ECE-240 Homework I

Prof. Brian Frost

Due September 10, 2019

Two circuit elements are said to be in series if they alone share exactly one node. The elements E_1 and E_2 are in series in Figure 1. Two circuit elements are said to be in parallel if they share two nodes. The elements E_1 and E_2 in Figure 2 are in parallel. The first few questions in this assignment will concern circuit elements you've learned about in class in parallel and in series. Generally speaking, two elements in parallel or in series can be though of as one circuit element whose voltage/current characteristics can be determined independent of the rest of a given circuit. Draw the circuit elements in question, and if a variable is needed (current or voltage), draw it in! Take for granted that the current through two elements in series is the same.

Figure 1: Two circuit elements in series.

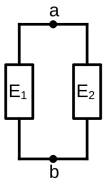

Figure 2: Two circuit elements in parallel.

1. What is the voltage across a short circuit in parallel with a resistor with resistance R?
2. What is the voltage across a short circuit in series with a resistor with resistance R?
3. What is the voltage across an open circuit in parallel with a resistor with resistance R?

4. What is the voltage across an open circuit in series with a resistor with resistance R?
5. A voltage source with voltage V and a current source with current I are in parallel. Is the voltage across the two elements known? Is the total current through both devices known?
6. What can be said of two independent voltage sources in parallel with voltages V_1 and V_2?
7. What element does a norator in parallel with a nullator behave like?
8. What element does a norator in series with a nullator behave like?
9. Regarding the circuit in Figure 3, how many branches, nodes and meshes are in the circuit?

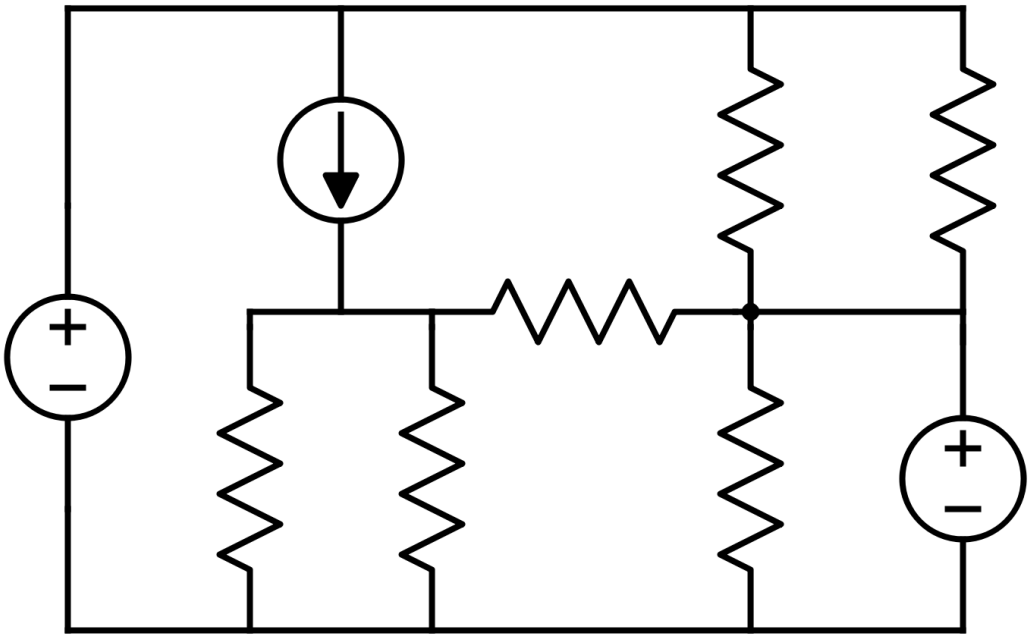

Figure 3: Reference circuit for final question.