

Nama : Dwi Wulandari

Npm : 2213022012

No. 29-04-2024

Kelas : 22 A

Date

Elektrodinamika

1. Hukum Ohm

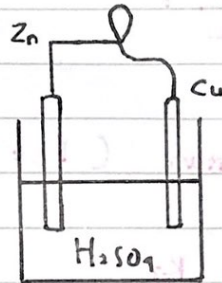
2. Rangkaian Listrik

→ Pembahasan

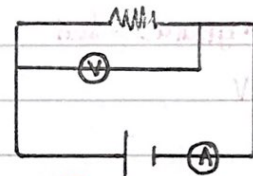
1. Hukum Ohm

$$I = 0. E \rightarrow DC$$

$$V = I \cdot R \rightarrow AC$$



Gambar 1



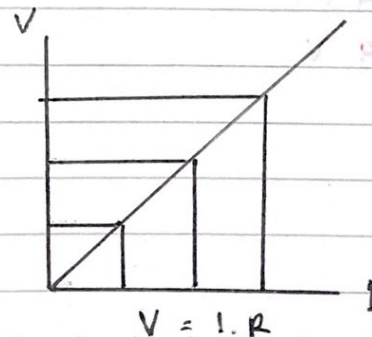
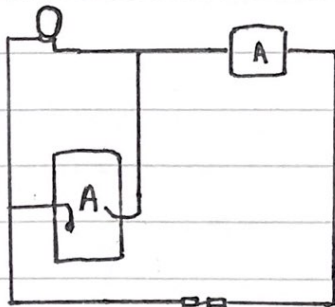
Gambar 2

Dari gambar 1 dapat dituliskan :

1. H_2 berupa gas

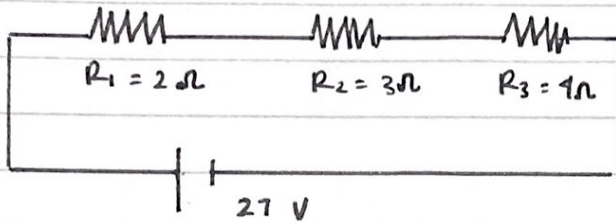
2. Jadi SO_4 mengalir menuju Cu lalu menghidupkan lampu lalu ke Zn

Dari gambar 2



→ Contoh

1. Rangkaian Listrik Seri



- $R_{\text{total}} = 9\Omega$ (Karena $R_1 + R_2 + R_3$)

$$I = \frac{27}{9} = 3\text{ A} \quad (\text{Rumus } \frac{V}{R})$$

- Pada rangkaian Seri $I = \text{Konstan}$ ($I = 3\text{ A}$)

- Mencari V

→ pada R_1

$$\begin{aligned} V &= R_1 \times I \\ &= 2 \times 3 \\ &= 6\text{ V} \end{aligned}$$

→ Pada R_2

$$\begin{aligned} V &= R_2 \times I \\ &= 3 \times 3 \\ &= 9\text{ V} \end{aligned}$$

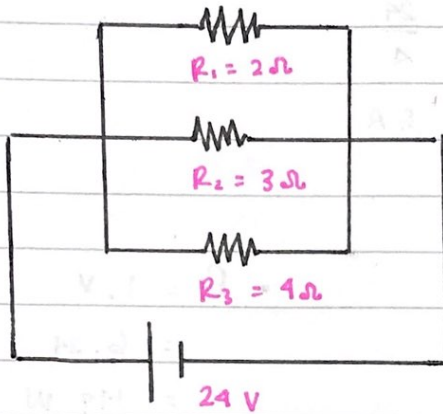
→ Pada R_3

$$\begin{aligned} V &= R_3 \times I \\ &= 4 \times 3 \\ &= 12\text{ V} \end{aligned}$$

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2. Rangkaian listrik paralel



Pada rangkaian paralel $V = \text{Konstan}$ ($V = 24 \text{ V}$)

$$\bullet \frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_t} = \frac{1}{2} + \frac{1}{3} + \frac{1}{4}$$

$$\frac{1}{R_t} = \frac{12 + 8 + 6}{24}$$

$$\frac{1}{R_t} = \frac{26}{24} \Rightarrow R_t = \frac{24}{26}$$

$$\bullet I_{\text{total}} = \frac{V}{R_{\text{total}}}$$

$$= \frac{24}{24/26}$$

$$= \frac{24}{1} \times \frac{26}{24}$$

$$I_{\text{total}} = 26 \text{ A}$$

Mencari I

$$\bullet R_1 =$$

$$I = \frac{V}{R_1} = \frac{24}{2} = 12 \text{ A}$$

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$$\bullet R_2 :$$

$$I = \frac{V}{R_2}$$

$$I = \frac{24}{3}$$

$$= 8 \text{ A}$$

$$\bullet R_3$$

$$I = \frac{V}{R_3}$$

$$= \frac{24}{4}$$

$$= 6 \text{ A}$$

Mencari Daya :

$$\bullet P_1 = 1 \cdot V$$

$$= 12 \cdot 24$$

$$= 288 \text{ W}$$

$$\bullet P_2 = 1 \cdot V$$

$$= 8 \cdot 24$$

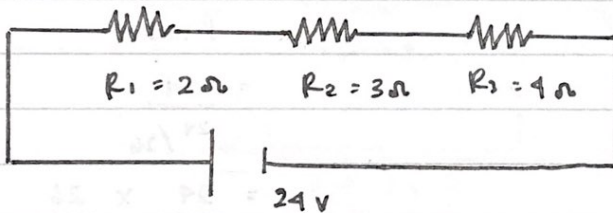
$$= 192 \text{ W}$$

$$\bullet P_3 = 1 \cdot V$$

$$= 6 \cdot 24$$

$$= 144 \text{ W}$$

3. Rangkaian Listrik Seri



$$\bullet R_{\text{total}} = R_1 + R_2 + R_3$$

$$= 2 + 3 + 4$$

$$= 9 \Omega$$

$$\bullet I = \frac{V}{R}$$

$$= \frac{24}{9} = 2,67 \text{ A}$$

$$\bullet V_1 = R_1 \cdot I$$

$$= 2 \cdot 2,67$$

$$= 5,34 \text{ V}$$

$$\bullet V_2 = R_2 \cdot I$$

$$= 3 \cdot 2,67$$

$$= 8,01 \text{ V}$$

$$\bullet V_3 = R_3 \cdot I$$

$$= 4 \cdot 2,67$$

$$= 10,68 \text{ V}$$

$$\bullet P_1 = I \cdot V_1$$

$$= 2,67 \cdot 5,34$$

$$= 14,25 \text{ W}$$

$$\bullet P_2 = I \cdot V_2$$

$$= 2,67 \cdot 8,01$$

$$= 21,38 \text{ W}$$

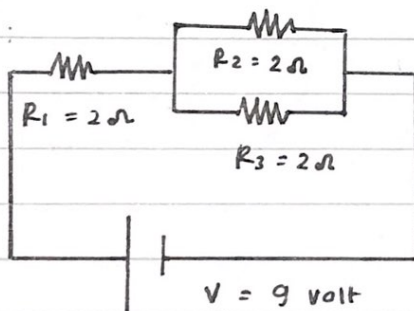
$$\bullet P_3 = I \cdot V_3$$

$$= 2,67 \cdot 10,68$$

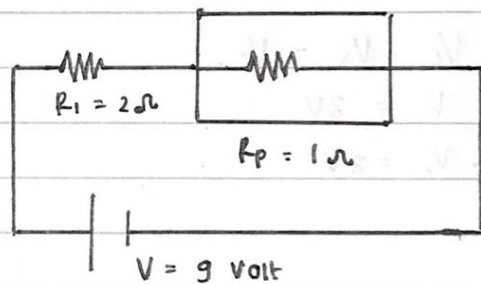
$$= 28,51 \text{ W}$$

4. Campuran Rangkaian Seri dan Paralel

1.



Menjadi



$$\bullet R_p = \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}}$$

$$= \frac{1}{\frac{1}{2} + \frac{1}{2}}$$

$$= 1\Omega$$

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$$\bullet R_{\text{total}} = R_1 + R_p$$

$$= 2 + 1$$

$$= 3$$

$$\bullet I = \frac{V}{R}$$

$$= \frac{9}{3}$$

$$= 3 \text{ A}$$

$$\bullet V_1 = R_1 \times I$$

$$= 2 \times 3$$

$$= 6 \text{ V}$$

$$\bullet V_p = R_p \times I$$

$$= 1 \times 3$$

$$= 3 \text{ V}$$

$$V_p = V_2 = V_3$$

$$\bullet V_2 = 3 \text{ V}$$

$$\bullet V_3 = 3 \text{ V}$$

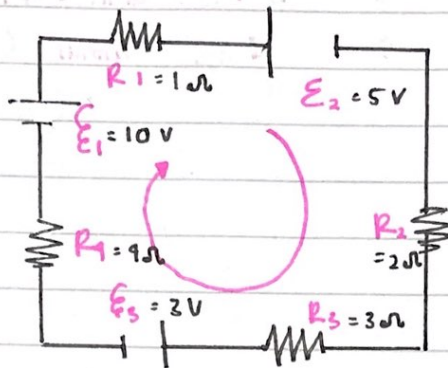
$$\bullet I \text{ di } R_2$$

$$I = \frac{V_2}{R_2}$$

$$= \frac{3}{2} = 1,5 \text{ A}$$

→ Rangkaian Listrik Kompleks

1.



$$E_1 > E_2 > E_3$$

1. Gambar arah arus sesuai dengan besarnya E
2. Gambar loop sesuka hati
3. Jika arah arus searah dengan arah loop, maka positif.

$$\sum E + \sum I \cdot R = 0$$

$$-E_1 + E_2 + E_3 + I(R_1 + R_2 + R_3 + R_4) = 0$$

$$-10 + 5 + 3 + I(1 + 2 + 3 + 4) = 0$$

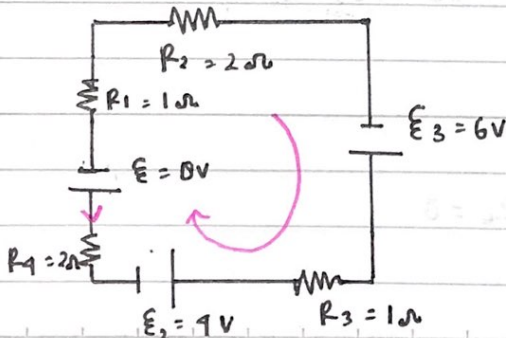
$$-2 + I(10) = 0$$

$$I(10) = 2$$

$$I = \frac{2}{10} = \frac{1}{5}$$

$$I = 0,2 \text{ A}$$

2.



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$$\sum \mathcal{E} + \sum I \cdot R = 0$$

$$\mathcal{E}_1 - \mathcal{E}_3 + \mathcal{E}_2 - I (R_1 + R_2 + R_2 + R_4) = 0$$

$$6 - 6 + 4 - I (1 + 2 + 1 + 2) = 0$$

$$6 - I (6) = 0$$

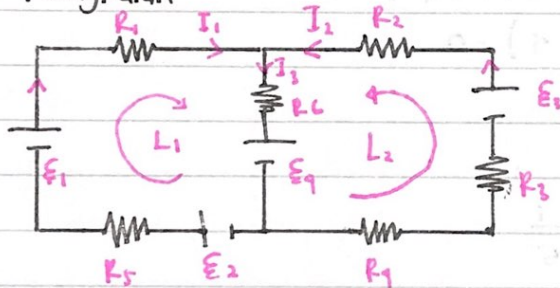
$$I (6) = 6$$

$$I = \frac{6}{6}$$

$$I = 1 \text{ A}$$

Karena arus bertawanan
dengan arah loop, maka
I nya minus (-)

→ Rangkaian



• Pada Loop 1 :

$$\sum \mathcal{E} + \sum I \cdot R = 0$$

$$-\mathcal{E}_1 + \mathcal{E}_4 + \mathcal{E}_2 + I_1 (R_1 + R_5) + I_3 (R_6) = 0$$

• Pada Loop 2 :

$$\sum \mathcal{E} + \sum I \cdot R = 0$$

$$-\mathcal{E}_3 + \mathcal{E}_1 + I_2 (R_2 + R_4 + R_6) + I_3 \cdot R_6 = 0$$