Review: Basic DC Circuit Analysis Tools

EGR 220, Chapters 1 – 4

February 18, 2020

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Lab Memo Feedback

- Engineering/Scientific experiments
  - ***Text*** of the lab is limited to 1 page
  - Include data, circuit diagrams and calculations as short, ½ page appendices (for example)
- Final statement
  - ***Go beyond*** what is in the lab handout
  - Have *your own* thoughts/questions/observations, etc. to demonstrate your thinking and learning.

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2

Our Circuit Analysis Toolbox

- Resistor networks & simple circuits
  - Nodes and branches
  - Series and parallel combinations
  - Equivalent resistance
- Circuit laws
  - Ohm's law
  - Kirchhoff: KVL and KCL
- Techniques and theorems
  - Current divider and voltage divider rules
  - Mesh and nodal analysis
  - Linearity & Superposition

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General Method for Circuit Analysis

- Identify knowns and unknowns and what is being sought
- *Reduce Complexity* – simplify circuit as needed
  - R_{eq} (all or only part of circuit)
  - Superposition (Analyze all sub-circuits)
- Redraw circuit at each analysis step, as needed
- Solve for desired values
  - Write down the law, theorem, or rule(s) you are using
  - Might use current and/or voltage dividers with R_{eq}
  - Nodal and Mesh analysis (KCL and KVL) to obtain simultaneous equations and solve

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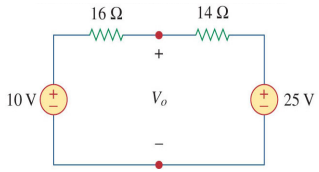
4

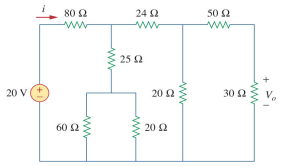
V, I, R_{eq} Practice

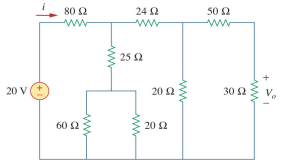
- Draw a simple resistor network for yourself
- Ask questions about changes in V, I, R_{eq} as you add or remove resistors & open or short branches

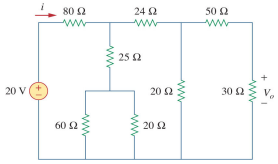
HW 1 problem 8: Find V_0



HW 2 problem 1

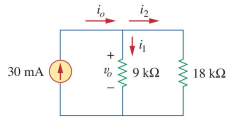






HW 2 problem 5

- An ammeter measures i_1
- Determine if the voltage v_o in the circuit would increase, decrease, or be unchanged, if the ammeter's internal resistance were to be:
  - 0Ω, 9kΩ, 10MΩ
- Calculate the numerical value of v_o in each case.



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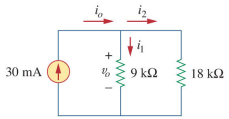
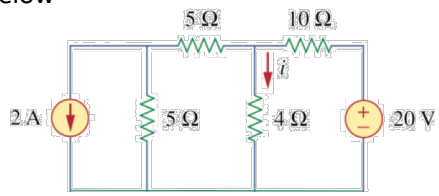


1) Find i in the circuit below



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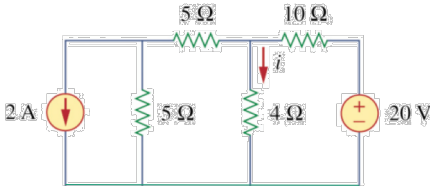

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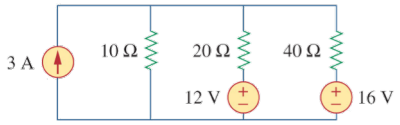
2) Find $V_{20\Omega}$



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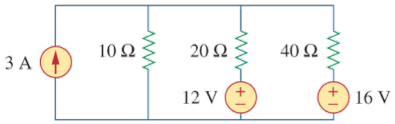

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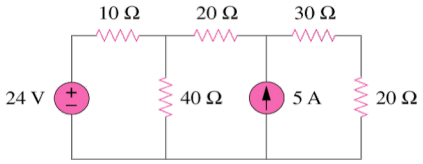
- Think through all analysis tools, and pros and cons of using each for the circuit below.



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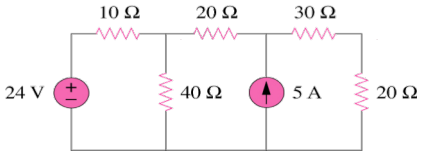

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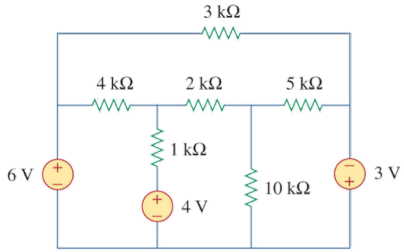

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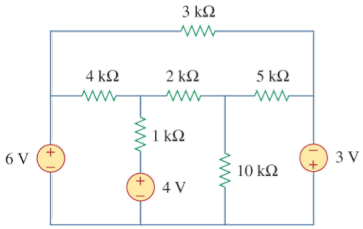

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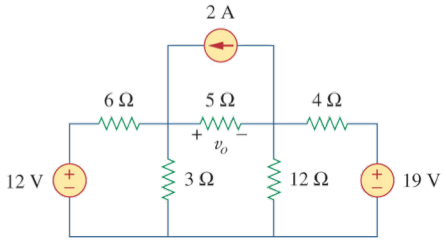

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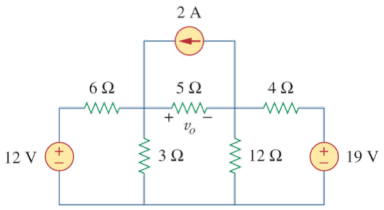

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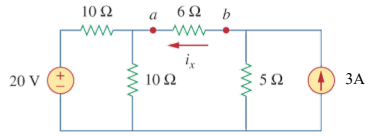

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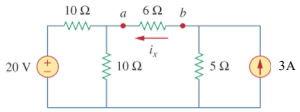

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Questions?

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