week2_circuits_form

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Week 2 Assignment – Circuit Calculations

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Problem 1: Calculate the following values:

The total resistance in the circuit, Rt

$2.875 \times 10^3 \Omega$ or $2.875 k\Omega$

Calculate the current through R1

1.739×10^{-3} amp.

Calculate the current through R2

6.522×10^{-4} amp.

Calculate the current through R3

1.087×10^{-3} amp.

Calculate the voltage across R1

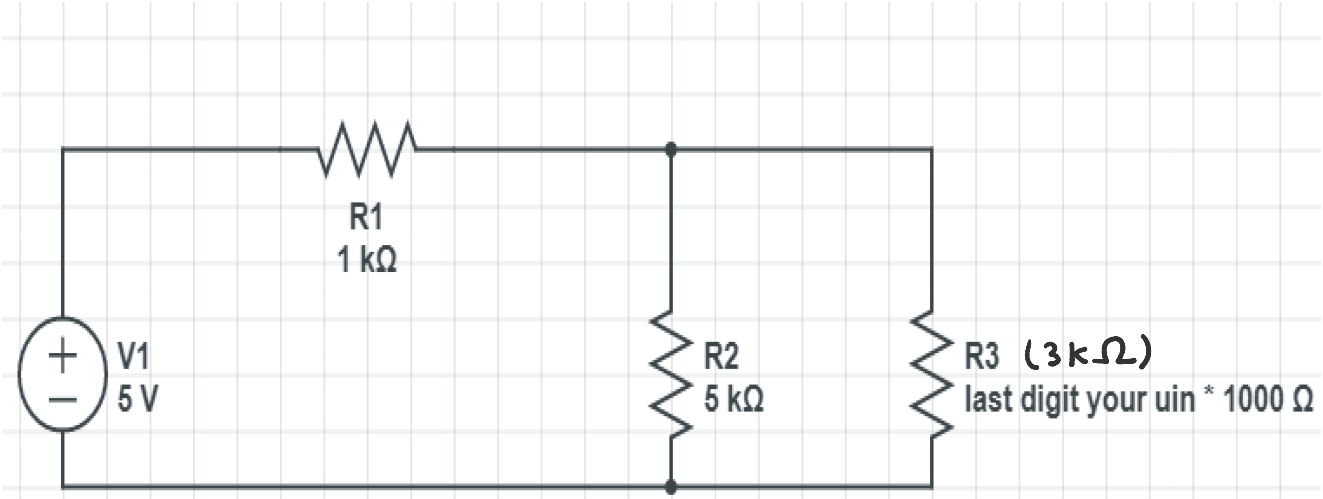
1.739 volts.

Calculate the voltage across R2

3.261 volts.

Calculate the voltage across R3

3.261 volts.



Circuit for Problem 1

Use this space to show your work for problem 1

$$R_T = R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}} = 1 + \frac{1}{\frac{1}{5} + \frac{1}{3}} = 1 + \frac{15}{8}$$

$$= 2.875\ \text{K}\Omega$$

$$I_T = \frac{V_T}{R_T} = \frac{5}{2.875 \times 10^3} = 1.739 \times 10^{-3}\ \text{amp.}$$

So, $I_1 = 1.739 \times 10^{-3}$ amp

$\Rightarrow V_1 = (1.739 \times 10^{-3})(1 \times 10^3) = 1.739$ volt.

$V_2 = V_3 = V_T - V_1 = 5 - 1.739 = 3.261$ volt.

$I_2 = \frac{3.261}{5 \times 10^3} = 0.6522 \times 10^{-3}$ amp

$I_3 = \frac{3.261}{3 \times 10^3} = 1.087 \times 10^{-3}$ amp.

Problem 2: Calculate the following values:

The total resistance in the circuit, Rt

9.505 kΩ.

Calculate the current through R1

2.025×10^{-4} amp.

Calculate the current through R2

3.24×10^{-4} amp.

Calculate the current through R3

5.26×10^{-4} amp.

Calculate the current through R4

3.75×10^{-4} amp.

Calculate the current through R5

1.5×10^{-4} amp.

Calculate the voltage across R1

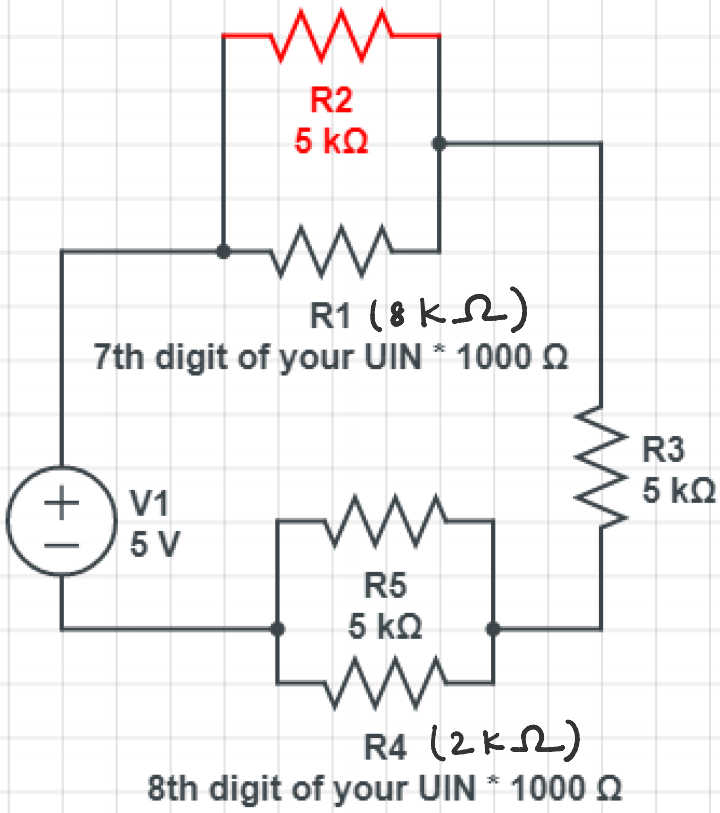
1.62 volts

Calculate the voltage across R2

1.62 volts

Calculate the voltage across R3

2.63 volts



Circuit for Problem 2

Calculate the voltage across R4

0.75 volts.

Calculate the voltage across R5

0.75 volts.

Use this space to show your work for problem 2

$$R_T = \frac{1}{\frac{1}{R_1}+\frac{1}{R_2}} + R_3 + \frac{1}{\frac{1}{R_4}+\frac{1}{R_5}} = \frac{1}{\frac{1}{8}+\frac{1}{5}} + 5 + \frac{1}{\frac{1}{2}+\frac{1}{5}} = \frac{40}{13} + 5 + \frac{10}{7} = 9.505\,k\Omega$$

$$I_T = \frac{V_T}{R_T} = \frac{5 \text{ volts}}{9.505\,k\Omega} = 5.26 \times 10^{-4} \text{ amp.}$$

So, $I_3 = 5.26 \times 10^{-4}$ amp.

$V_3 = (5.26 \times 10^{-4})(5 \times 10^3) = 2.63$ volts.

$$R_{12} = \frac{1}{\frac{1}{8}+\frac{1}{5}} = \frac{40}{13} = 3.077\,k\Omega.$$

$$R_{45} = \frac{1}{\frac{1}{2}+\frac{1}{5}} = \frac{10}{7} = 1.430\,k\Omega.$$

$I_{12} = I_{45} = I_T = 5.26 \times 10^{-4}$ amp.

$V_{12} = (I_{12})(R_{12}) = (5.26 \times 10^{-4})(3.077 \times 10^3) = 1.62$ volts.

$V_{45} = (I_{45})(R_{45}) = (5.26 \times 10^{-4})(1.430 \times 10^3) = 0.75$ volts.

So, $V_1 = V_2 = 1.62$ volts.

$V_4 = V_5 = 0.75$ volts.

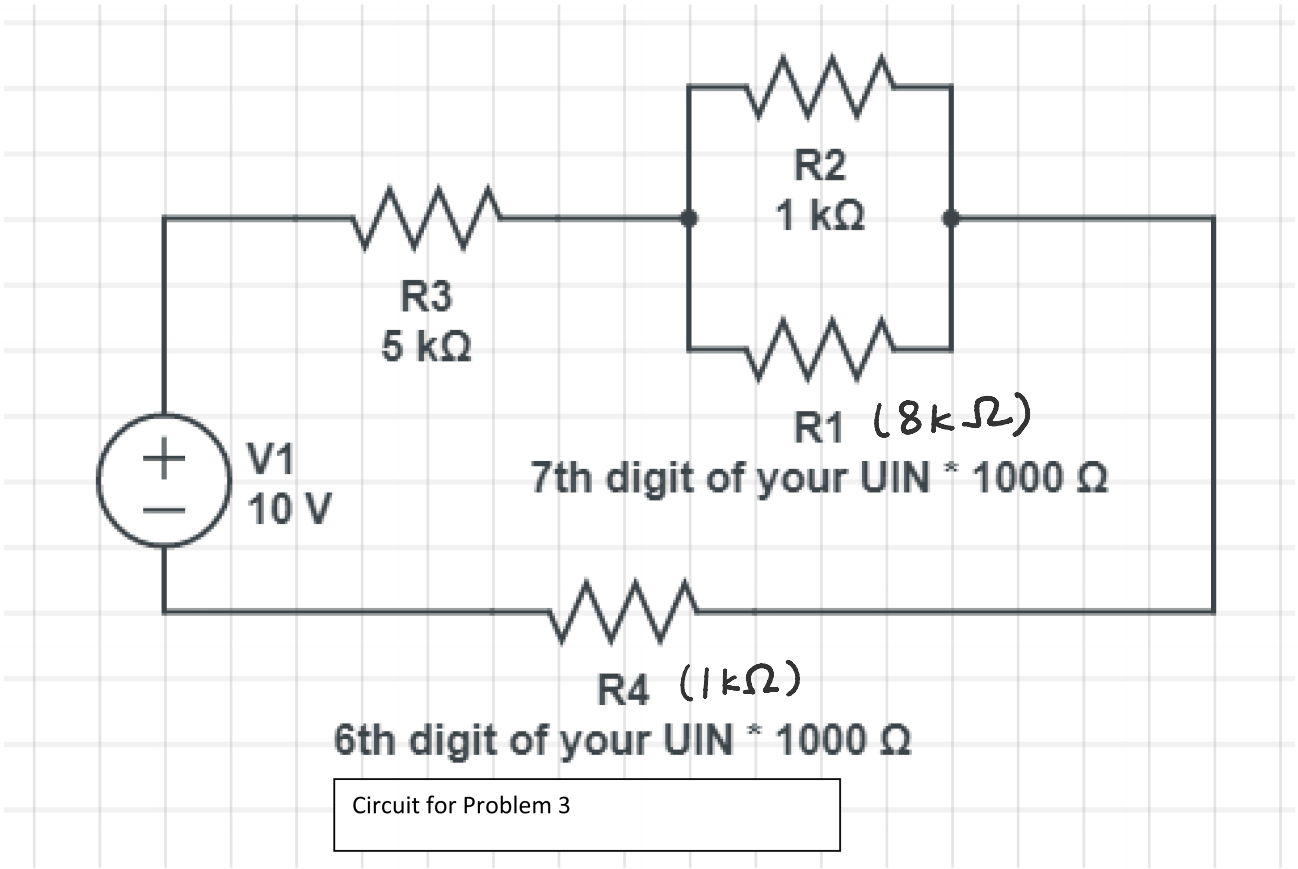
$$I_1 = \frac{V_1}{R_1} = \frac{1.62}{8 \times 10^3} = 2.025 \times 10^{-4} \text{ amp.}$$

$$I_2 = \frac{V_2}{R_2} = \frac{1.62}{5 \times 10^3} = 3.24 \times 10^{-4} \text{ amp.}$$

$$I_4 = \frac{V_4}{R_4} = \frac{0.75}{2 \times 10^3} = 3.75 \times 10^{-4} \text{ amp.}$$

$$I_5 = \frac{V_5}{R_5} = \frac{0.75}{5 \times 10^3} = 1.5 \times 10^{-4} \text{ amp.}$$

Problem 3: Calculate the following values:



Circuit for Problem 3

The total resistance in the circuit, Rt

6.889 kΩ

Calculate the current through R1

1.575×10^{-4} amp.

Calculate the current through R2

1.26×10^{-3} amp.

Calculate the current through R3

1.452×10^{-3} amp.

Calculate the current through R4

1.452×10^{-3} amp.

Calculate the voltage across R1

1.26 volts.

Calculate the voltage across R2

1.26 volts.

Calculate the voltage across R3

7.26 volts

Calculate the voltage across R4

1.45 volts.

Use this space to show your work for Problem 3.

$$R_T = 5 + \frac{1}{\frac{1}{1}+\frac{1}{8}} + 1 = 5 + \frac{8}{9} + 1 = 6.889\,k\Omega$$

$$I_T = \frac{V_T}{R_T} = \frac{10\,V}{6.889\,k\Omega} = 1.452 \times 10^{-3}\ amp.$$

So, $I_3 = I_4 = 1.452 \times 10^{-3}$ amp.

$\Rightarrow V_3 = (5 \times 10^3)(1.452 \times 10^{-3})$ volt

$= 7.26$ volts.

$V_4 = (1 \times 10^3)(1.452 \times 10^{-3})$ volt.

$= 1.452$ volts.

So, $V_1 = V_2 = 10 - (7.26 + 1.45)$

$= 1.26$ volts.

$I_1 = \frac{1.26\,V}{8 \times 10^3\,\Omega} = 1.575 \times 10^{-4}$ amp.

$I_2 = \frac{1.26\,V}{1 \times 10^{-3}\,\Omega} = 1.26 \times 10^{-3}$ amp.