EECE 2150 - Electrical Engineering Fall 2021
Quiz 3

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Student Name: _____

Consider the circuit in the figure. The resistors are $R_1 = 10\,\text{Ohms}$ and $R_2 = 3\,\text{Ohms}$. The box around V_s and R_s is meant to show that these two components are integral parts of the source and cannot be separated. We have the use of an ideal voltmeter.

Initially the switches are both open and we measure the voltage at point V as $V = 12\,\text{Volts}$. When we close the switch to connect R_1 to the circuit, the measured voltage drops to $V = 10\,\text{Volts}$.

1. What is the voltage of the source, V_s

$V_s =$ _____ Volts

2. What is the source resistance?

$R_s =$ _____ Ohms

3. How much current is going through R_1 in this case?

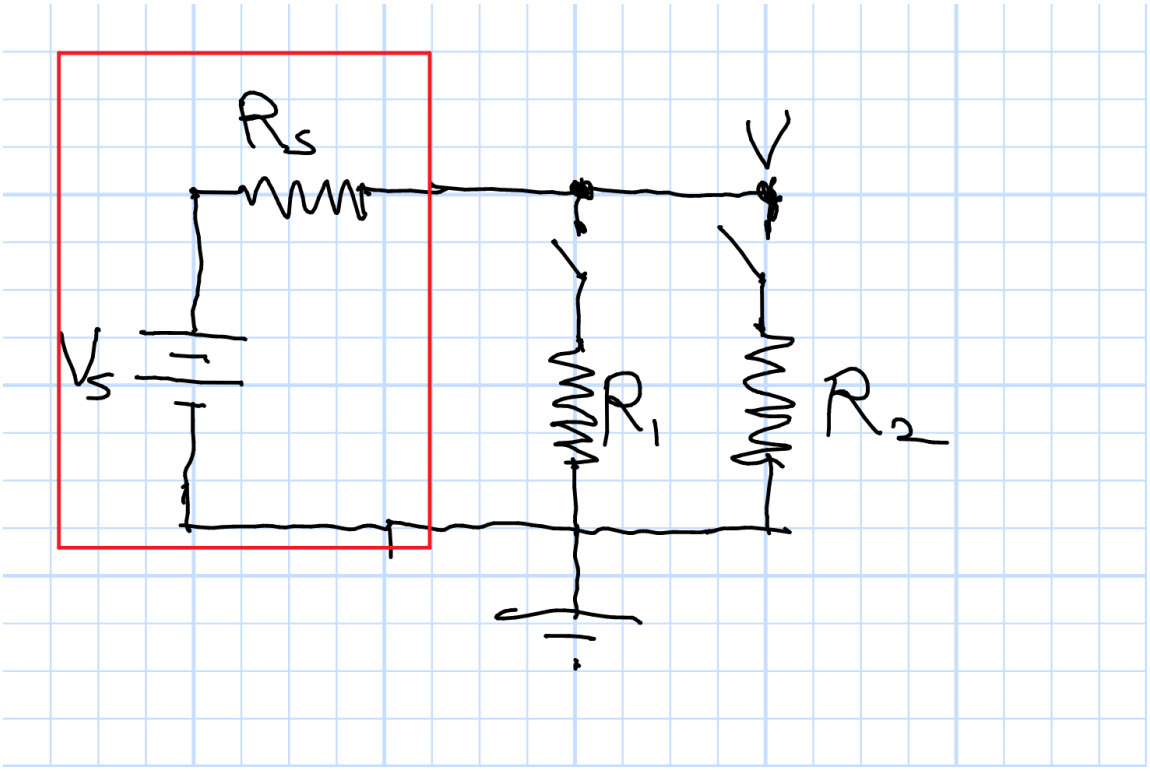
$i_1 =$ _____ Amperes

4. Now we also close the switch to connect R_2 in addition to the already connected R_1. What is the combined resistance of the "load" which now consists of both R_1 and R_2?

$R_{load} =$ _____ Ohms

5. What voltage,V will we measure in this case?

$V =$ _____ Volts


R_s
V_s
V
R_1
R_2

1. What is the voltage of the source, V_s

This is an open circuit so

$$V_s = V = 12\,\text{Volts}.$$

2. What is the source resistance?

Voltage Divider:

$$V = V_s \frac{R_1}{R_1 + R_s} \qquad R_s = \frac{V_s R_1}{V} - R_1 = 2\,\text{Ohms}.$$

3. How much current is going through R_1 in this case?

Ohm's Law:

$$i = V/R_1 = \frac{10\,\text{Volts}}{10\,\text{Ohms}} = 1\,\text{Ampere}.$$

4. Now we also close the switch to connect R_2 in addition to the already connected R_1. What is the combined resistance of the "load" which now consists of both R_1 and R_2?

Parallel Resistors:

$$R_{load} = R_1 \parallel R_2 = 2.31\,\text{Ohms}.$$

5. What voltage,V will we measure in this case?

Voltage Divider:

$$V = 12\,\text{Volts} \times \frac{(R_1 \parallel R_2)}{(R_1 \parallel R_2) + R_s} = 6.43\,\text{Volts}.$$