Module I: DC Circuits 6 Hrs

Basic circuit elements and sources; Ohms law, Kirchhoff's laws; Series and parallel connection of circuit elements; Source transformation; Node voltage analysis; Mesh current analysis; Maximum power transfer theorem

CO1:

Evaluate DC and AC circuit parameters using various laws and theorems

Module 1

Evaluate DC circuit parameters using various laws and theorems

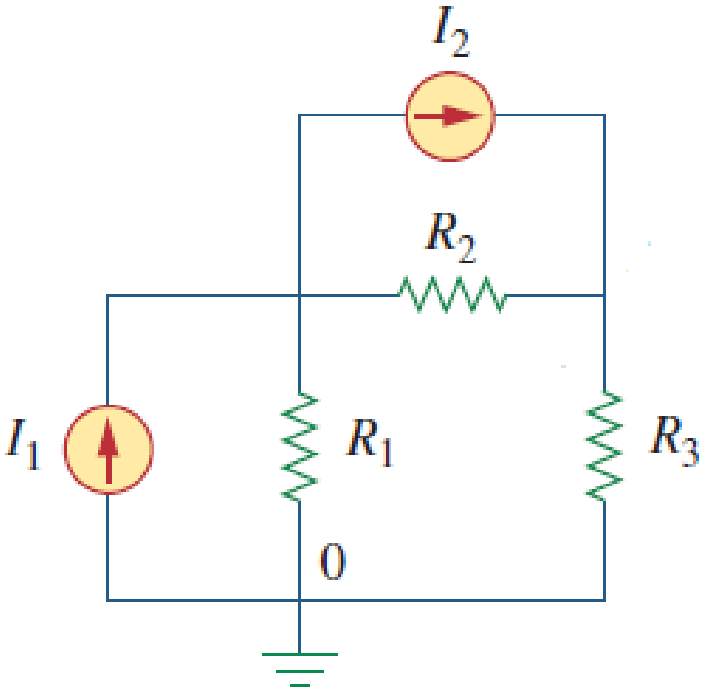
Nodal analysis

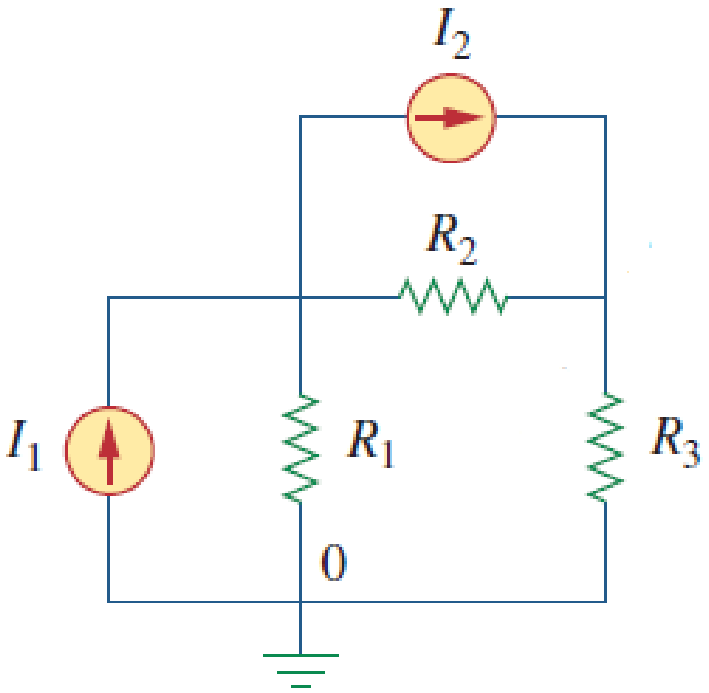
- Node voltages as the circuit variables
- Kirchhoff's current law
- Node is a point of connection between two or more branches
- Branch represents any two terminal element

Steps

- Select a node as the reference node
- Assign voltages V_1, V_2, ----- V_n to the remaining N-1 nodes
- Apply Kirchhoff's current law to each of the n-1 non-reference nodes
- Use Ohm's law to express the branch currents in terms of node voltages
- Solve the resulting simultaneous equations

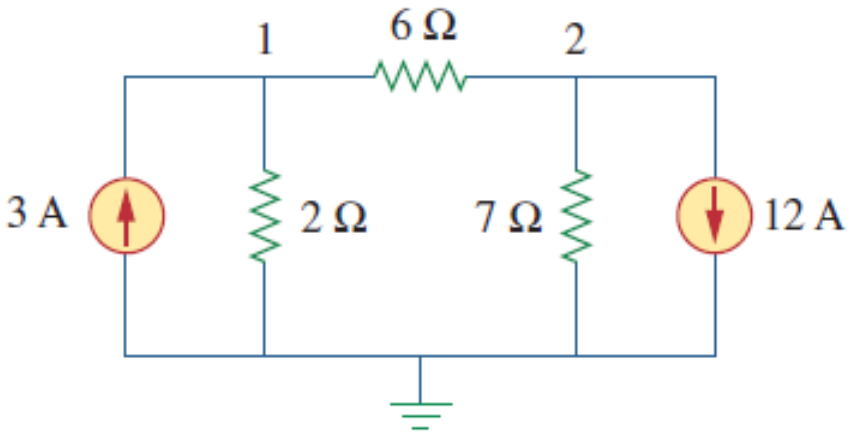
Example 1

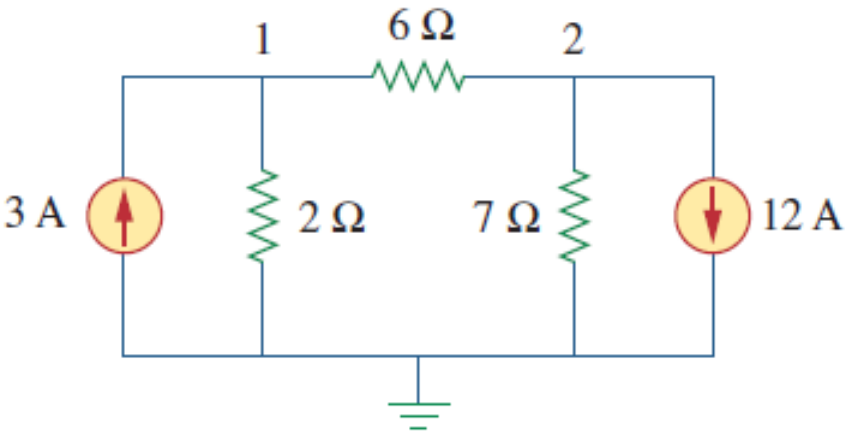



I_2
R_2
I_1
R_1
R_3
0

Example 2

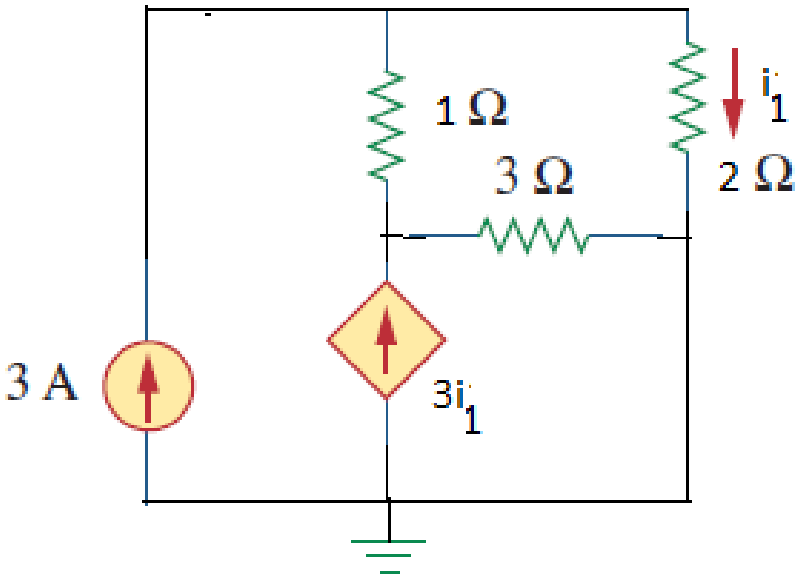
Obtain the nodal voltages



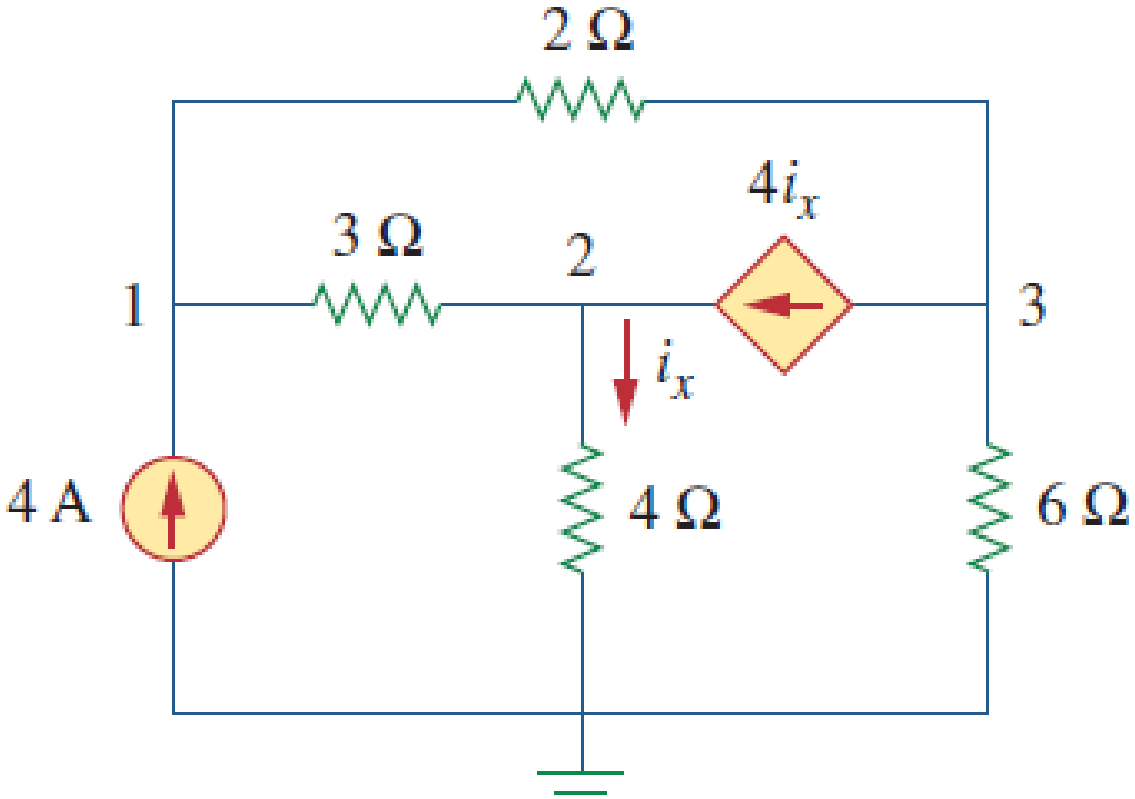

1
6 Ω
2
3 A
2 Ω
7 Ω
12 A

Example 3

Determine the nodal voltages



Exercise 1
Find the nodal voltages



Ans: $V_1 = 32$ V; $V_2 = -25.6$ V; $V_3 = 62.4$ V