Mesh Current Analysis

Network reduction technique

Class 5 - 6 November 2021

Introduction

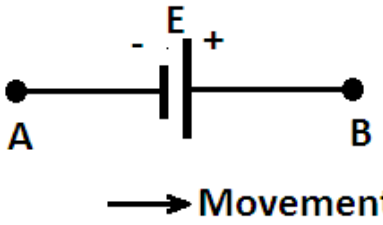
Mesh

- A closed path for the flow of current

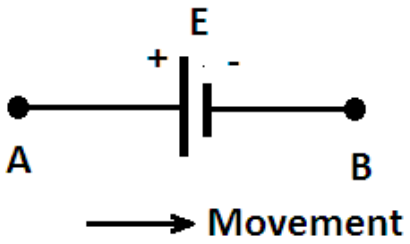
Kirchhoff's Voltage Law (KVL)

- The algebraic sum of voltages in a mesh is zero

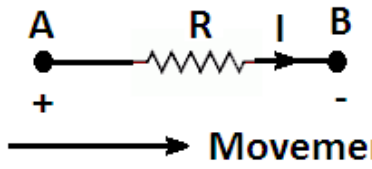
Sign Conventions for Kirchoff's Voltage Law (KVL)



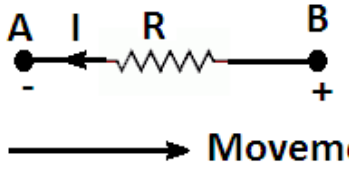
Rise in potential, because we are going negative terminal of the battery to postive terminal.
Therefore, EMF = + E



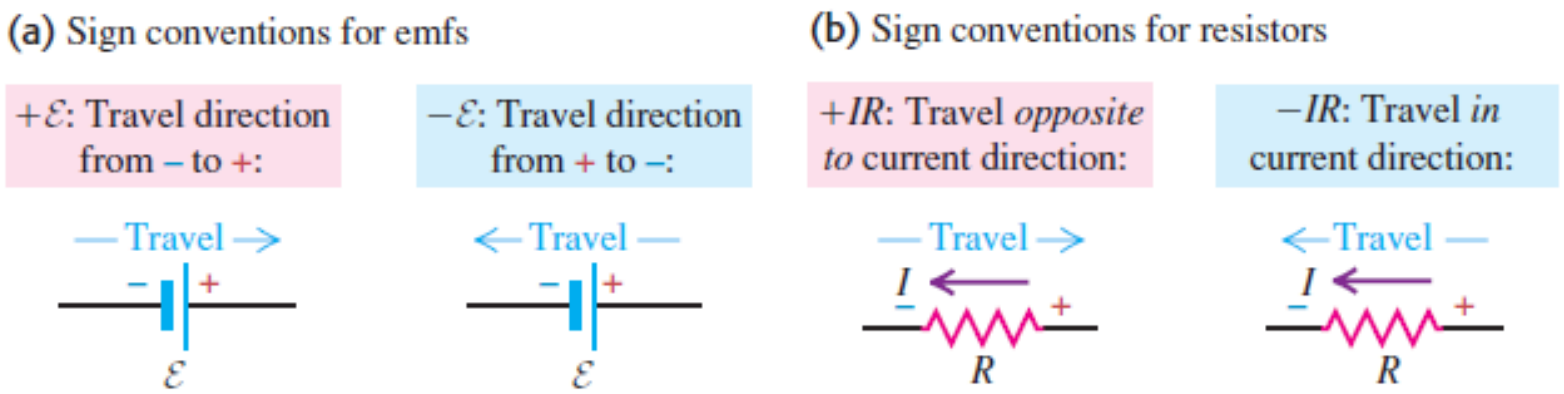
Fall in potential, because we are going postive terminal of the battery to negative terminal.
Therefore, EMF = - E



Fall in potential, because we are going in the direction of current.
Therefore, voltage drop = - IR

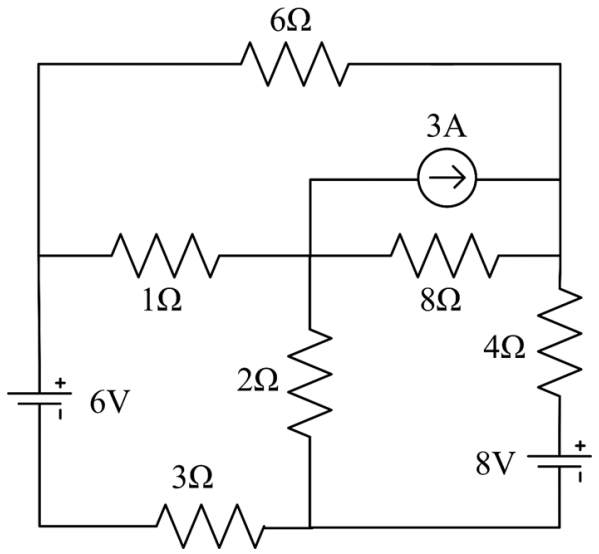


Rise in potential, because we are going in opposite direction of current.
Therefore, voltage drop = + IR



Mesh Current Analysis Method

- Transform all the current sources present in the circuit to voltage sources
- Mark different currents in all the independent meshes of the given network
- Write KVL equations for these independent meshes
- Solve for the currents



Determine the power drawn by 2Ω resistor using mesh current analysis

Illustration 1

Determine the power drawn by 2Ω resistor using mesh current analysis

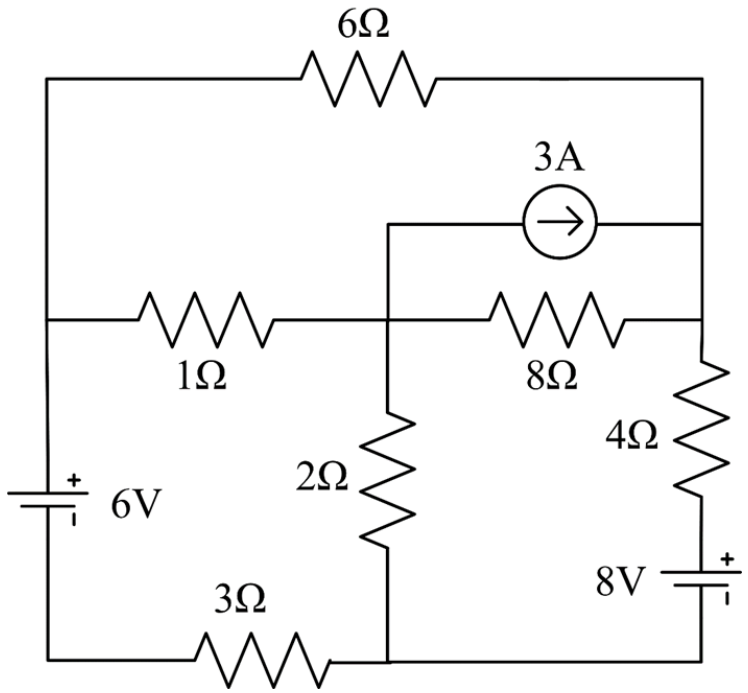
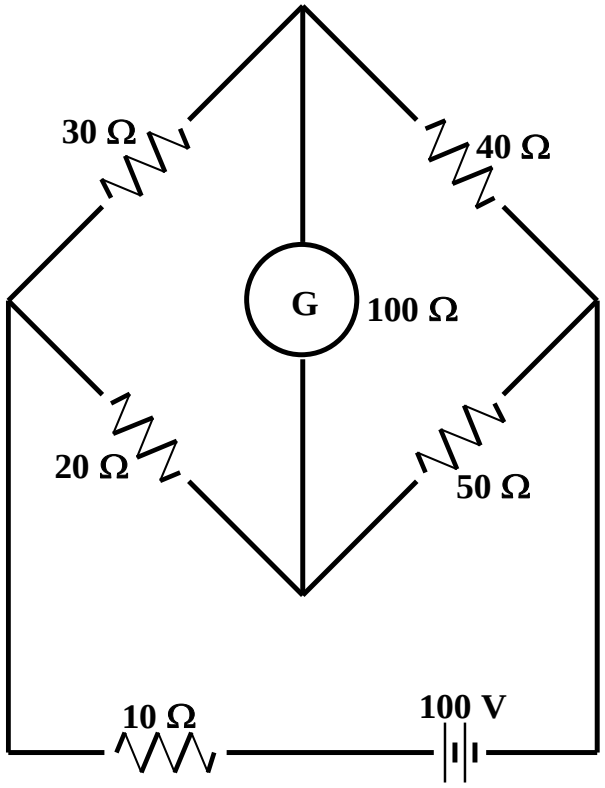


Illustration 2

Determine the current through the galvanometer "**G**". Also, write network equations using inspection method



$I_G = 0.0844$ A

Illustration 3

Realize the network defined by mesh current equation

$$\begin{bmatrix} 30 & -20 & 0 \\ -20 & 50 & -20 \\ 0 & -20 & 20 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \\ i_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ -20 \end{bmatrix}$$

Illustration 4

Find the power supplied by the 5 A current source. Also, determine the voltage between the points M & N.

Quiz

The value of current I in the circuit is

a) 1 A

b) 2 A

c) 0.5 A

d) 0.25 A

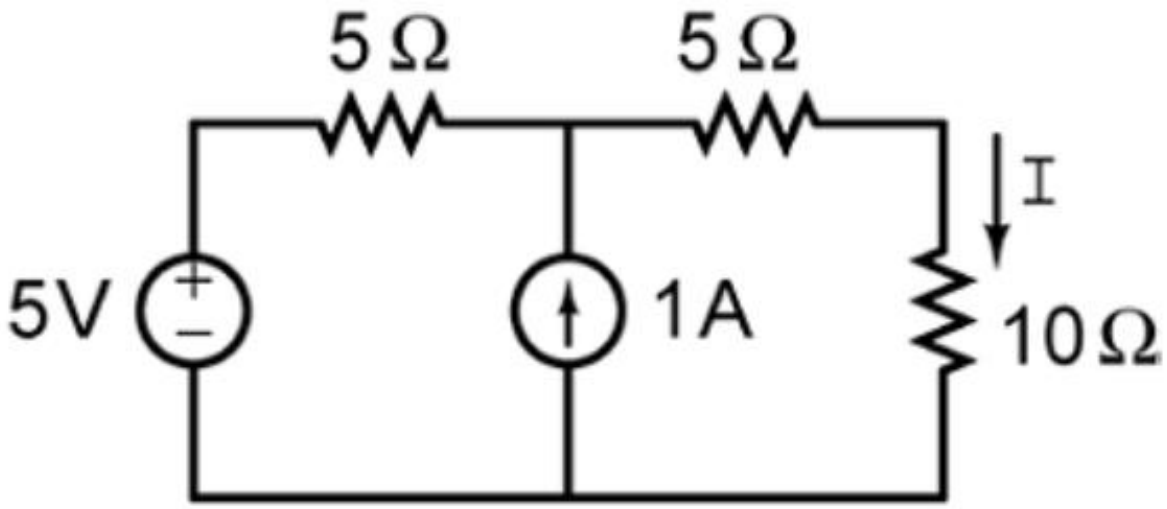
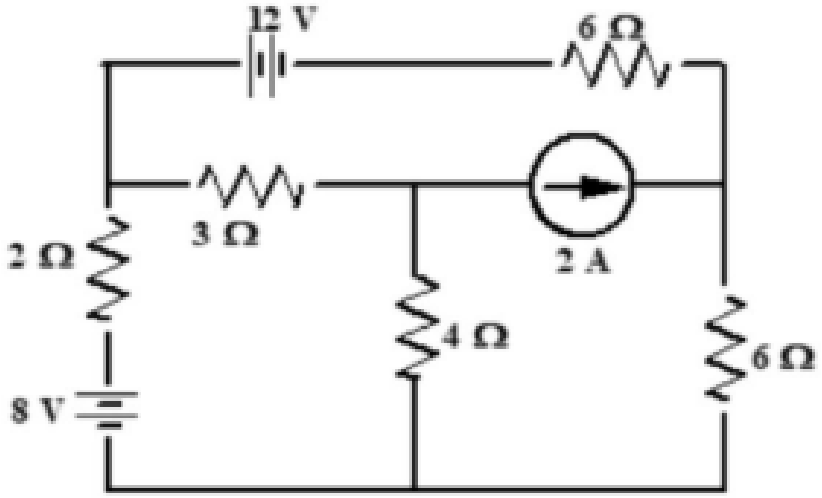


Illustration 5

Find the power supplied by 2A current source using mesh current analysis.



Quiz

The current supplied by the voltage source is

a) 2 A

b) 3 A

c) 1 A

d) 0 A