Schedule…

Date	Day	Class No.	Title	Chapters	HW Due date	Lab Due date	Exam
1 Sept	Mon		Labor Day			NO LAB	
2 Sept	Tue					NO LAB	
3 Sept	Wed	1	Fundamentals	2.1			
4 Sept	Thu						
5 Sept	Fri		**NO** Recitation				
6 Sept	Sat						
7 Sept	Sun						
8 Sept	Mon	2	Kirchoff's Laws	2.2 – 2.3		NO LAB	
9 Sept	Tue					NO LAB	

Small and Simple

Alma 37:6

6 Now ye may suppose that this is foolishness in me; but behold I say unto you, that by small and simple things are great things brought to pass; and small means in many instances doth confound the wise.

Lecture 1 – Fundamentals of Electrical Circuits

Important Concepts

- Ideal/Dependent voltage sources
- Ideal/Dependent current sources
- Electrical Networks
  - Branches
  - Nodes
  - Loops
  - Meshes

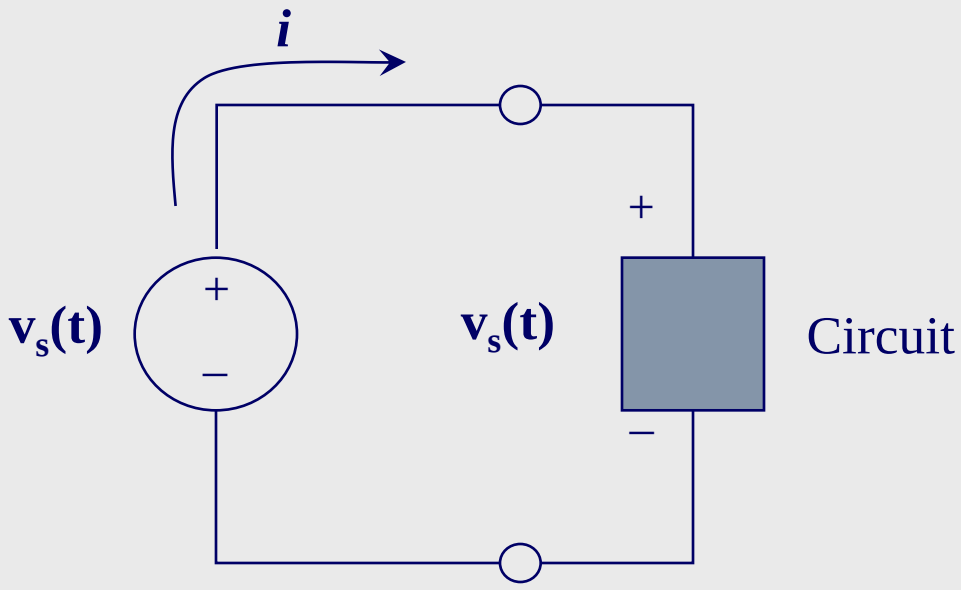
Ideal Voltage Sources

- An electric device that generates a prescribed voltage

- Provides a prescribed voltage across its terminals irrespective of the current flowing through it. The amount of current supplied by the source is determined by the circuit connected to it

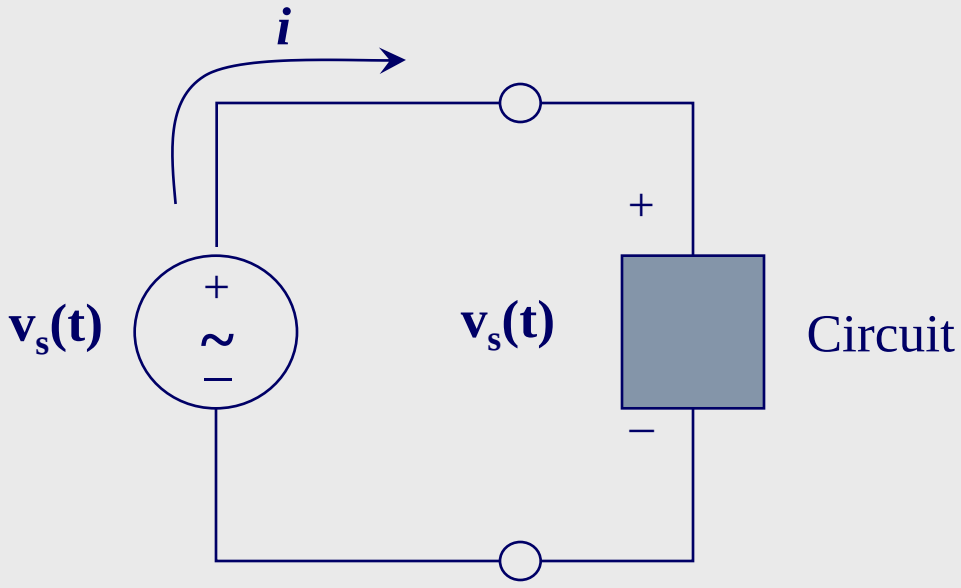
Ideal Voltage Sources

- Time-dependent voltage source
  - Voltage as a function of time t
  - Lowercase **v** usually connotes AC source



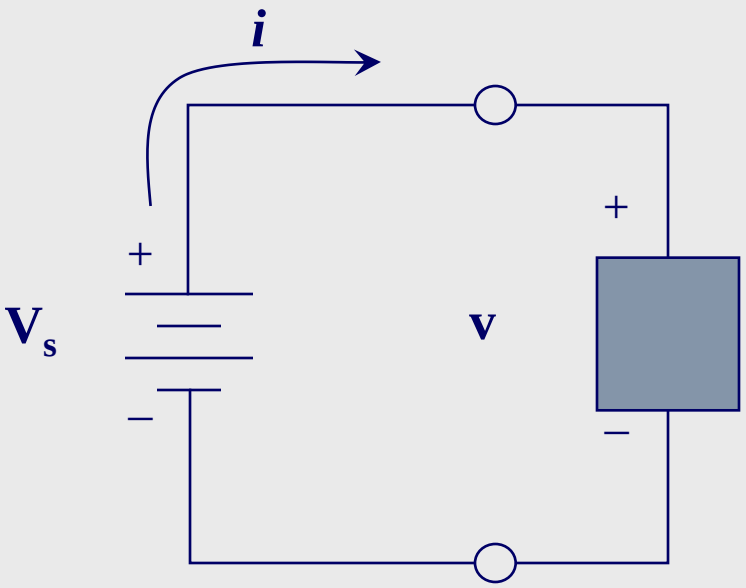
Ideal Voltage Sources

- Time-dependent voltage source – special case: sinusoidal
  - Voltage as a function of time t
    - IE: $\mathbf{v_s(t) = V\cos(\omega t)}$
  - Lowercase v usually connotes AC source



Ideal Voltage Sources

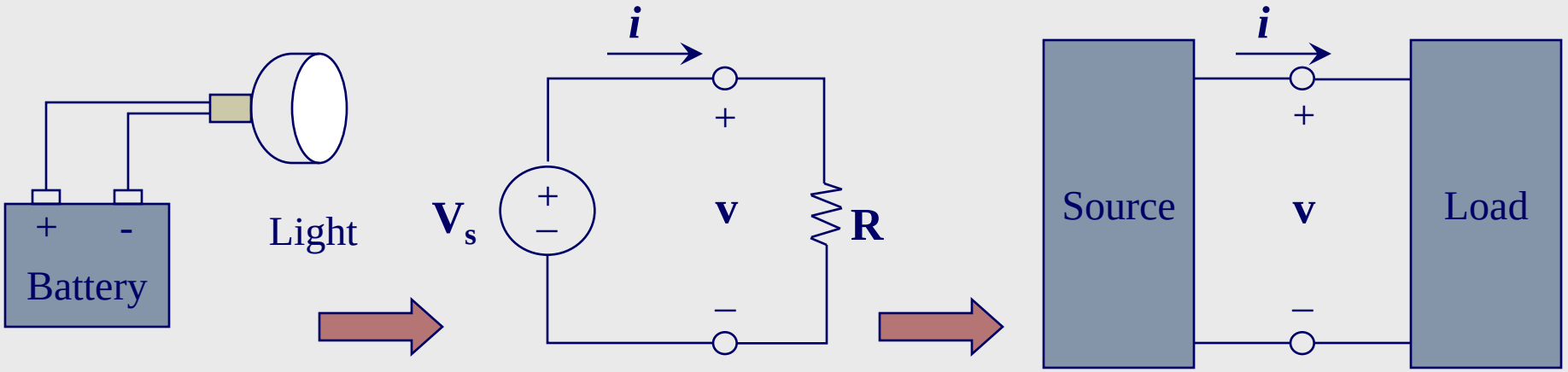
- DC voltage source
  - Voltage is not a function of time
  - Capital V connotes DC voltage
  - DC voltage source example: **a battery**



A generic voltage is denoted by just a lowercase **v**

Ideal Voltage Sources

- Source-load representation



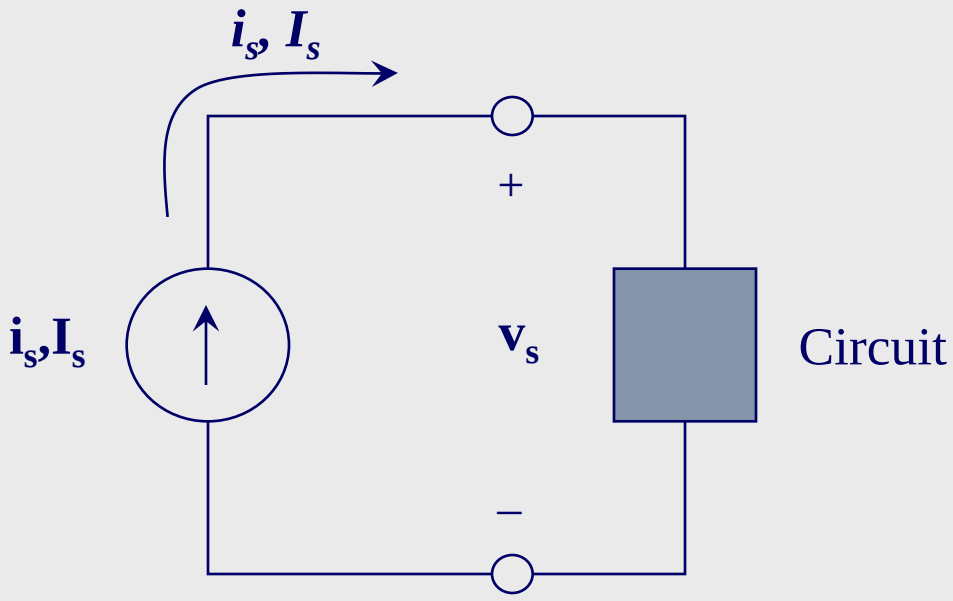
Ideal Current Sources

- An electric device that generates a prescribed current

- Provides a prescribed current to any circuit connected to it. The voltage generated by the source is determined by the circuit connected to it.

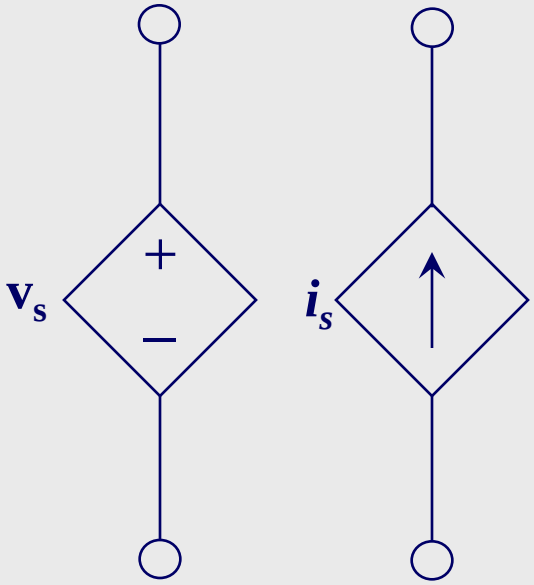
Ideal Current Sources

- Lowercase ***i*** connotes AC current
- Capital ***I*** connotes DC current



Dependent (Controlled) Sources

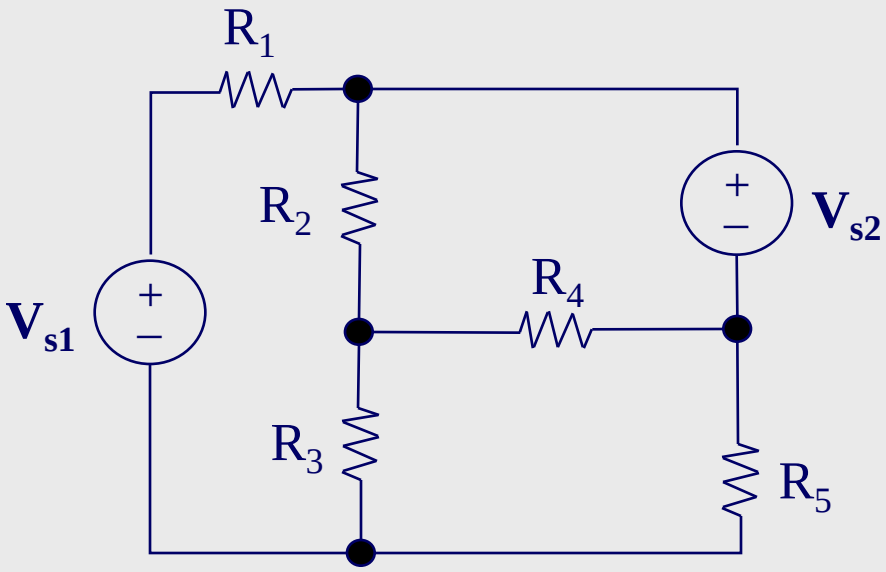
- Diamond shaped source indicates dependent source
- Dependent sources are an important part of amplifiers



Source Type	Relationship
Voltage controlled voltage source (**VCVS**)	$v_s = av_x$
Current controlled voltage source (**CCVS**)	$v_s = ai_x$
Voltage controlled current source (**VCCS**)	$i_s = av_x$
Current controlled current source (**CCCS**)	$i_s = ai_x$

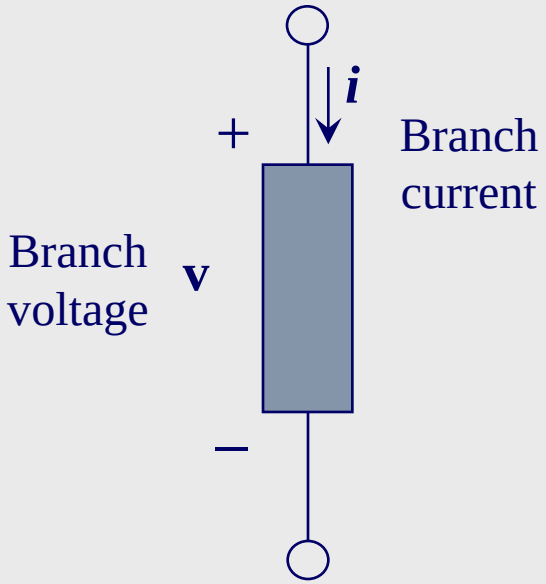
Electrical Network

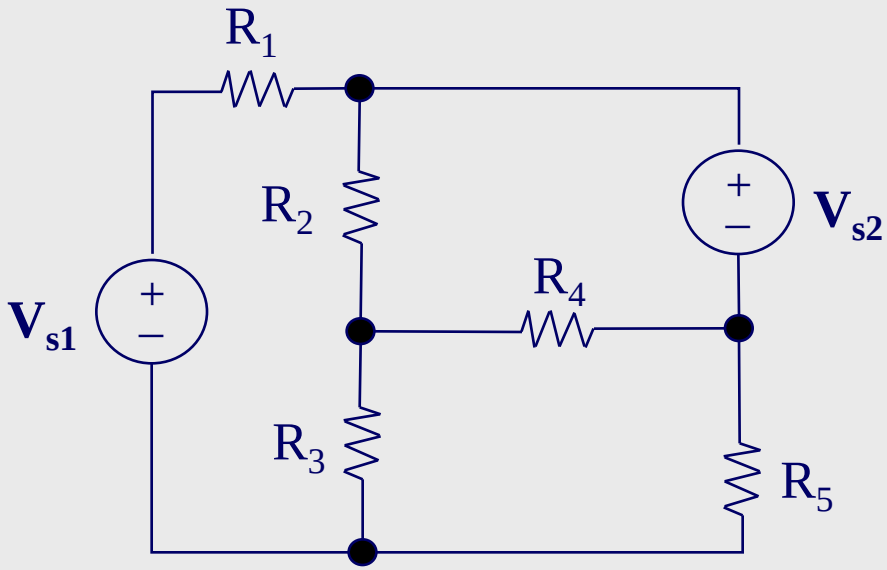
- A collection of elements through which current flows



Electrical Network - Branches

- Any portion of a circuit with two terminals connected to it.
- May consist of one or more circuit elements





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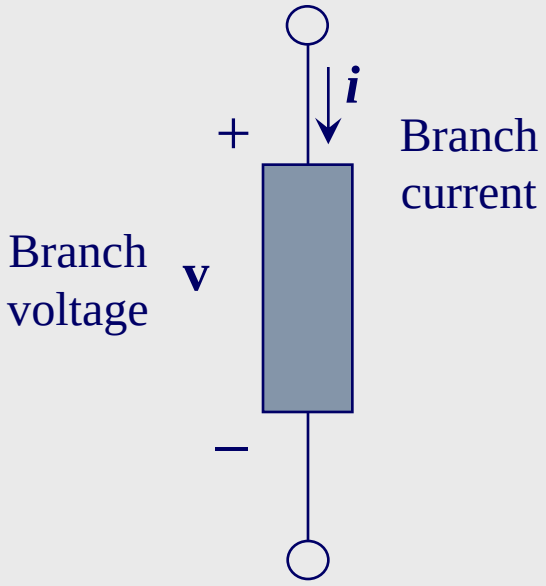
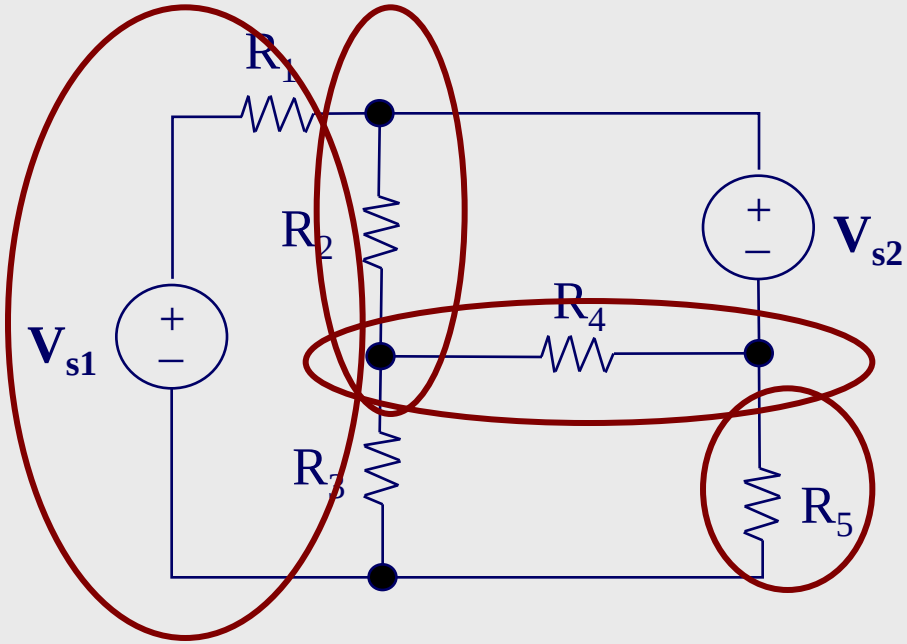
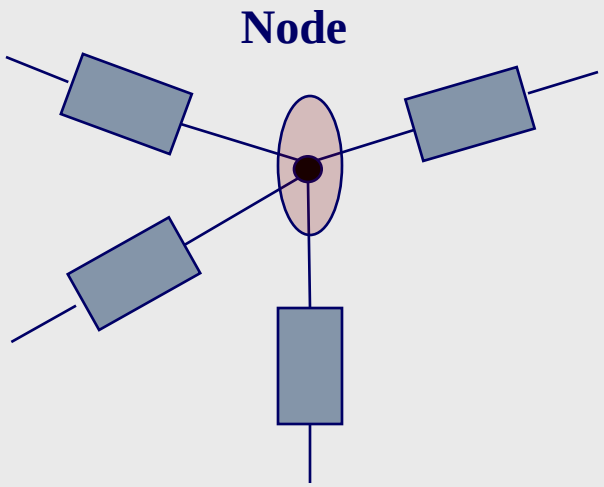
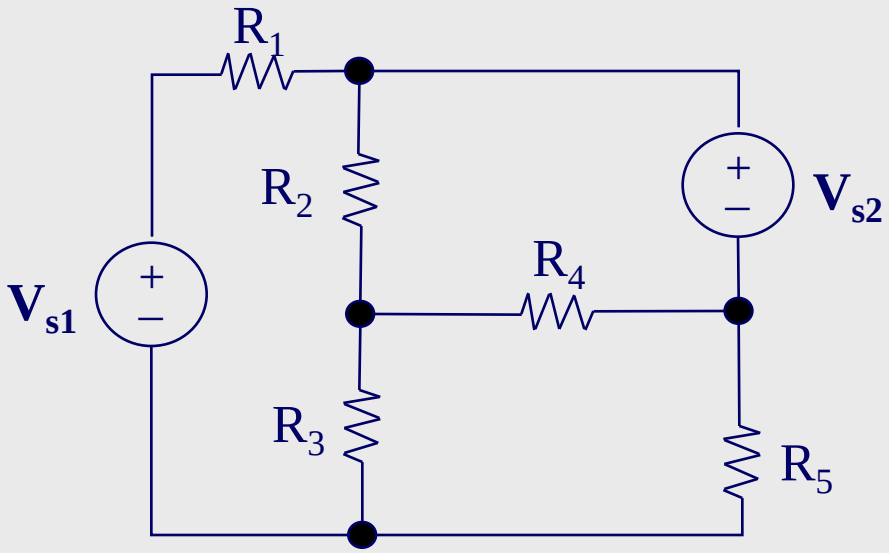




Electrical Network - Nodes

- The junction of two or more branches
- Trivial Node: the junction of only two branches





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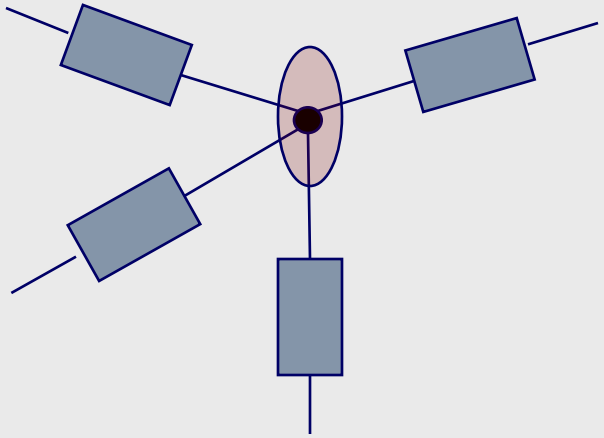
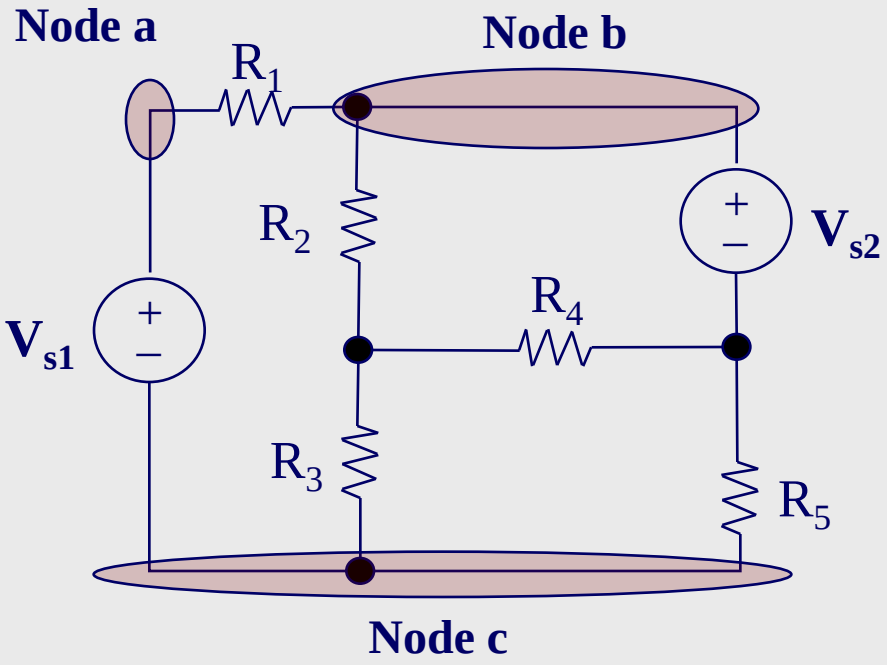
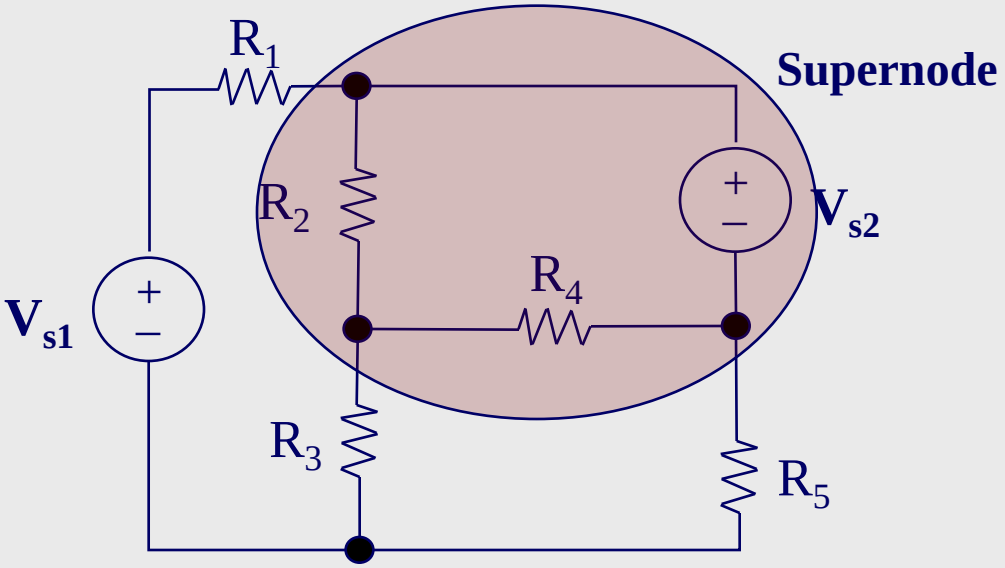




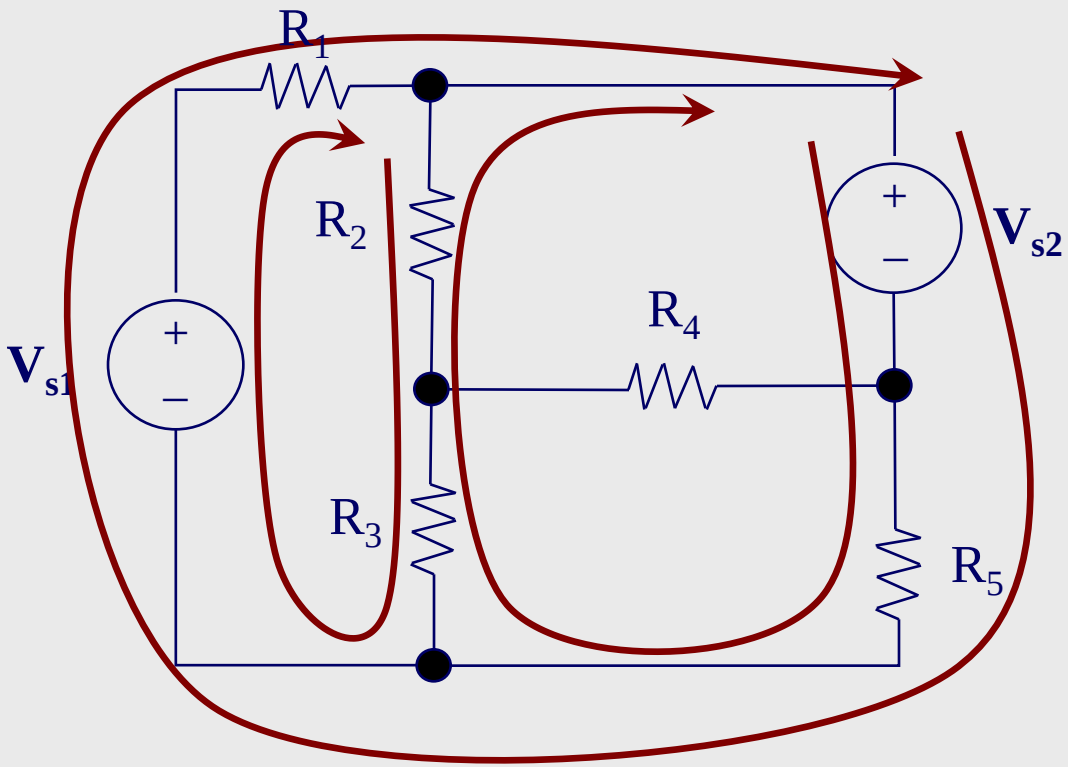
Electrical Network – Supernodes

- Obtained by defining a region that encloses more than one node
- Can be treated the exact same way as normal nodes



Electrical Network – Loops

- Any enclosed connection of branches



Electrical Network – Meshes

- A loop that does not contain other loops