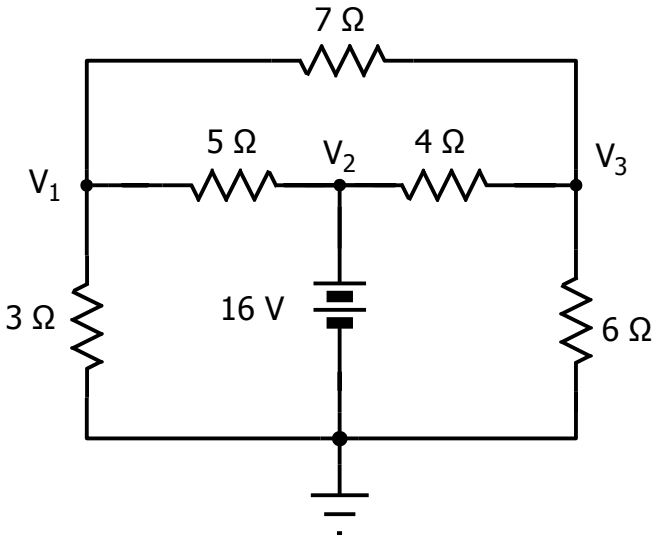
EE3 Fall 2020
Practice Problems 5

1. More NVA practice. Find V_1 & V_3.



$V_1 = 6.6$ V; $V_3 = 8.83$ V

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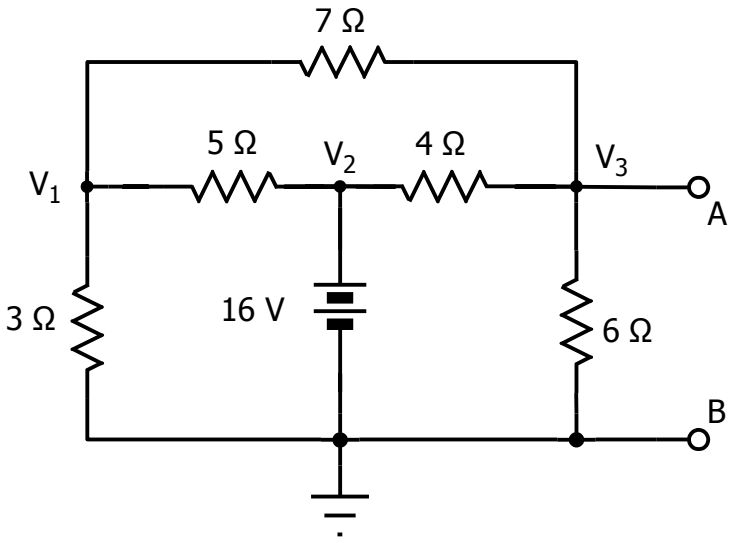
2. In this circuit, V_3=8.8 V.. You will be using Method (a.) to find the Thévenin Equivalent circuit.

   Use the V_{OC}-I_{SC} method to find the Thévenin Equivalent circuit, looking in through Port A-B.



$R_{th} = 1.88\ \Omega$

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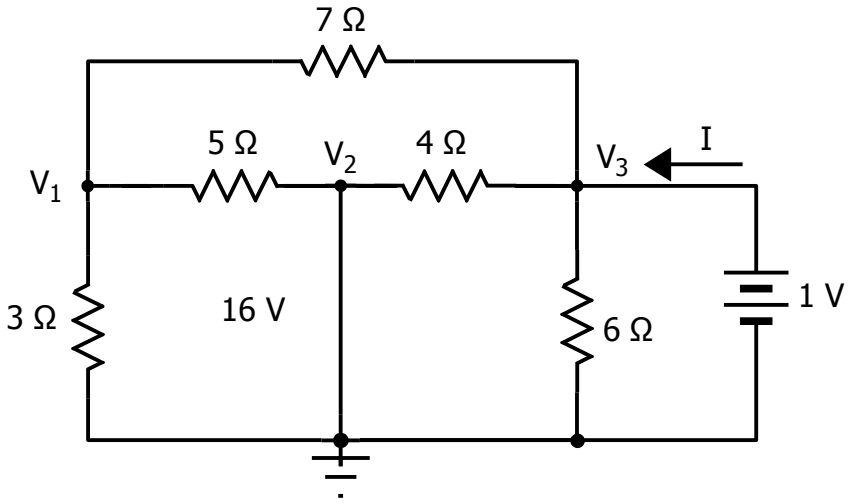
3. This time, you will find the Thévenin Equivalent circuit by using Method (b.). We zeroed out the 16 V battery and attached a test battery to the circuit as shown.
   a. Find an expression for the current I_T.
   b. Compute V_T / I_T. Units are ohms.
   c. Compare your answer to Problem 2.



$R_{th} = 1.89\ \Omega$

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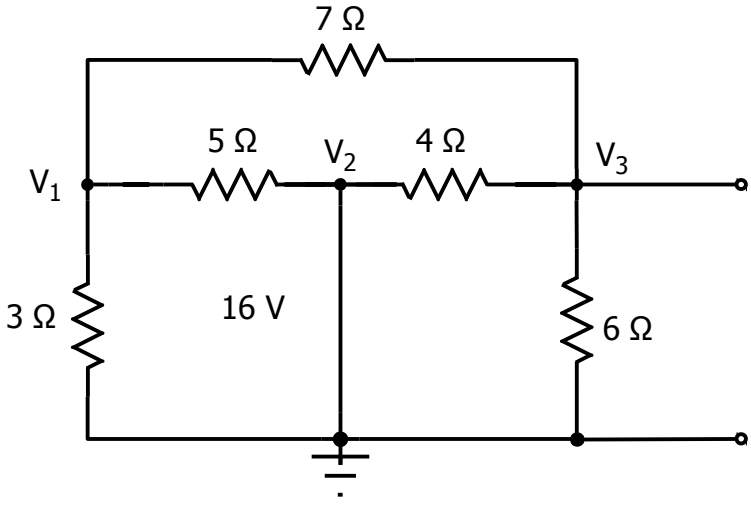
4. This time, you will find the Thévenin Equivalent circuit by using Method (c.). We replaced the 16 V battery with a short.
   a. Using your knowledge of series and parallel circuits, find the resistance of the circuit when looking in through the port.
   b. Compare your answer to Problem 3.



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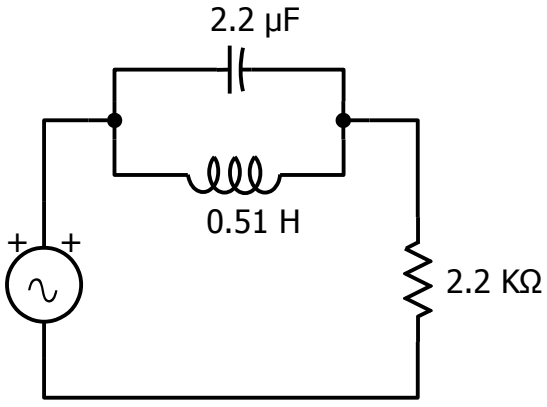

5a. Using the expressions for capacitive and inductive impedance, find the total impedance presented by the capacitor, inductor, and resistor to the voltage source. Set ω = 1000 rad/s.

$$Z_{tot} = 2200 - j4180$$

b. Now find the current through the voltage source if v(t) = 10 cos(1000t). Express in both rectangular and polar forms.

$$i_V(t) = 0.99 + j1.87 \text{ mA} = 2.12 \angle 62.1^\circ$$

d. Find the current through the inductor i_L. Express in both rectangular and polar forms.

$$i_L(t) = -8.1 - j15.4 \text{ mA} = 17.4 \angle -118^\circ$$

e. Find the current through the capacitor i_C.

$$i_C(t) = 9.1 + j17.2 \text{ mA}$$

f. Add i_L and i_C. The sum should equal the current in #2.

$$i_L + i_C = 0.99 + j1.87 \text{ mA}$$

g. Compare the magnitudes of $i_L(t)$, $i_C(t)$, and $i_V(t)$. Can you explain the apparent anomaly?