

Circuit Analysis (Speedy Study Guide)

Speedy Study Guides

CIRCUIT ANALYSIS

CIRCUITS

There are a number of tools you can use for very small electrical circuits. For example, given a small electrical circuit you can do any or all of the following:

- Look for resistor combinations – either series or parallel.
- Look for components that you can find a Thevenin or Norton equivalent for.
- Look for embedded voltage dividers.
- Hope that all of the above will lead to a very simple circuit that you can analyze.

But... what happens when you do all of that and you still can't figure out what you're after?

- You need some general method that you know will get you the result.

In other words, what you may need is a method that has a high probability of success – one that is almost guaranteed to work for a large variety of circuits. There are two general methods you might try in that situation:

- The method of node voltages.
- The loop equations method.

Node Voltage Equations

- The method of Node Voltages starts with writing the KCL equations for the nodes in a circuit. These equations are written in terms of node voltages (even though you are writing the Current Law, the variables are voltages) that the same!

That's a little simplified, but that is the essence of the method. We'll start with a simple circuit, and we will try to discover what you have to do. Here's a very simple circuit. It is a voltage divider. We notice some very simple facts about this circuit:

- There are two nodes in this circuit: One is marked with a red dot, the other is marked with a green dot.
- There is a difference between the two nodes. If we know V_s , the source voltage – then we know the voltage at the node marked with a green dot.
- We don't know the voltage at the node marked with a red dot unless we do some analysis.

Now, what we are really saying about this circuit is the following:

- Since there is only one node where we do not know the voltage, when we write the equations for this circuit, we really only need one equation.
- There's one unknown and there's going to be one equation.
- The equation we need to write is KCL at the node with the unknown voltage.

Now, we will write the equation at the node with the unknown voltage.

- We need to define a symbol for the unknown voltage. We'll call it V_o .
- Then we write KCL at the node where V_o appears.
- Finally, we solve whatever equation results from writing KCL.

Now, we will write the equation at the node with the unknown voltage.

- To write KCL, we need to define two currents for this case. They are shown below:

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Reviews




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CIRCUIT ANALYSIS (SPEEDY STUDY GUIDE)



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