Learning Objectives

3.4 Parallel Resistors and Current Division

Summary

Chapter 3 - Resistive Circuits

Lecture 7

Section 3.4

MEMS 0031 Electrical Circuits

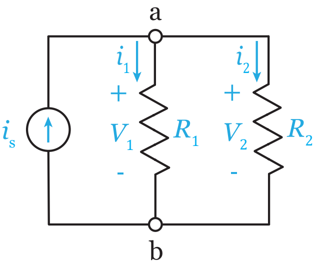
Mechanical Engineering and Materials Science Department
University of Pittsburgh

Student Learning Objectives

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

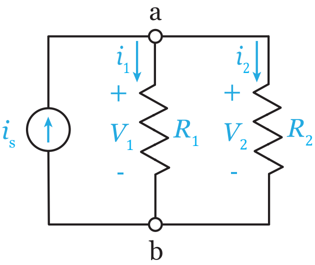
- Construct an expression for voltage drop across parallel resistors and current division through parallel resistors
- Construct equivalent resistance for parallel resistors
- Understand the concept of conductance in its relation to resistance

Parallel Resistors

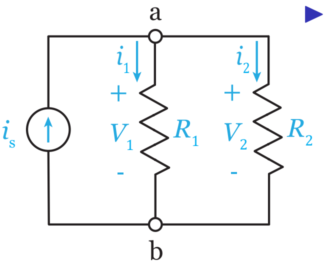


- Devices in parallel have the same voltage potential across them.
- The current is divided between the parallel paths.

Parallel Resistors Cont'd

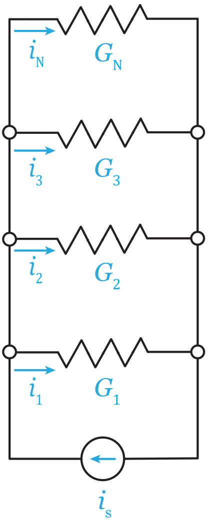


Conductance



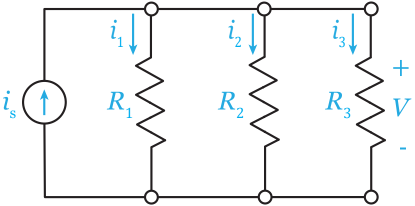
- **Conductance** (G, [S]) has units of Siemens [$1/\Omega$]

General Case

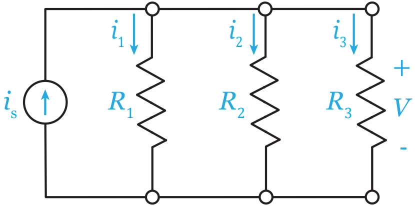


Example #1

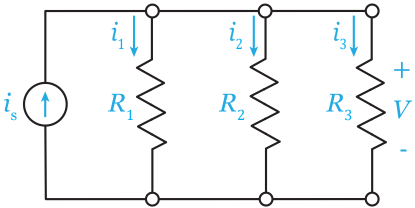
- Find the a) currents through each of the parallel resistors given i_s=28 [A], b) the equivalent resistance, c) the voltage potential across the network if R_1=0.5 [Ω], R_2=0.25 [Ω] and R_3=0.125 [Ω] and d) verify the conservation of power is maintained.



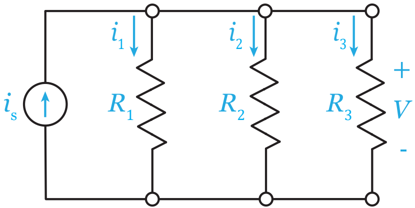
Example #1



Example #1

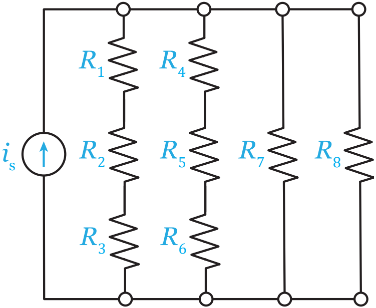


Example #1



Example #2

Find the equivalent resistance of the circuit shown below.



Student Learning Objectives

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

- Construct an expression for voltage drop across parallel resistors and current division through parallel resistors
  - The voltage drop across parallel resistors is the same. That is, resistors in parallel experience the same voltage potential, which is equivalent to the source current times the equivalent resistance of the resistors in a parallel configuration. The current through parallel resistors is expressed as the the resistance of the opposing resistor per the sum of the resistances existing in a parallel configuration, times the sources current.

Student Learning Objectives

- Construct equivalent resistance for parallel resistors
  - Equivalent resistance for parallel resistors is:

$$\frac{1}{R_{eq}} = \sum_{i=1}^{N} \frac{1}{R_i}$$

- Understand the concept of conductance in its relation to resistance
  - Conductance is simply the inverse of resistance, $G=1/R$. It is a measure of how easily a component allows the flow of electricity.

Suggested Problems

- 3.3-4, 3.4-1, 3.4-2, 3.4-4, 3.4-5, 3.4-9