UNIVERSITY OF CALIFORNIA
Department of Electrical Engineering and Computer Sciences
EE42/100 Fall 2011

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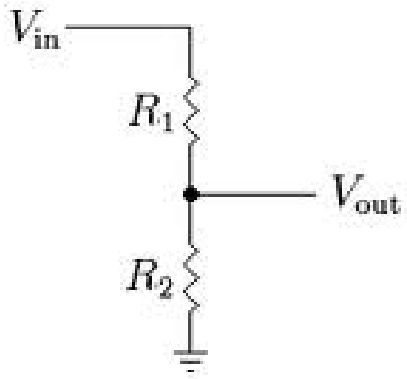
Test 1

1) The circuit below is known as a resistive voltage divider



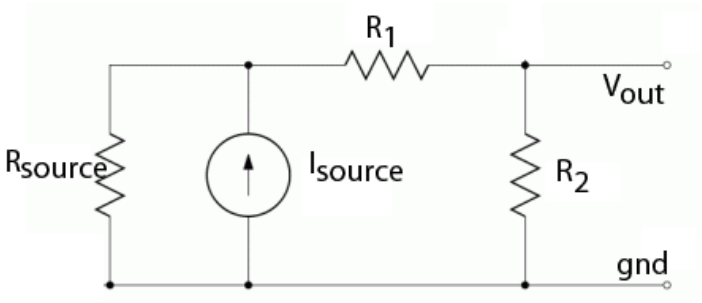
a) Assuming V_{in} is an ideal voltage source, derive an equation for V_{out}

b) Suppose I wanted to measure the voltage at V_{out} with a voltmeter.

i) Would I want the voltmeter to have a low or high resistance? Why?

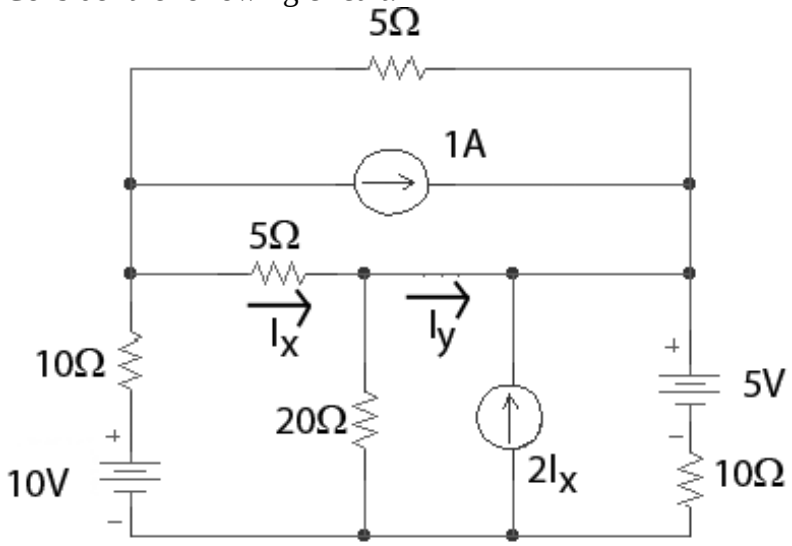
ii) Redraw the circuit above to include the resistance of the voltmeter, and derive an equation for V_{out} as a function of the resistance of the voltmeter.

c) In the above analysis, you have assumed that V_{in} is an ideal voltage source. Suppose, instead of the voltage source, I use a Norton current source to drive the voltage divider as follows:

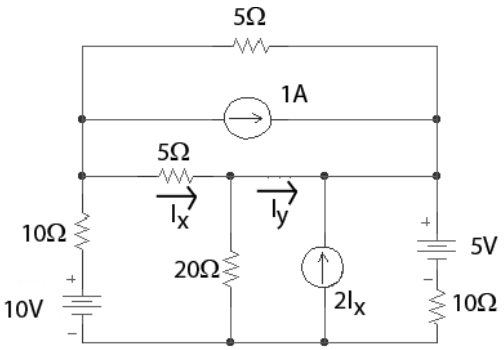


Derive an equation for V_{out} as a function of the various component values above.

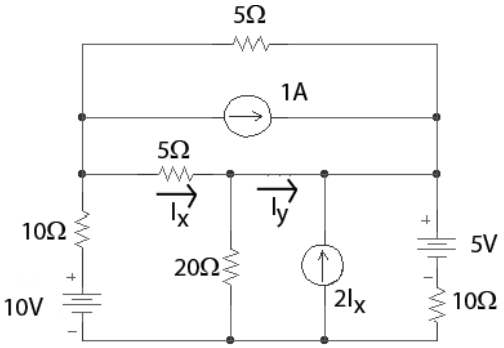
2) Consider the following circuit:



a) Calculate current I_y using nodal analysis (you can leave your answer in a simplified set of equations ; no need to find a final answer).

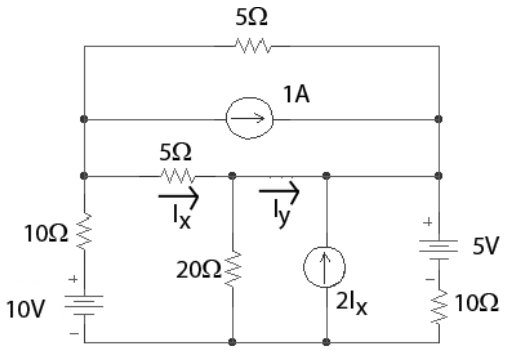


b) Similarly, calculate current I_y using mesh analysis (just set up the equations; no need to calculate the final solution).



c) Ignoring your personal preference, would you recommend nodal or mesh analysis for the analysis of this circuit? Why?

d) Analyze the circuit above to find I_y using superposition (again, just show the equations; no need to calculate a final solution).



e) Replace the dependent current source with a 2A constant current source. Derive the matrix equation to be solved if this circuit were to be solved by inspection.