Review Superposition, Thevenin's Equivalent Circuit, and LTSpice

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8/31/2021

1 Introduction

Superposition, Thevenin's Equivalent , and LTSpice are all effective tools to simplify and solve complex circuits. Therefore it is important to review and understand how to use each of them. This report demonstrates my understanding of these tools so that we can continue the class with ease.

2 Methods

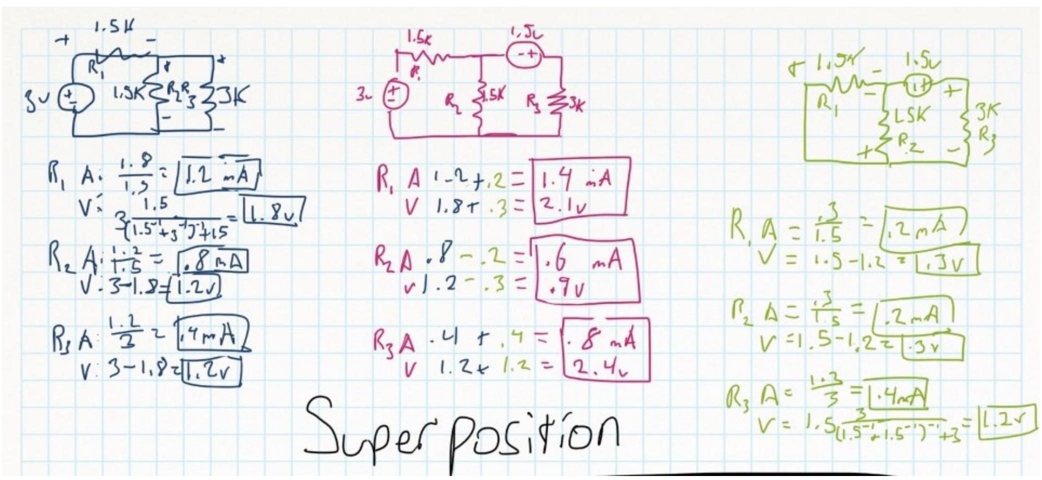
Solving a circuit using Superposition is done by picking one power source and removing all other power sources by shorting the voltage suppliers and opening the amperage suppliers. Then only using the chosen power supply, solve the voltage and current for each component of the circuit. Then repeat this for every other power supply. After all of these calculations, the sum of the contributions from each power supply through a component will provide the voltage and current of the original circuit.

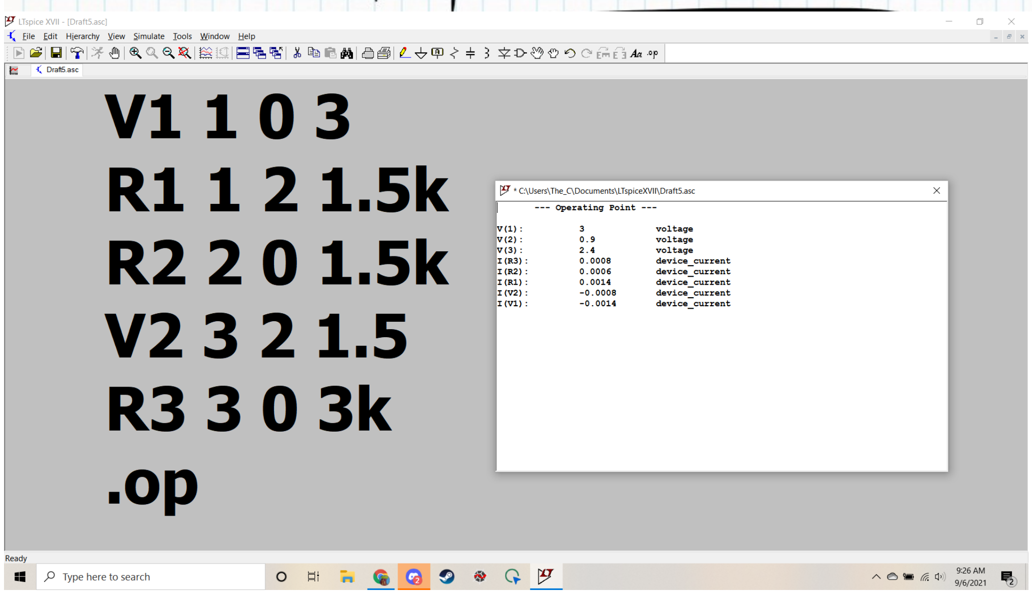
Thevenin's Equivalent is mostly used when attempting to determine the input a load will see from a circuit. Thevenin's Equivalent can be found by switching between the Thevenin Equivalent of a power source and the Norton Equivalent of that power source. The reason this is done is because it can switch the paired resistor between series and parallel with adjacent resistors so that they can be simplified. This process can be done until there are only one resistor and power supply attached to the load.

3 Results

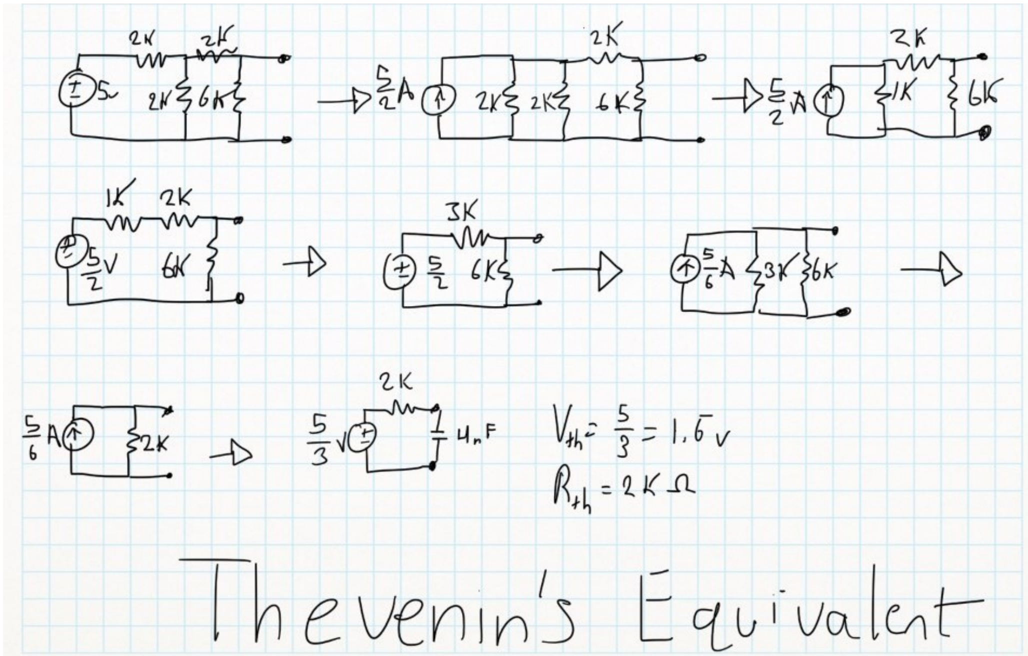
Below is the written work and LTSpice confirmation for the examples listed at http://www.yilectronics.com/Courses/ENGR338L_CE/f2021/lab1_Review_Superposition_LTspice/Lab1.html.

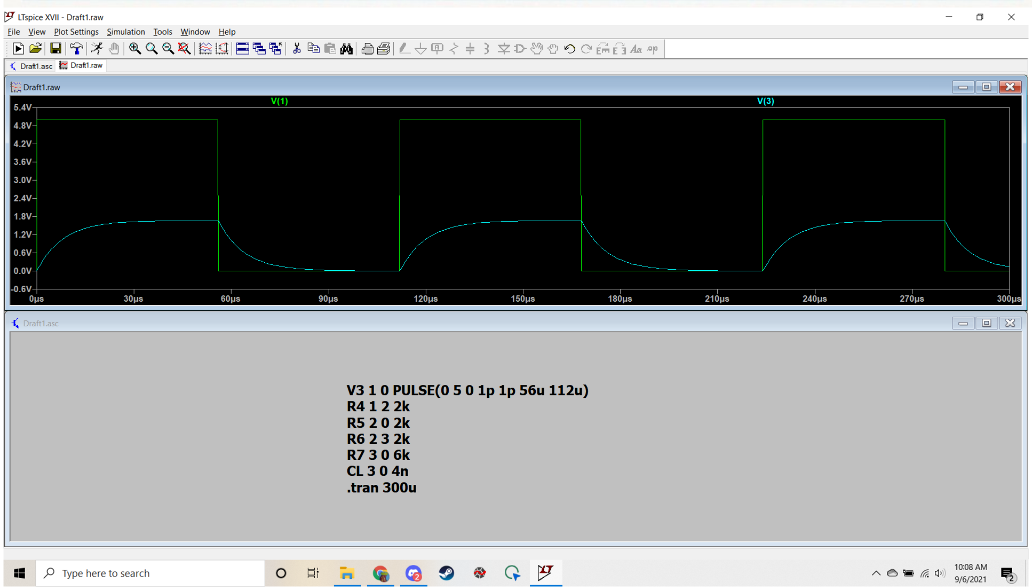
3.1 Superposition





3.2 Thevenin's Equivilent





4 Discussion

Superposition was a great method to use for the example 1 because it was a fairly small circuit with multiple power sources. Having a small circuit is needed for superposition because after 3 or 4 components, it becomes more viable to use something like node voltage or mesh current method. As seen above, the method works well and was confirmed using LTSpice.
Thevenin's equivalent helped us to determine if we gave the capacitor enough time to charge because it does not charge all the way to 5v due to the voltage divider. Since the Thevenin's equivalent voltage is 1.6v and the capacitor just about reached that, we know that 56u is enough time for the capacitor to charge.