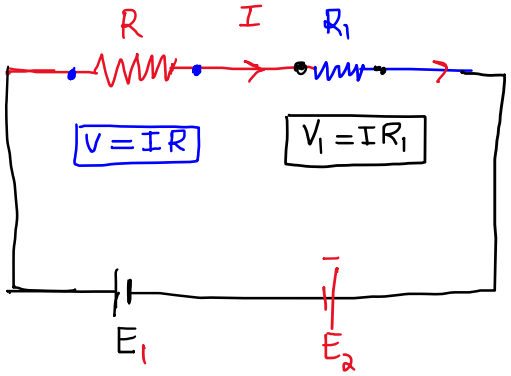
Applications of Linear System

Linear Equation and Network Circuits

Ohm Law:-

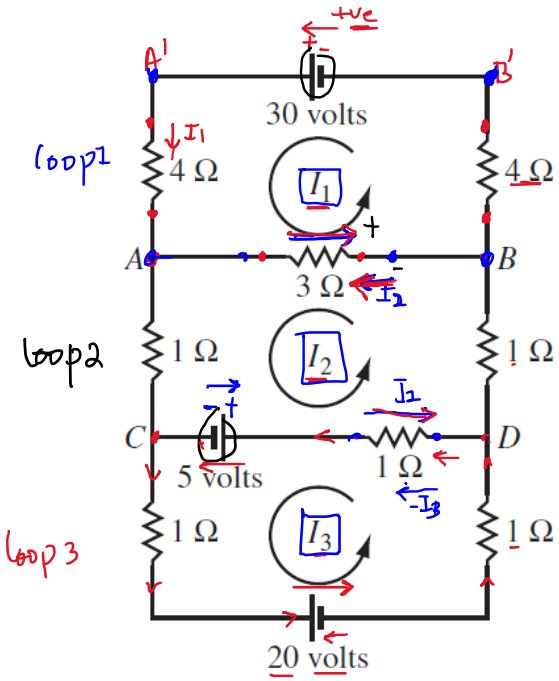


$E = V + V_1$

$E_1 + E_2 = V + V_1$

KIRCHHOFF'S VOLTAGE LAW

The algebraic sum of the RI voltage drops in one direction around a loop equals the algebraic sum of the voltage sources in the same direction around the loop.



I_3 = -ve

Example: Determine the loop currents in the electric circuit.

I_3 -
I_2 =
I_1 =

For loop 1:-

$4I_1 + 3I_1 + 4I_1 - 3I_2 = 30$

$11I_1 - 3I_2 = 30$

For loop 2:-

$-3I_1 + I_2 + I_2 + 3I_2 + I_2 - I_3 = 5$

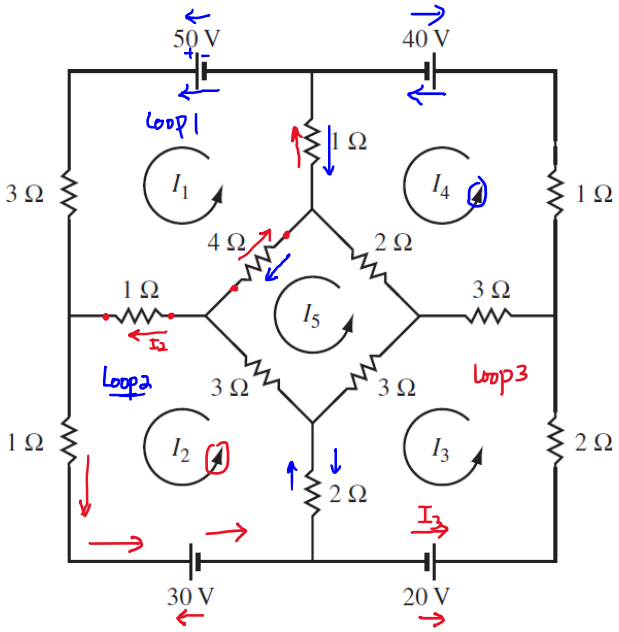
$-3I_1 + 6I_2 - I_3 = 5$

For loop 3

$-I_2 + 3I_3 = -20 - 5 = -25$

$$\left[\begin{array}{ccc|c} 11 & -3 & 0 & 30 \\ -3 & 6 & -1 & 5 \\ 0 & -1 & 3 & -25 \end{array}\right]$$

8.



Loop1:-

$$9I_1 - I_2 - 4I_5 - I_4 = 50$$

Loop2:-

$$-I_1 + 7I_2 - 2I_3 - 3I_5 = -30$$

loop3

$$10I_3 - 2I_2 - 3I_5 - 3I_4 = 20$$

loop4

$$7I_4 - I_1 - 2I_5 - 3I_3 = -40$$

loop5

$$-2I_4 + 12I_5 - 4I_1 - 3I_2 - 3I_3 = 0$$