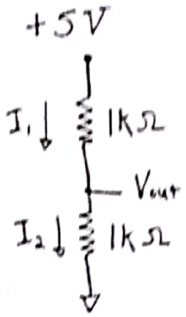
Manu Patil 9/11/2018

Problem set: Resistors in series and parallel

1) For the following circuit,



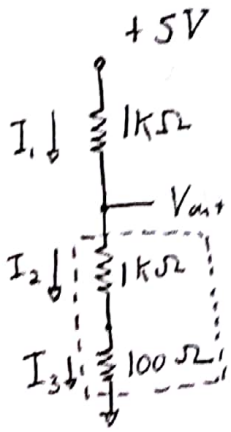
$\Delta V = IR$

$\frac{2.5}{1k} = I$

Please list the following (with units). V_{out} should be measured relative to ground.

- Vout (theory) = 2.5
- Vout(measured) = 2.59
- I_1 = .0025
- I_2 = .0025

2) For the following circuit,



$V = IR$ $\quad I = \frac{5}{2.1}$

$\frac{5}{2.100} = .00$

$\frac{5}{2100} \cdot 1000$

Please list the following (with units).

- Vout (theory) = ~~2.38~~ 2.61
- Vout(measured) = 2.72
- I_1 = ~~.0025~~ $5/2100 \approx .00238$
- I_2 = $5/2100 \approx .00238$
- I_2 = $5/2100 \simeq .00238$

2.38 ΔV over R_2
.0238 ΔV over R_2
2.61

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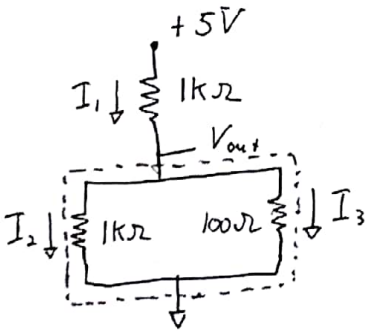
3) For the previous circuit, we redraw with an equivalent circuit as follows:

$R_{eq} = 1.1K\Omega$

What is the value of Req?

1.1KΩ

4) For the following circuit,



$\frac{1}{\frac{1}{1000} + \frac{1}{100}}$ $\quad \frac{1}{.0\$1}$

$I = \frac{V}{R}$ $\quad \therefore R = 1K + \frac{1}{.0\$1}$

$I = \frac{5}{1000 + \frac{1}{.011}}$

$V = IR$

$= (.00458)(1.1K\Omega)$

- Vout (theory) = 416
- Vout(measured) = .43
- I_1 = $5/(1000 + 1/.011) = .00458$
- I_2 = .00456
- I_3 = ~~.004~~ .00456

5) For the previous circuit, we redraw with an equivalent circuit as in problem 3. What is the value of Req?

$R_{eq} = 90.909 = \frac{1}{\frac{1}{1000} + \frac{1}{100}}$

6) Redo problem 4 replacing the 100 ohm resistor with 100 K.

- Vout (theory) = ~~4.99~~ ~~0.01~~ 2.49
- Vout(measured) = 2.5(

$\frac{1}{\frac{1}{1000} + \frac{1}{100,000}} = \frac{1}{.00101} = R$

$\Delta V = 1000 \cdot I_1$ $\quad I = \frac{5\text{ V}}{1000 + \frac{1}{.00101}}$

$\Delta V_1 = 2.51$ $\quad I_1 = .00251$

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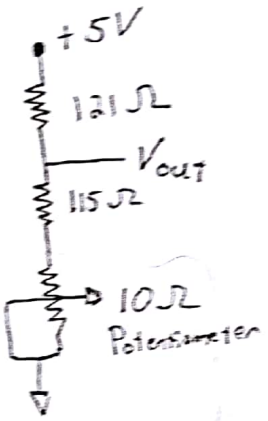
- I_1 = .0025
- I_2 = .002
- I_3 = .0002

7) Build the following circuit using a 10 ohm potentiometer (variable resistor). Note that the potentiometer has three terminals and we are only using one.



$V = IR$

$\frac{5}{121+115} = I = .0211$

$\frac{5}{121+115+10} = I = .0202$

In this arrangement the potentiometer is a resistor whose value we can vary between 0 and 10 Ohms. What is the maximum and mininum value of Vout?

- Vout (theory) maximum = 2.54 minimum = 2.43
- Vout (exp) maximum = 2.55 minimum = 2.53

Deliverables:

Just fill in your results on this work sheet (or rewrite) and scan your handwritten work in. Again, these types of assignments are simply checked for completeness.

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