Name: _____ (please print)

Signature: _____

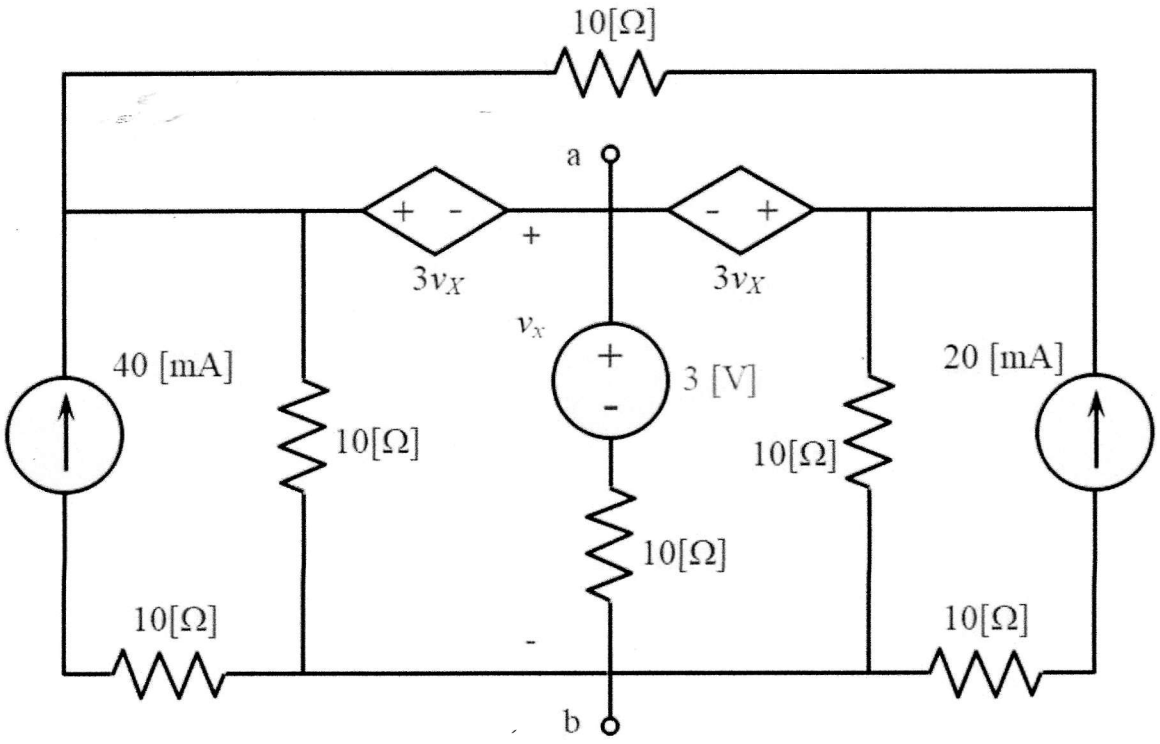
ECE 2201 – Quiz #6
July 6, 2021
Online

1. This quiz is open book, open notes. You may not work with another person or try to obtain the answer to the quiz online.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

_____/25

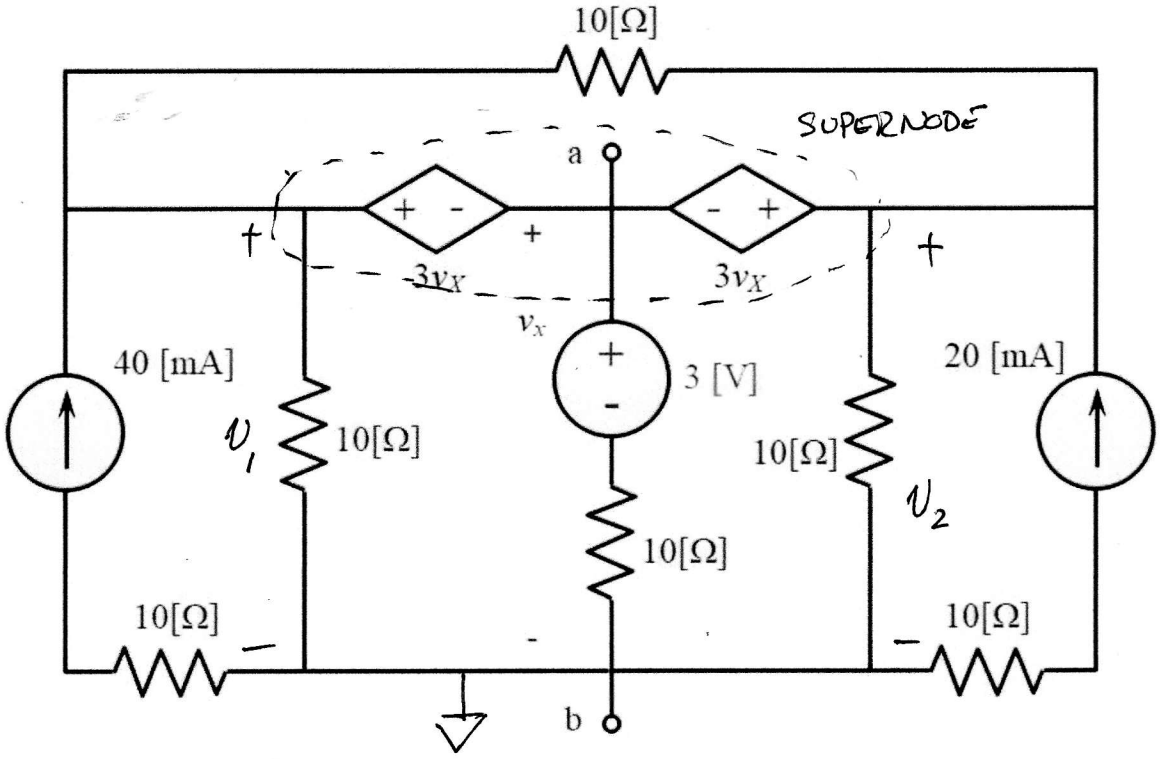
Room for extra work

For the circuit below, find the Thevenin equivalent circuit at terminals a, b. Draw the Thevenin equivlant, being sure to label terminals a, b.



Room for extra work

For the circuit below, find the Thevenin equivalent circuit at terminals a, b. Draw the Thevenin equivlant, being sure to label terminals a, b.



We note that v_x is the open circuit voltage. NVM:

Supernode: $\frac{v_1}{10} - 0.04 + \frac{v_2}{10} - 0.02 + \frac{v_x - 3}{10} = 0$

constraint: $v_1 - v_2 = 3v_x - 3v_x = 0 \Rightarrow v_1 = v_2$

auxchary: $v_x - v_1 + 3v_x = 0 \Rightarrow v_1 = 4v_x$

substituting: $\frac{4v_x}{10} - 0.04 + \frac{4v_x}{10} - 0.002 + \frac{v_x - 3}{10} = 0$

$v_x = v_{oc} = 0.4\,[V]$

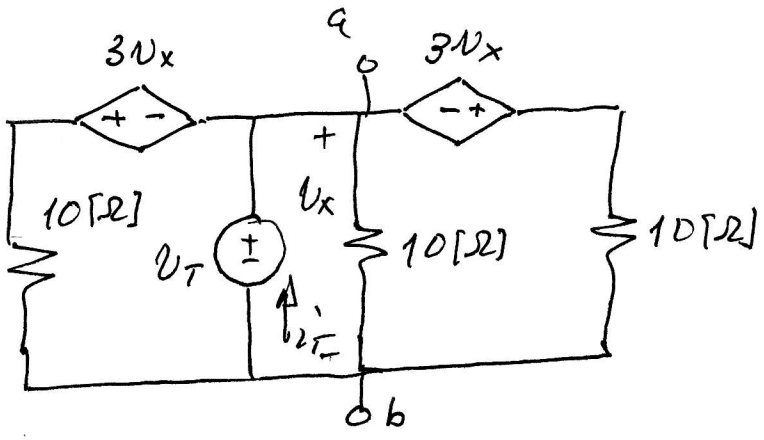
Note that the 10 [Ω] resistors in series with the current sources, and 10 [Ω] resistor in parallel with the two dependent sources, play no role here and can be ignored. We will leave them out in what follows...

Room for extra work

Test source:

Set $v_T = 1\,[V]$

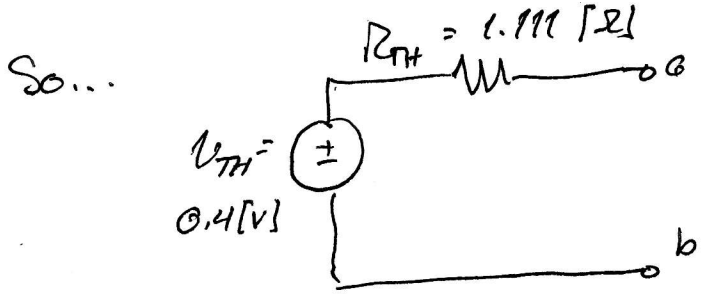
$\Rightarrow v_x = 1\,[V]$



$$i'_T = \frac{1}{10} + \frac{1+3v_x}{10} + \frac{1+3v_x}{10} = 0.9\,[A]$$

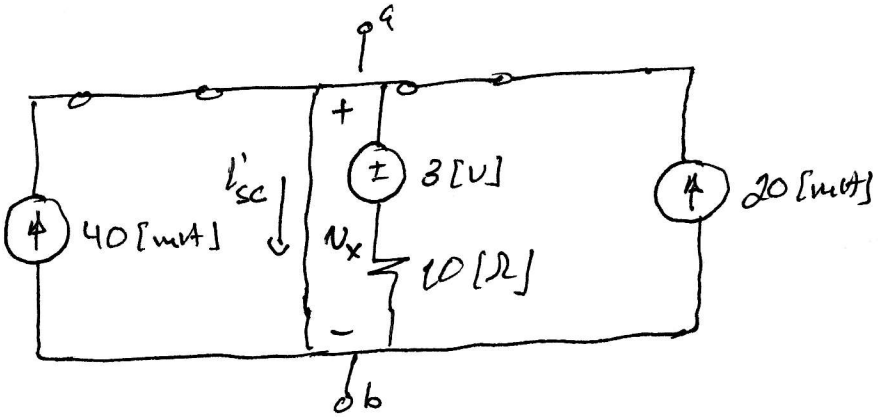
$$R_{TH} = v_T / i'_T = 1/0.9 = 1.111\,[\Omega]$$

So...



As a check, we will also use short-circuit current i_{sc}:

When terminals a, b are shorted, $v_x = 0$.



$$i'_{sc} = 0.04 + 0.02 + 3/10$$

$$= 0.36\,[A]$$

$$\therefore R_{TH} = v_{oc} / i'_{sc}$$

$$= 0.4 / 0.36$$

$$= 1.111\,[\Omega] \checkmark$$