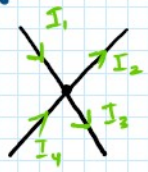
2. Kirchoff's Laws, Types of Connections

07 February 2024 12:37

KIRCHOFF'S CURRENT LAW (KCL)

At any particular junction, sum of all currents is zero



KIRCHOFF'S VOLTAGE LAW (KVL)

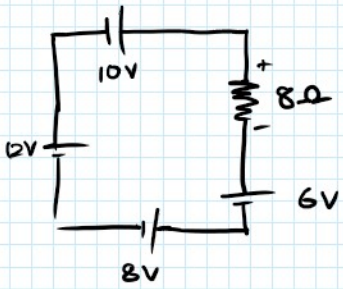
Around every closed path in a network, sum of voltages is zero

Voltage drop ⟶ negative

Voltage rise ⟶ positive

EXAMPLE

Find the current through 8 Ω resistor.

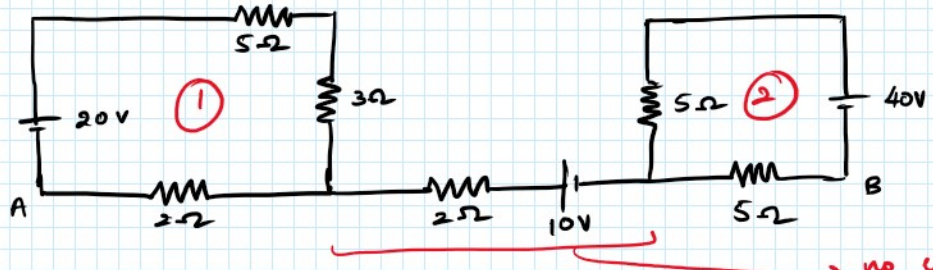


$$10 - 8I - 6 - 8 + 12 = 0$$

$$-8I = -8$$

$$I = \frac{-8}{-8} = 1\ A$$

Find voltage V_{AB}



no current because its not a closed path

In ①,

$$20 - 5I_1 - 3I_1 - 2I_1 = 0$$

$$20 - 10I_1 = 0$$

$$10I_1 = 20$$

$$I_1 = 2\ A$$

Drop across 2Ω = 4 V

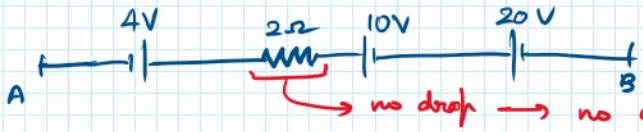
In ②,

$$40 - 5I_2 - 5I_2 = 0$$

$$I_2 = \frac{40}{10}$$

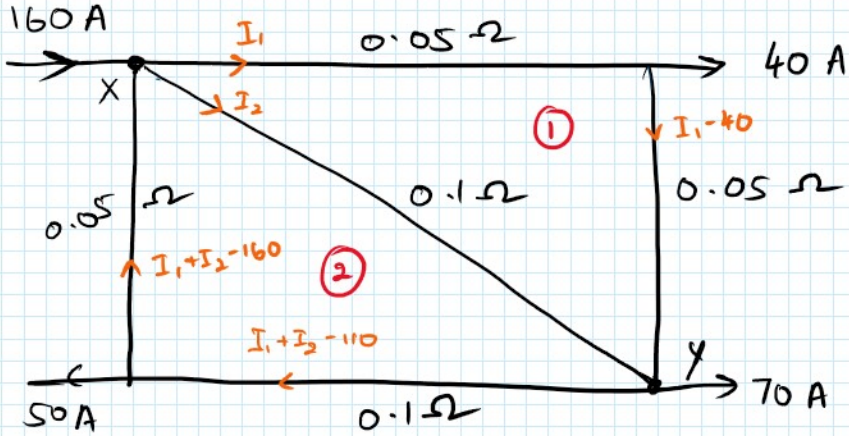
$$I_2 = 4\ A$$

Drop across 5 Ω = 20 V



$V_{AB} = 20 + 10 - 4 = 26\ V$

Find the current in the branch XY.



In ①,

$$-0.05I_1 - 0.05(I_1 - 40) + 0.1(I_2) = 0$$

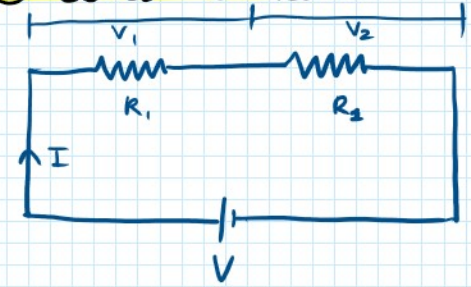
$$0.1I_1 - 0.1I_2 = 2$$

In ②,

$$-0.1I_2$$

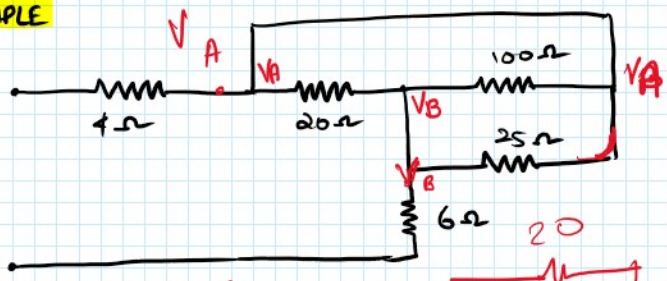
TYPES OF CONNECTION

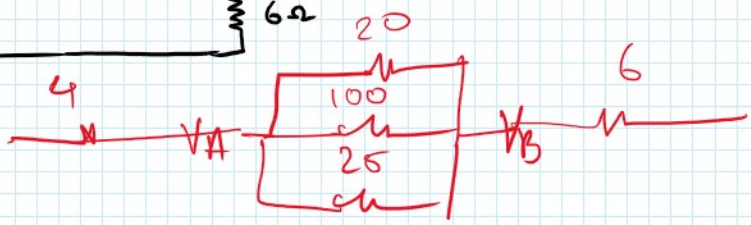
① SERIES CONNECTION



EXAMPLE

(1)





$$\frac{1}{20}+\frac{1}{100}+\frac{1}{25}=\frac{1}{R} \Rightarrow \frac{5+1+4}{100}=\frac{10}{100}=\frac{1}{10}=\frac{1}{R}$$

$$R = 10\,\Omega$$

(2)