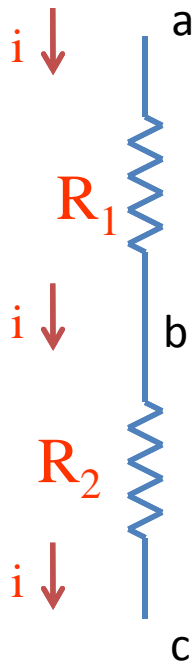# EECS 70A: Network Analysis

Lecture 6

Today's Agenda

- Review of Nodal Analysis

- Mesh Analysis

  – Introduction

    - What is a Mesh?

    - Mesh Current

  – Method

- Mesh Analysis with Current Source

Node Voltage(review)

i ↓

a

R_1

i ↓

b

R_2

i ↓

c

V_{ab} is the voltage drop
across resistor 1

Nodal Analysis(Review)

Based on KCL, Use node voltages as circuits variables.

1. Define a reference node.
2. Label remaining nodes. (n-1 nodes)
3. Apply KCL + ohm to all nodes and supernodes
   1. Express all I's in terms of v's
4. Apply KVL to loops with voltage source
5. Solve the n-1 simultaneous equations, to find V's
6. Use Ohm's law to find the currents.
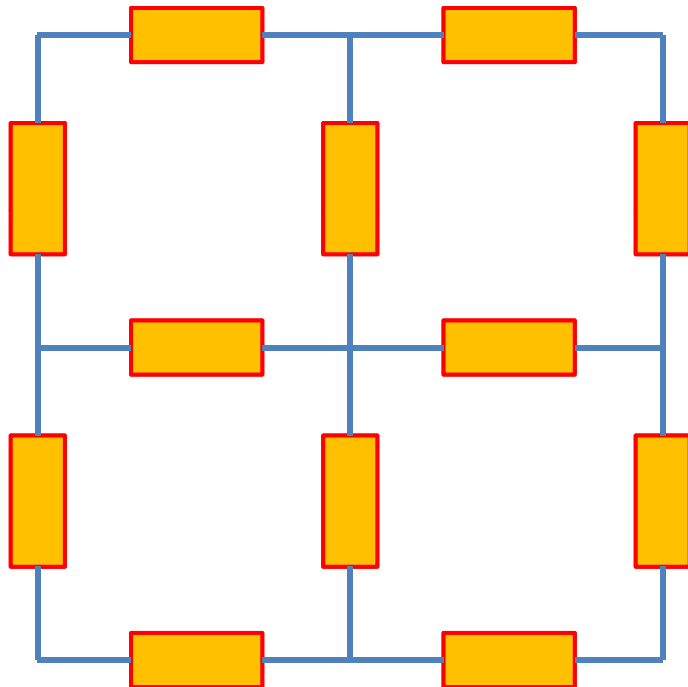
Apply KCL + Ohm to All Nodes and Supernodes
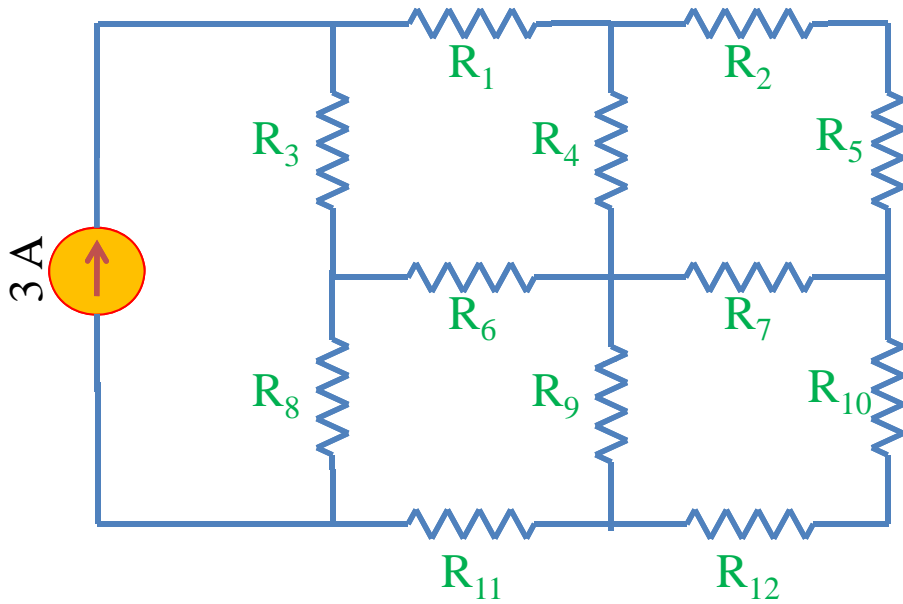
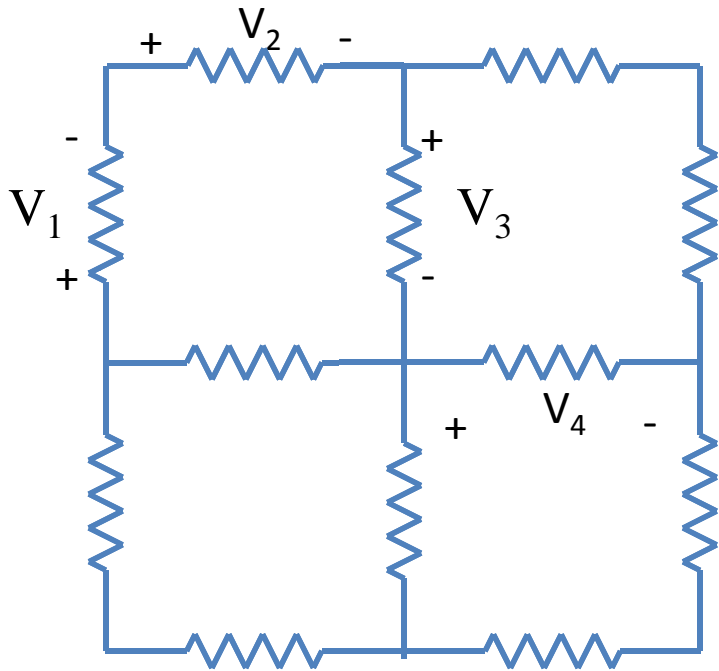# Nodal Analysis-Example
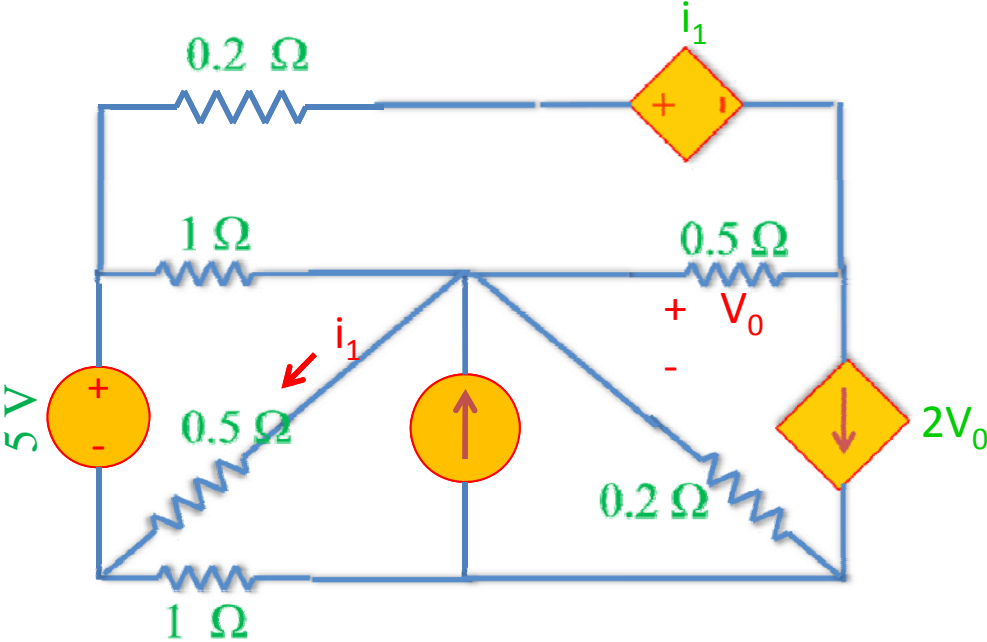
Mesh Analysis-Introduction
What is a Mesh?

- A loop is a closed path with no node passed more than once.

- A mesh is a loop that does not contain any other loops within it.

Mesh Current vs. Element Current

- The current through a mesh is known as mesh current.

- Direction of the mesh current is arbitrary-conventionally assumed to be clockwise.

- The current through an element can be the same as mesh current or the subtraction of two mesh currents.
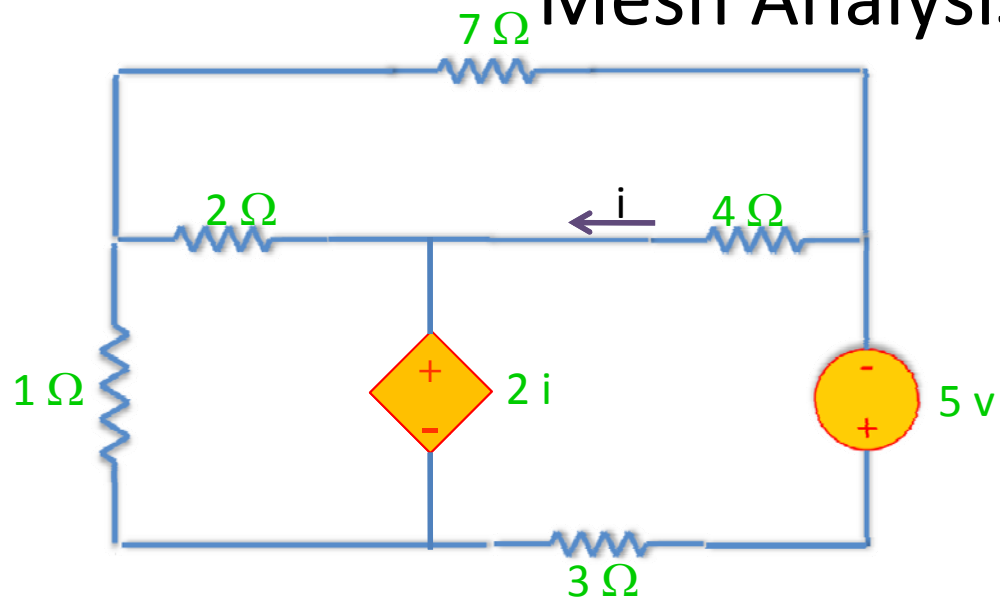
Mesh Analysis-Method

- Assign mesh currents $i_1, i_2, \ldots i_n$
- Apply KVL+ Ohm's law to each mesh
- Solve the equations for $i_1, i_2, \ldots i_n$
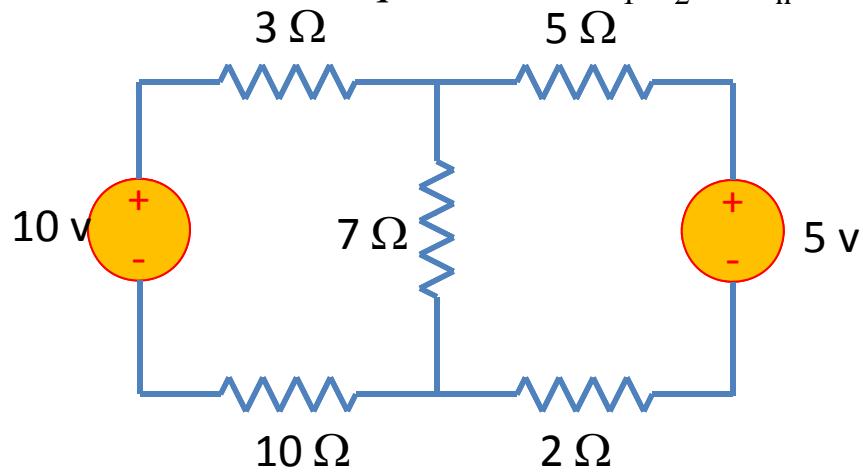
Apply KVL+ Ohm's Law to Each Mesh
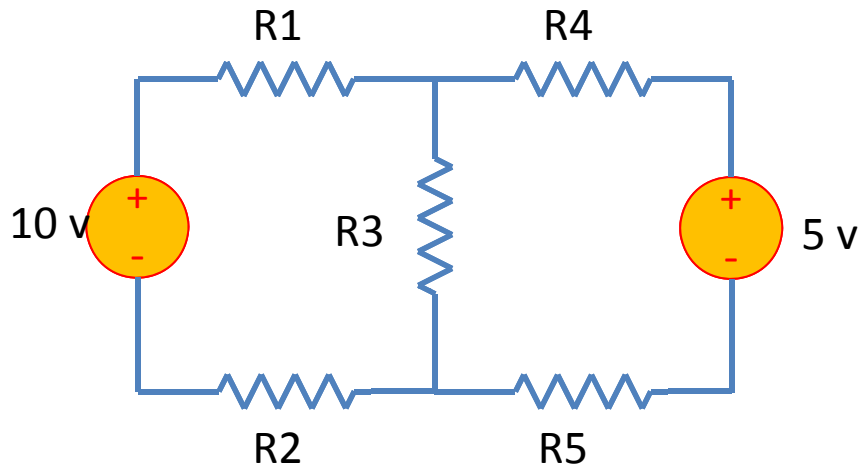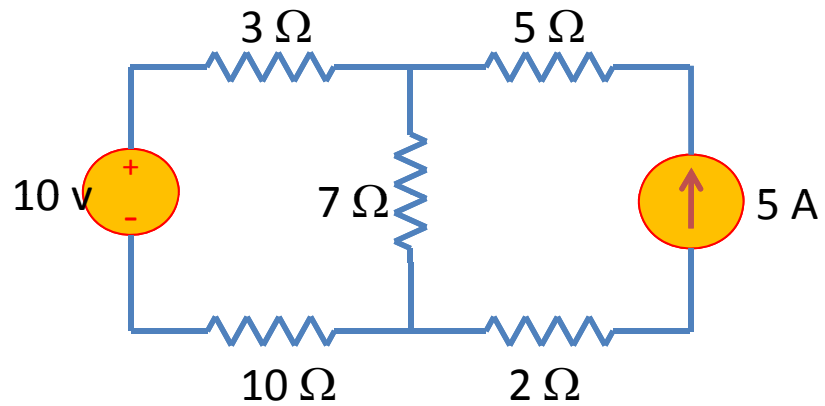
Mesh Analysis - Example

Mesh Analysis with Current Sources

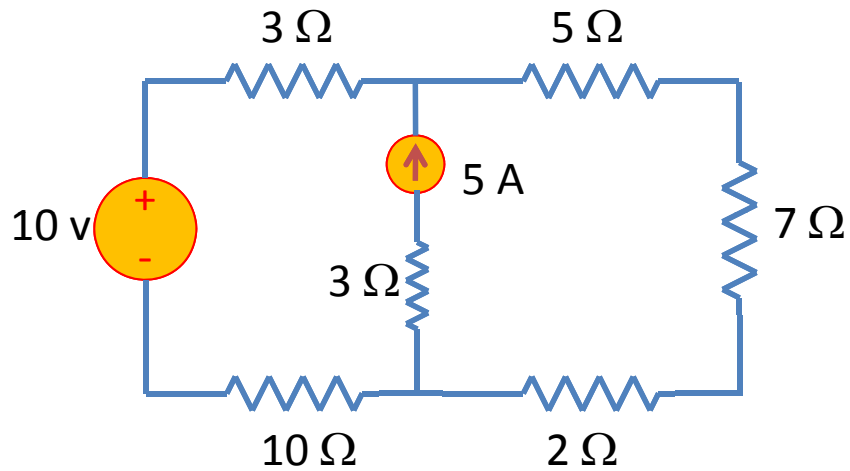- CASE 1: current source only in one mesh.

   already have the current for that mesh => no need to write
   KVL for that mesh

3 Ω   5 Ω
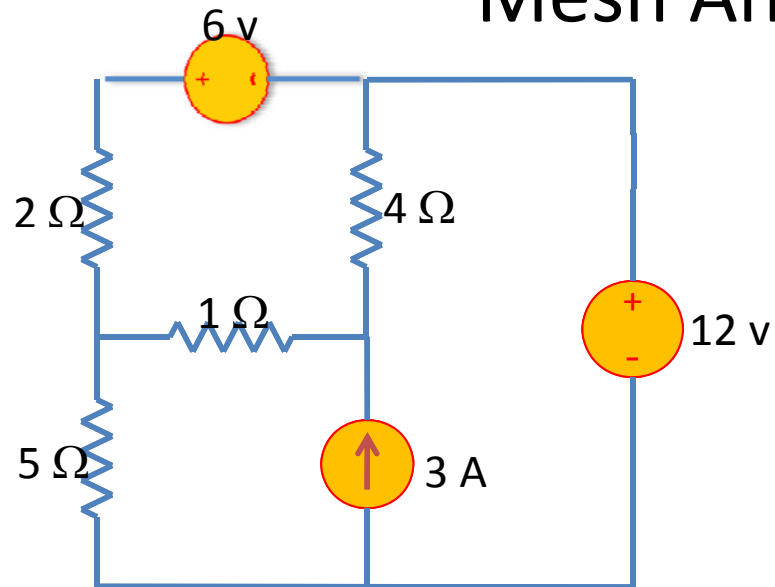
10 v (+/-)   7 Ω   ↑ 5 A
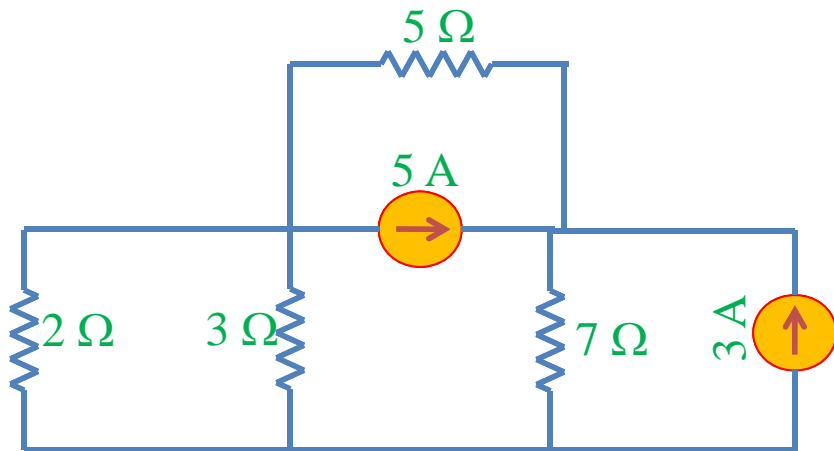
10 Ω   2 Ω

Mesh Analysis with Current Sources

- CASE 2: current source exits between two meshes. => create a supermesh
    - Apply KVL to the supermesh
   - Apply KCL to the supermesh
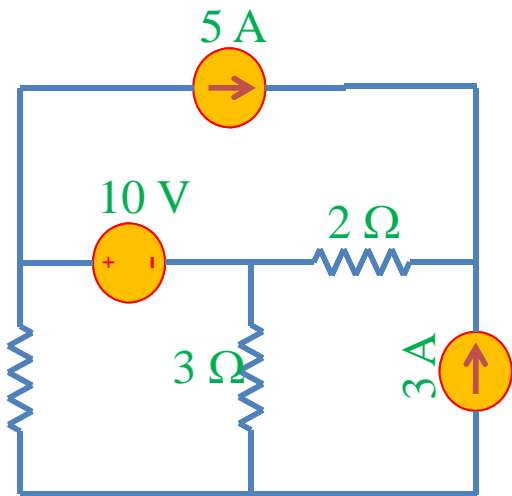

3 Ω   5 Ω

10 v   +   -
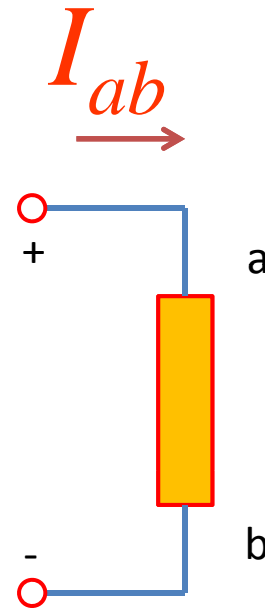
5 A

3 Ω

7 Ω

10 Ω   2 Ω
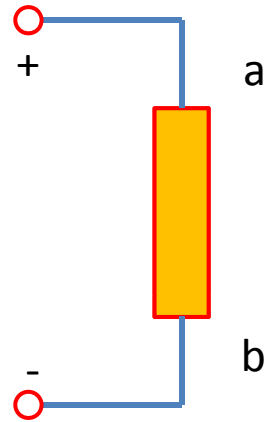
Mesh Analysis- Example
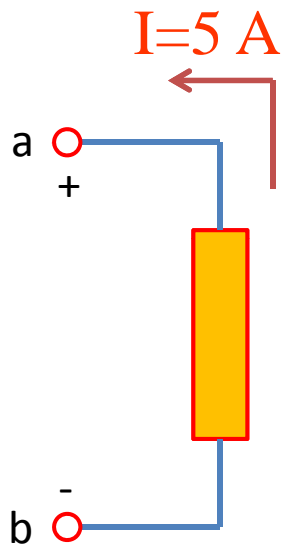
Mesh Analysis- Example
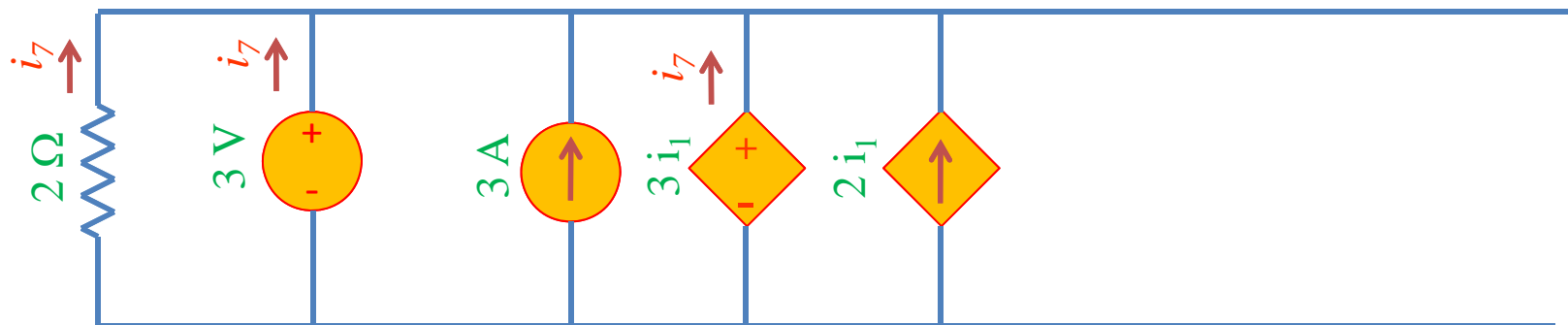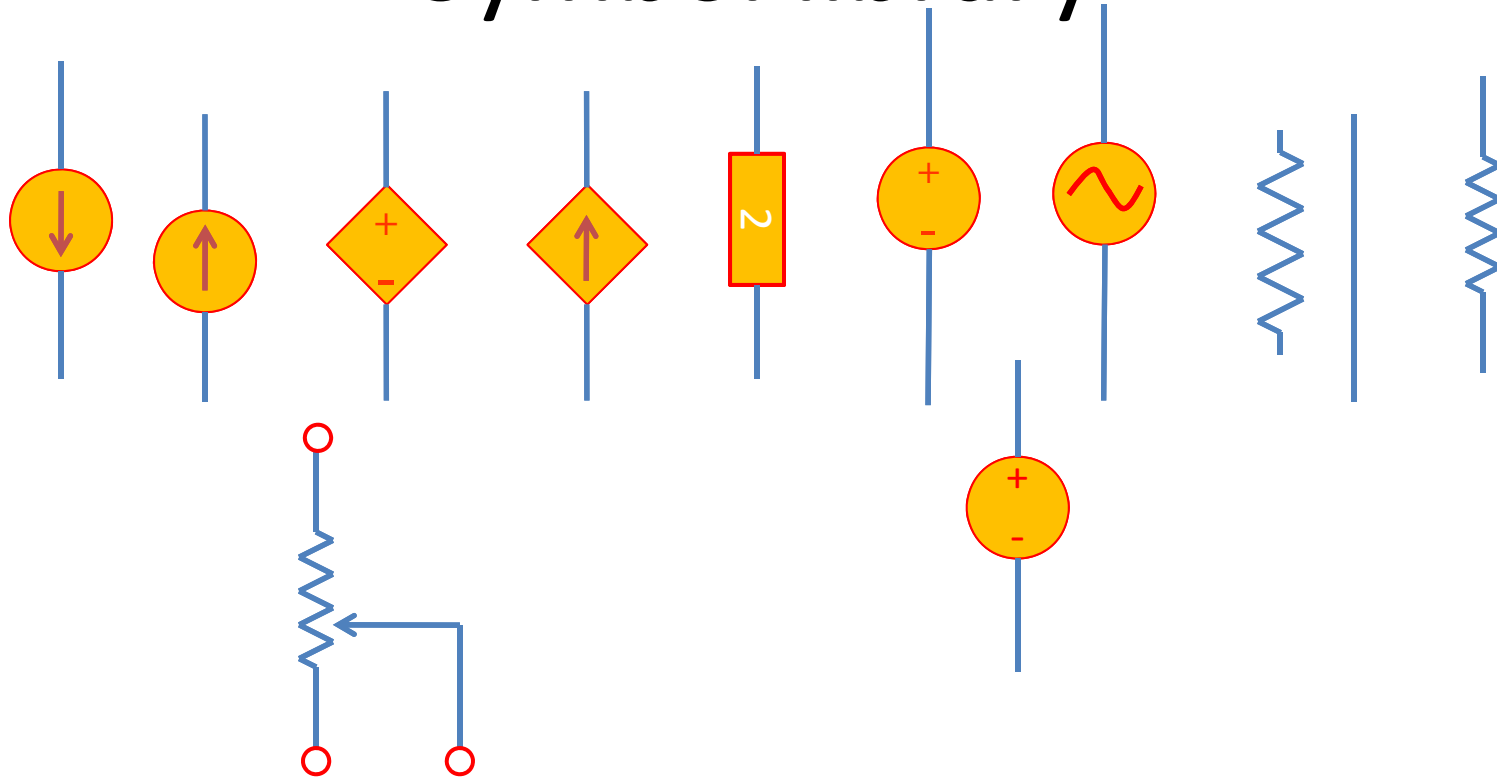
Nodal Versus Mesh Analysis

- The method that results in fewer number of equations is more suitable.
  - Mesh analysis for networks with many series connected elements
  - Nodal Analysis for networks with many parallel connected elements

  But also depends on the type of the sources.
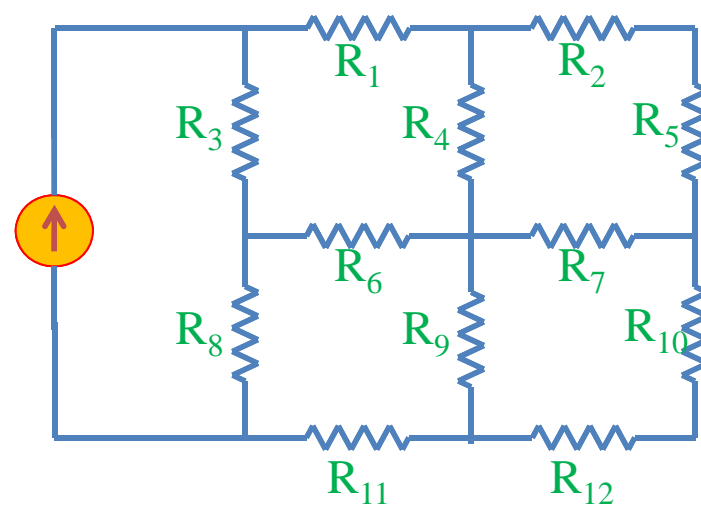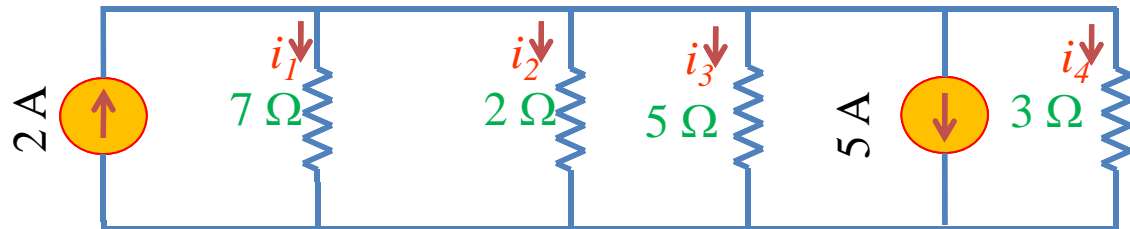
Symbol library

Symbol library

Symbol & circuit library