EEM076 Lab1

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1 Measuring currents

1.1 Calculations

Calculate the currents I_1 and I_2 in *Figure 1*.

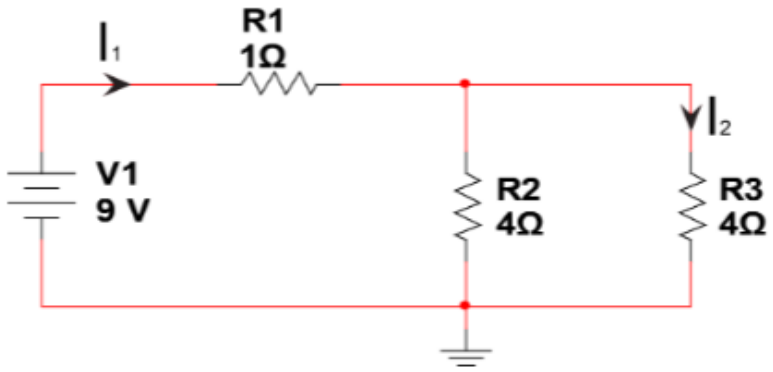

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert equation here

1.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

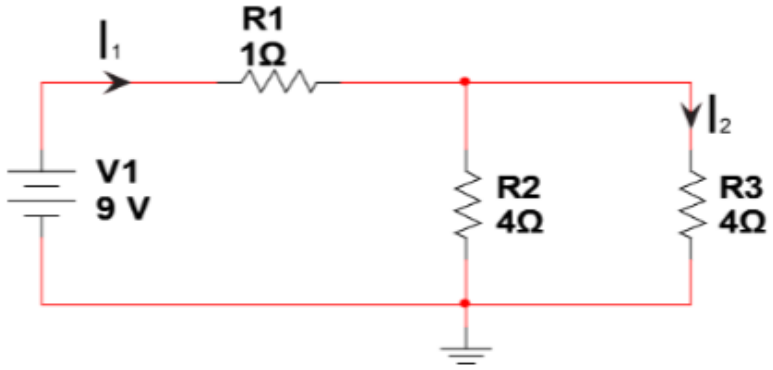

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

1.3 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

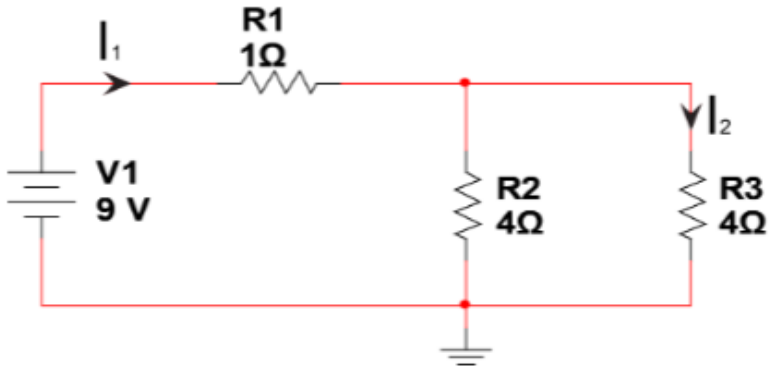

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here

2 Mesh analasys

2.1 Calculations

Calculate the currents I_1, I_2 and, I_3.

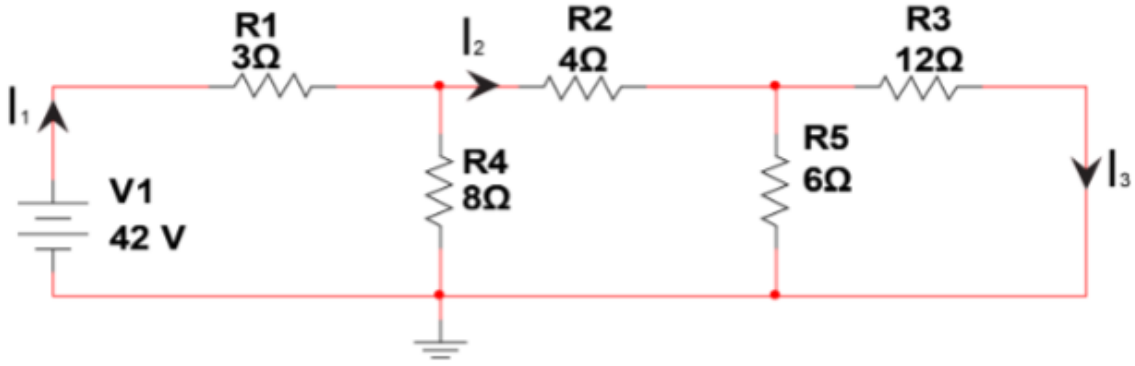

Figure 4. The circuit to simulate in Task 2 consists of three meshes.

insert equation here

2.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

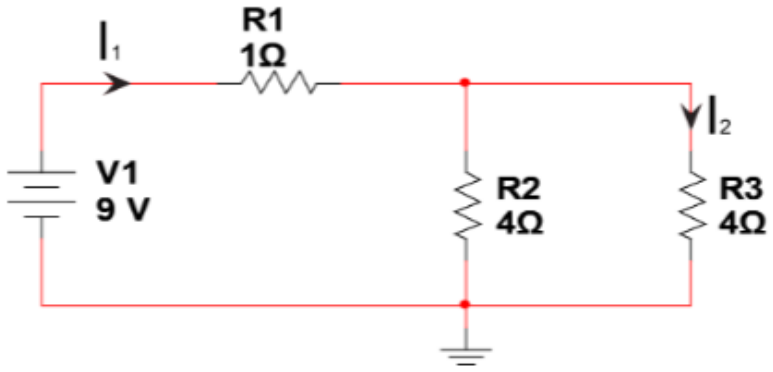

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

2.3 Simulation

Calculate the currents I_1 and I_2 in *Figure 1*.

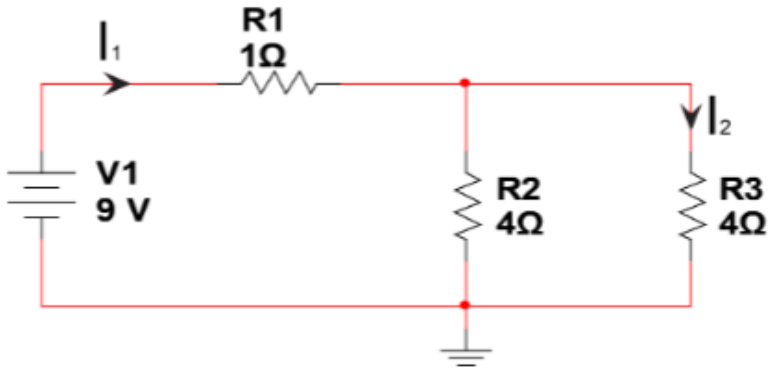

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here

3 The Superposition Principle

3.1 Calculations

Calculate the voltage V_x once when V1=0 V and I_s=2 A, then once when V1=42 V and Is=0 A. *Hint: A voltage source will become a short circuit when set to zero while a current source will become an open circuit.*

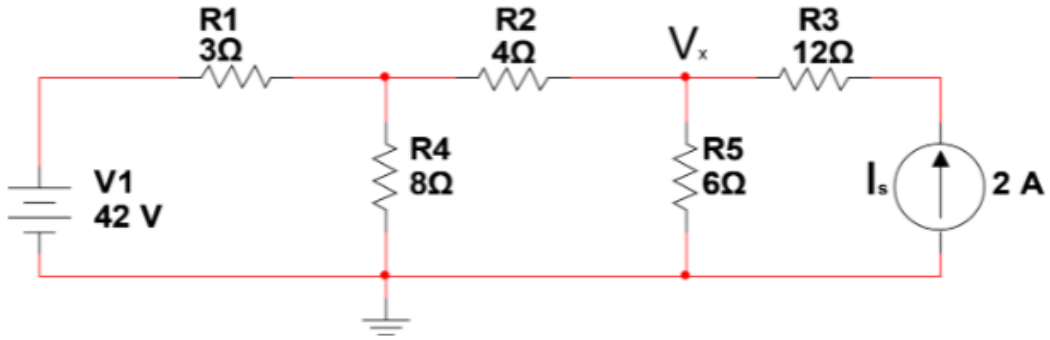

Figure 5. The circuit for Task 3 where the superposition principle is used.

insert equation here

3.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

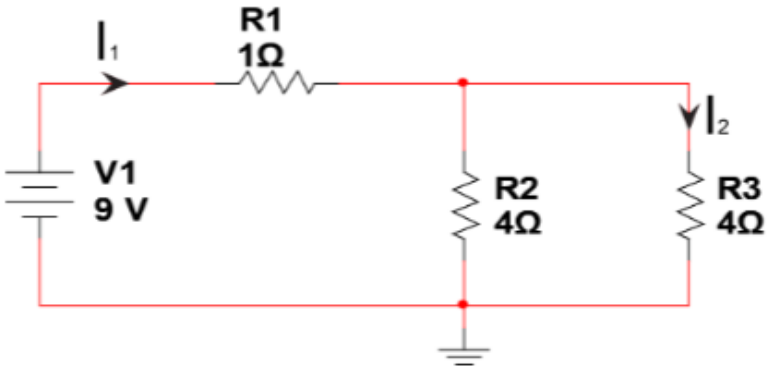

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

3.3 Simulation

Calculate the currents I_1 and I_2 in *Figure 1*.

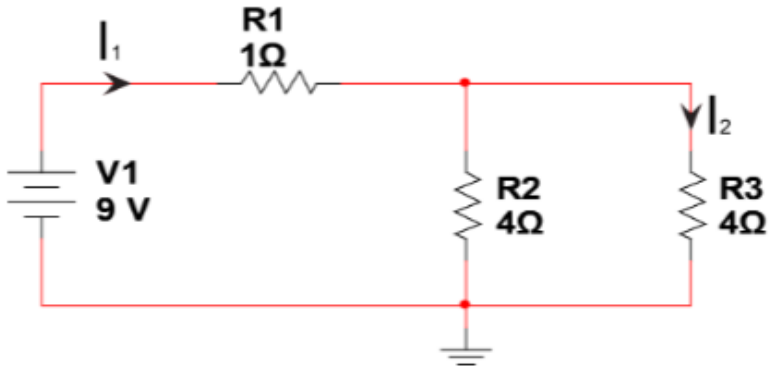

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here

4 Input and Output impedance

4.1 Calculations

4.1 Calculations

Calculate the gain $F = \frac{V_{out}}{V_{in}}$ given the circuit in *Figure 6*. Furthermore, calculate the Thévenin and Norton equivalent (V_{Th}, I_N, R_{Th}) and draw the equivalent circuits.

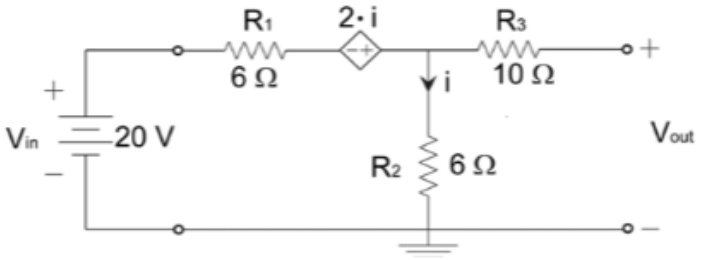

Figure 6. Amplifier circuit.

insert equation here

4.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

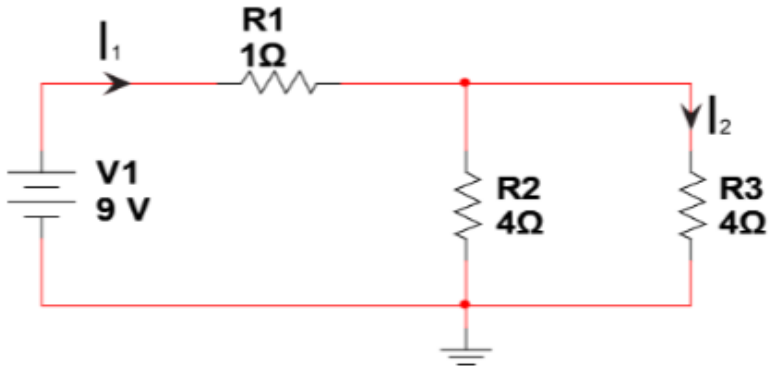

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

4.3 Simulation

Calculate the currents I_1 and I_2 in *Figure 1*.

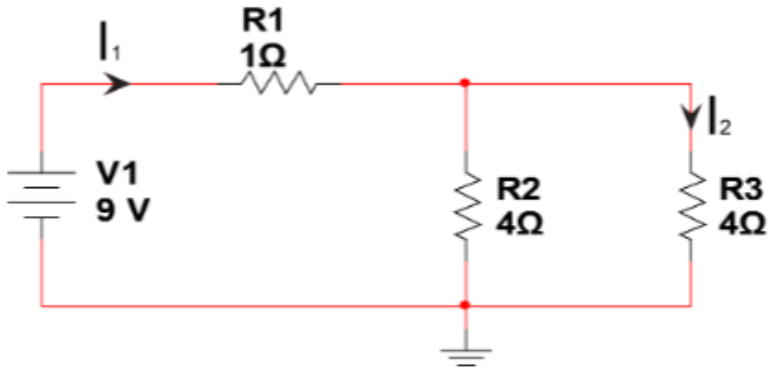

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here

5 Maximal power from a voltage source

5.1 Calculations

Calculate the value of the load resistance R_L for which the maximum power is delivered to the output, V_{Th}=1 V and R_{Th}=50 Ω. *Hint: Express the output power as a function of R_L and find its maximum.*

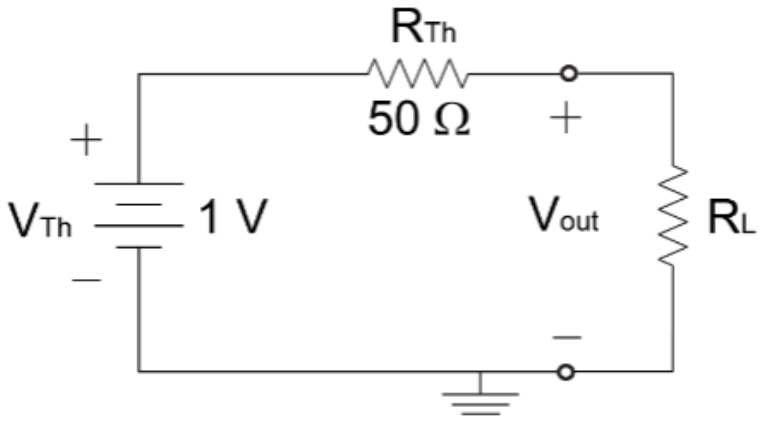

Figure 7. A Thevénin equivalent circuit delivering power to a load resistance R_L.

insert equation here

5.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

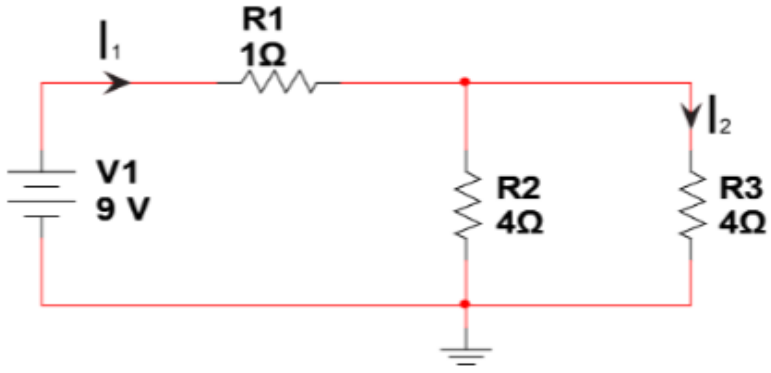

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

5.3 Simulation

Calculate the currents I_1 and I_2 in *Figure 1*.

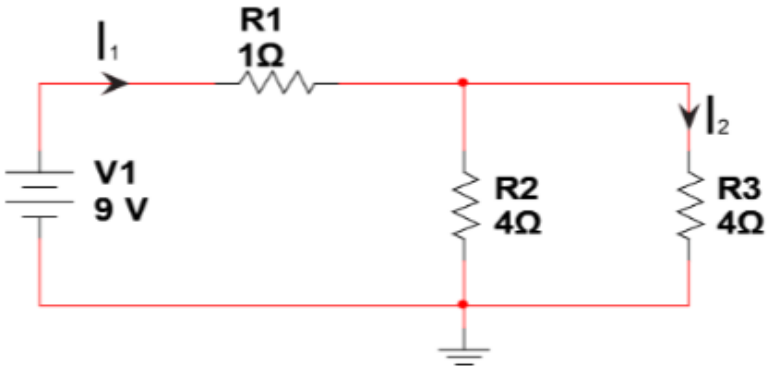

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here

6 Maximum power from a current source

6.1 Calculations

Calculate the output impedance of the circuit in *Figure 8* without any load resistance R_L (open circuit output) and draw the schematics of the Thevénin equivalent circuit. Specify the numerical values of V_{Th} and R_{Th} in your schematics.

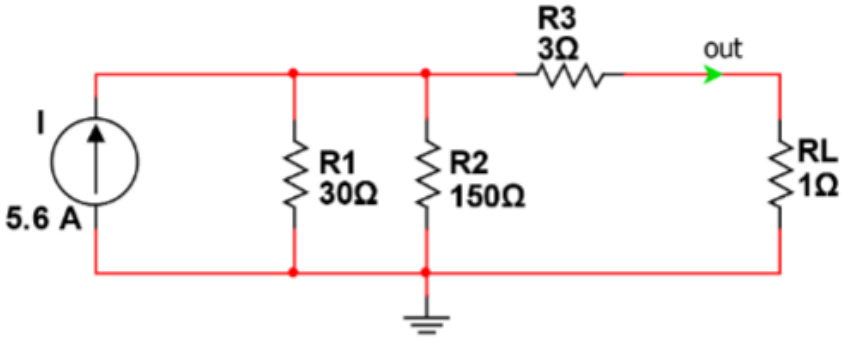

Figure 8. A loaded circuit that can be expressed with a Thevénin equivalent circuit and its load.

insert equation here

6.2 Circuit design

Calculate the currents I_1 and I_2 in *Figure 1*.

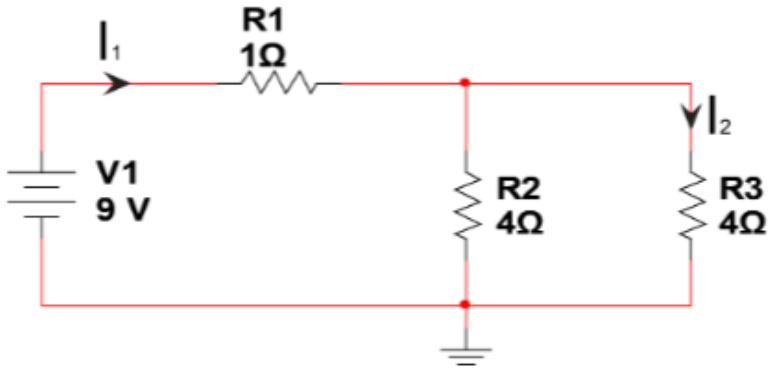

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert maybe description here

6.3 Simulation

Calculate the currents I_1 and I_2 in *Figure 1*.

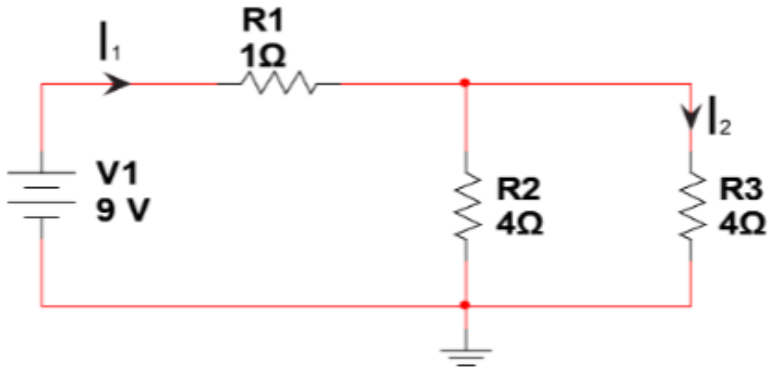

Figure 1. The first circuit to analyze. It consists of a DC voltage source and resistors.

insert analasys here