

# Chapter 4 - Methods of Analysis of Resistive Circuits

Lecture 12  
Section 4.5

MEMS 0031

Learning Objectives

4.5 Mesh Current  
Analysis with  
Independent  
Voltage Sources

Summary

MEMS 0031 Electrical Circuits

Mechanical Engineering and Materials Science Department  
University of Pittsburgh



# Student Learning Objectives

At the end of the lecture, students should be able to:

- ▶ Apply Mesh Current Analysis (MCA) to circuits with independent voltage sources

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# MCA with Independent VS

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- ▶ A “mesh” is a circuit loop that contains no other loops within it
- ▶ A “mesh current” is a circular current around the mesh
- ▶ For  $N$  meshes, we write  $N$  KVL equations
- ▶ Ohm’s law will be used to write voltage drops in terms of mesh currents and resistances
- ▶ MCA only works for planar circuits

Learning Objectives

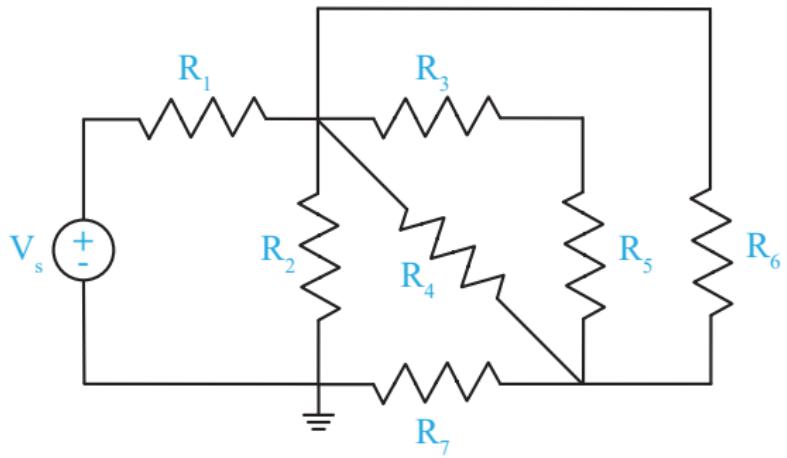
4.5 Mesh Current Analysis with Independent Voltage Sources

Summary



# Mesh Currents

## ► Examples of Mesh Currents:



Learning Objectives

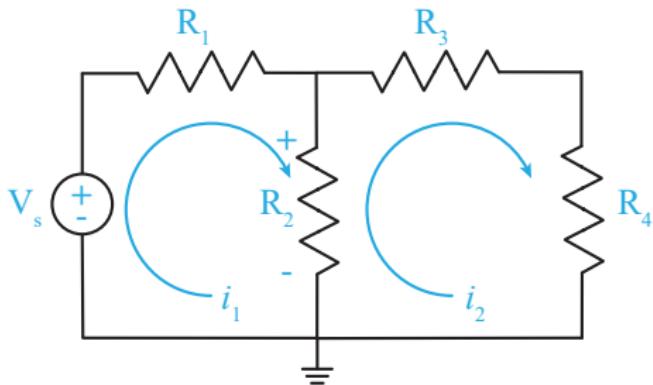
4.5 Mesh Current Analysis with Independent Voltage Sources

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# Single/Multiple Loop Currents

- ▶ What is the shared mesh current?



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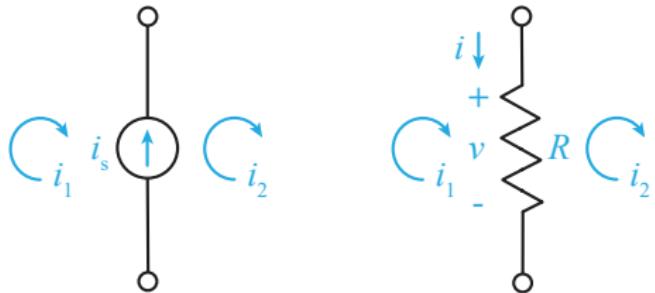
# Shared Loop Currents

- ▶ What is the net resulting current?

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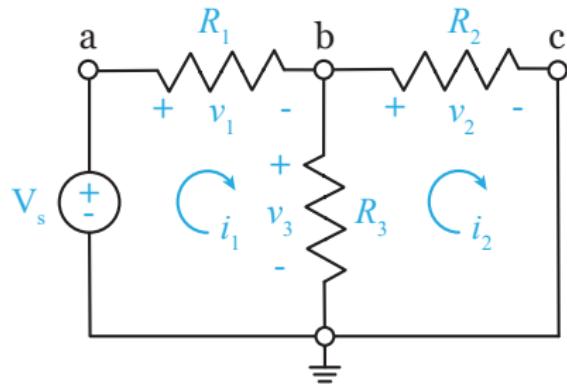
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# Example #1

- ▶ Construct a system of equations to solve for the mesh currents  $i_1$  and  $i_2$ :



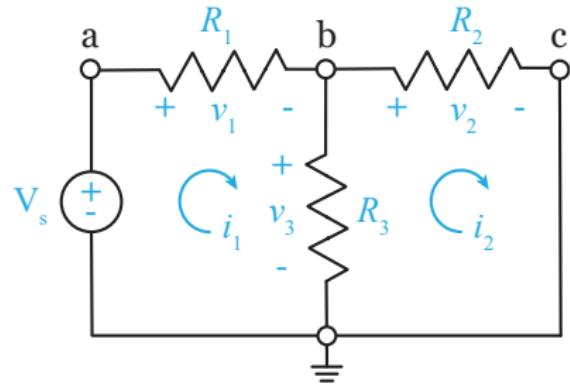
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# Example #1



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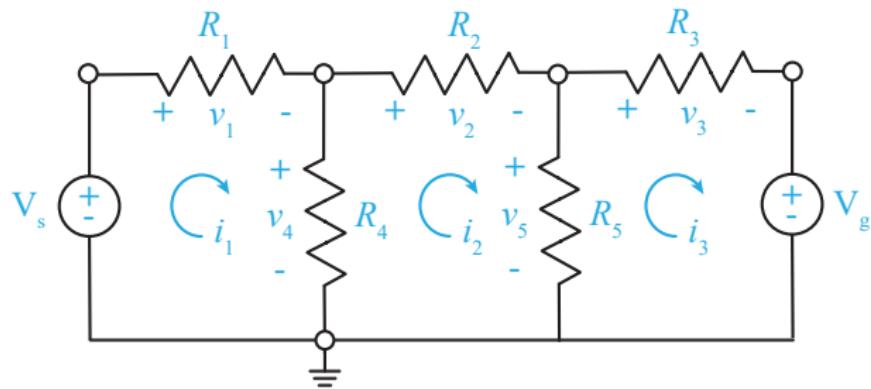
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# Example #2

- ▶ Construct a system of equations to solve for the mesh currents  $i_1$ ,  $i_2$  and  $i_3$ :



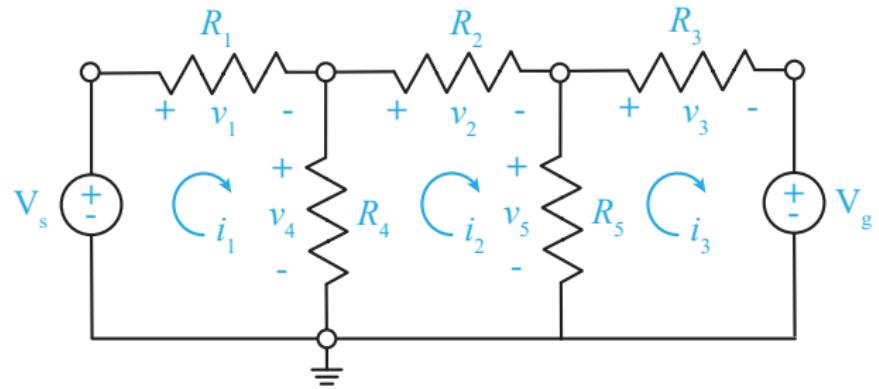
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# Example #2



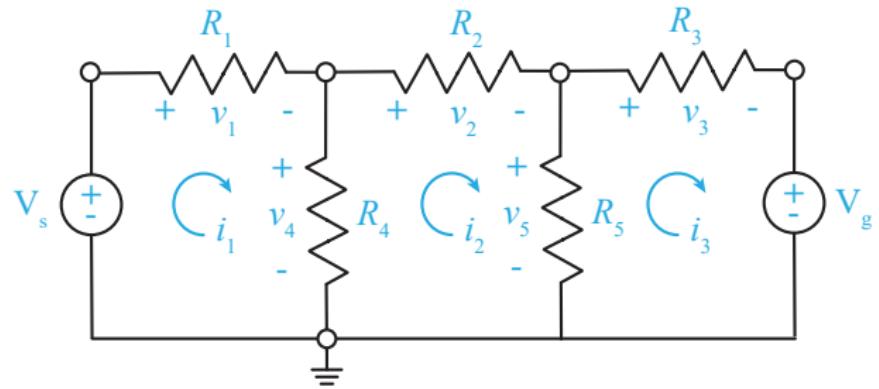
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# Example #2



Learning Objectives

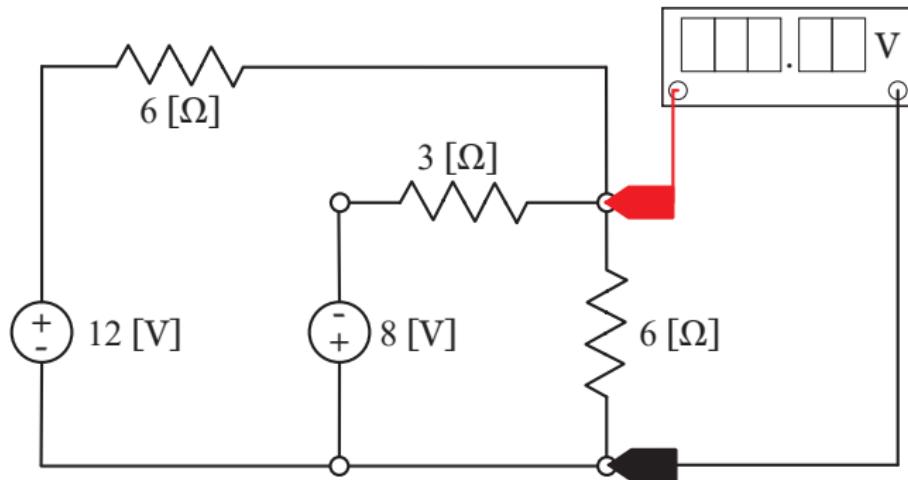
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# Example #3

- Determine the voltage read by the voltmeter:



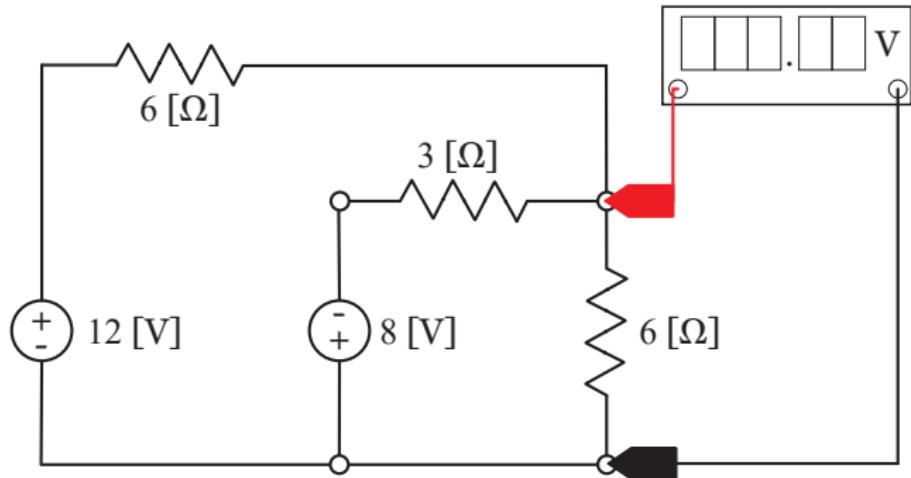
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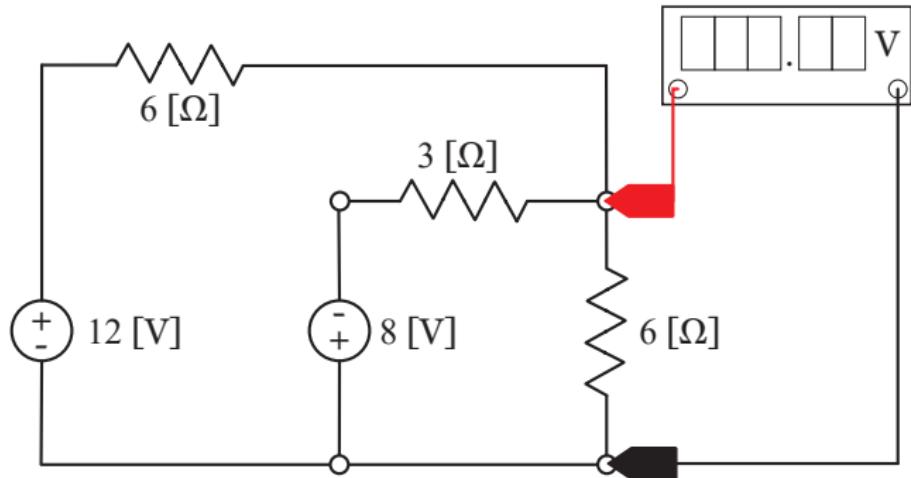
Summary



# Example #3



# Example #3



# Student Learning Objectives

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of Resistive Circuits

At the end of the lecture, students should be able to:

- ▶ Apply Mesh Current Analysis (MCA) to circuits with independent voltage sources
  - ▶ MCA requires us to specific  $N$  KVL loops, and solve for the mesh currents using Ohm's law.

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# Suggested Problems

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- ▶ 4.5-1, 4.5-2, 4.5-4, 4.5-6

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