ECSE-200 Quiz # 6 (8th prime Oct 2018)

NAME_____ McGill ID#_____

READ each question carefully. Do your work independently. SHOW ALL YOUR WORK. Give units on your answers (where appropriate).

Consider the circuit diagram.

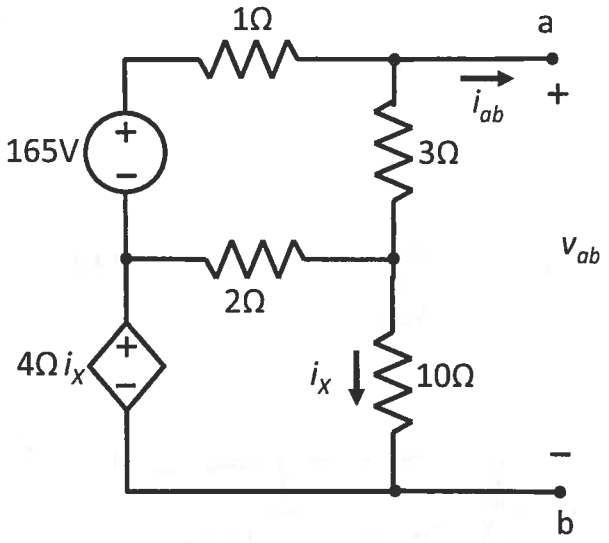
1) What is the open circuit voltage of the circuit with respect to the terminals A and B ? [1pt]

2) What is the short circuit current of the circuit with respect to the terminals A and B ? [1pt]

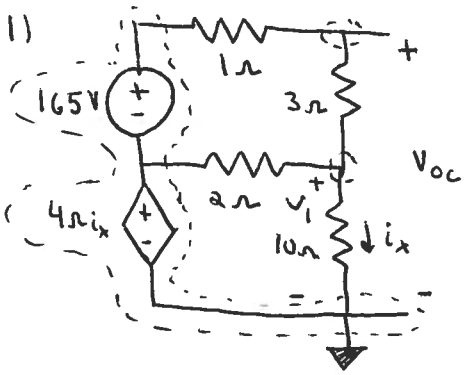
3) What is the Thévenin resistance of the circuit with respect to the terminals A and B? [1pt]

4) What is the Norton equivalent circuit with respect to the terminals A and B? [1pt]

5) What is the Norton equivalent circuit with respect to the terminals A and B if the independent voltage source has a value of 495 V ? [2pts]



1)



$$0 = \frac{V_{oc} - 165V - 4\Omega i_x}{1\Omega} + \frac{V_{oc} - V_1}{3\Omega}$$

$$0 = \frac{V_1}{10\Omega} + \frac{V_1 - 4\Omega i_x}{2\Omega} + \frac{V_1 - V_{oc}}{3\Omega}$$

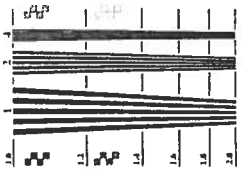
$$i_x = V_1 / 10\Omega$$

$$165 = \frac{4}{3} V_{oc} - \frac{11}{15} V_1$$

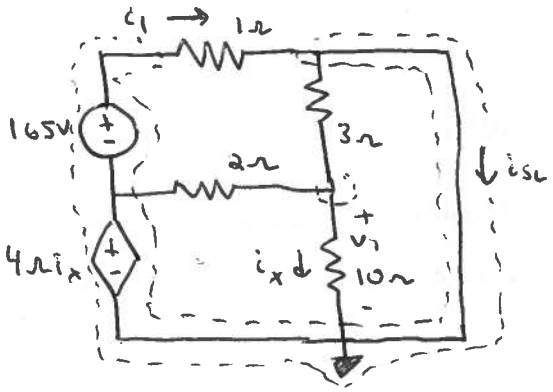
$$0 = -\frac{1}{3} V_{oc} + \frac{11}{15} V_1$$

$$V_{oc} = \frac{\begin{vmatrix} 165 & -11/15 \\ 0 & +11/15 \end{vmatrix}}{\begin{vmatrix} 4/3 & -11/15 \\ -1/3 & 11/15 \end{vmatrix}}$$

$$= 165V \quad [+1]$$



2)



$$0 = \frac{v_1}{10\Omega} + \frac{v_1}{3\Omega} + \frac{v_1 - 4\Omega i_x}{2\Omega}$$

$$i_x = \frac{v_1}{10\Omega} \quad \therefore \; v_1 = 0V \quad i_x = 0A$$

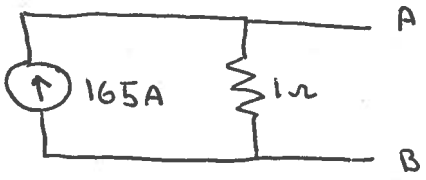
$$i_1 = \frac{4\Omega i_x + 165V}{1\Omega} = 165A$$

$$i_{sc} = \frac{v_1}{3\Omega} + i_1$$

$$= \underline{165A} \quad [+1]$$

3) $R_T = \frac{v_{oc}}{i_{sc}} = 1\Omega$ [+1]

4)



[+1]

5) By linearity, i_{sc} is proportional to value of independent voltage source.

[+1] for i_{sc}
[+1] for R_T