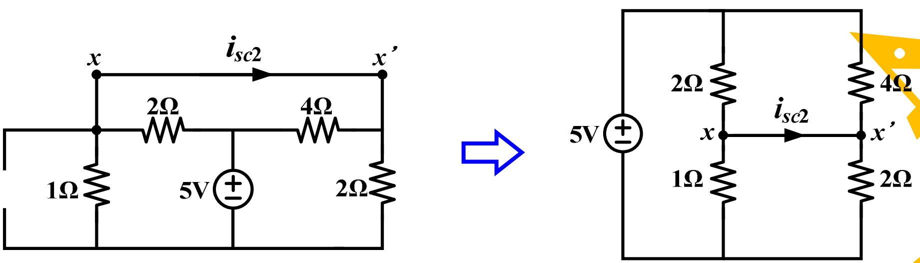
The first step is to find the Norton equivalent current i_N, this short circuit current can be found by using superposition method.
First, let us find the short circuit current i_{sc1} for ports *xx'* when only the current source is actived.



Thus, the short circuit current i_{sc1} can be found to be,

$$i_{sc1} = 3\times\frac{(1\|2)}{(1\|2)+(4\|2)} = 1\text{A}$$

Then, let us find the short circuit current i_{sc2} for ports *xx'* when only the voltage source is actived.

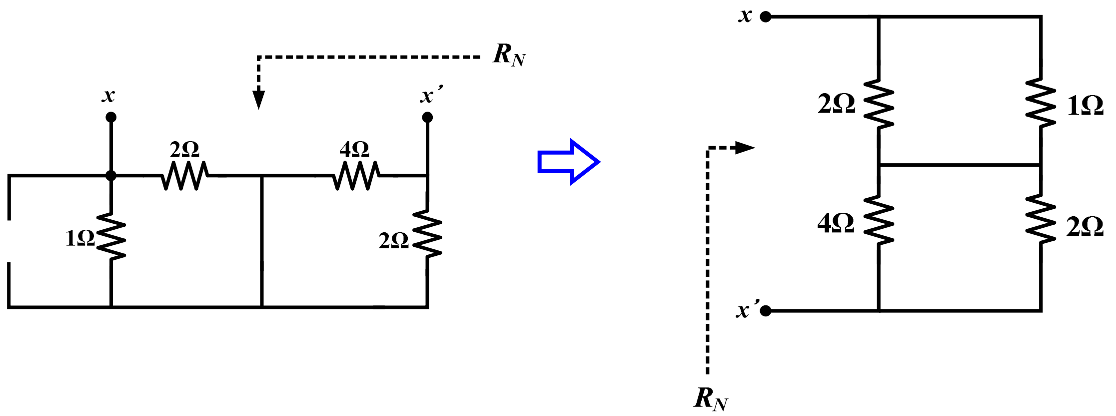


This is the Wheatstone bridge circuit since $\frac{2\,\Omega}{4\,\Omega}=\frac{1\Omega}{2\,\Omega}$. It is well know for Wheatstone bridge circuit that $i_{sc2}=0\text{A}$.

Then the Norton current i_N is superposition of this two current:

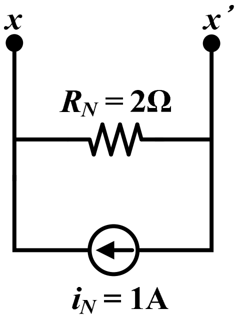
$i_N = i_{sc1} + i_{sc2} = 1\text{A}$.

The second step is to find the Norton resistance R_N. The Norton resistance R_N can be found by measuring the open-circuit network seen from the *xx'* ports with independent source set to zero.



$R_N = (2\,\|\,1) + (4\,\|\,2) = 2\Omega$

Finally, the Norton equivalent circuit of this circuit network can be drawn as follows:



i_N =______1A_______, R_N =______2Ω_______.