

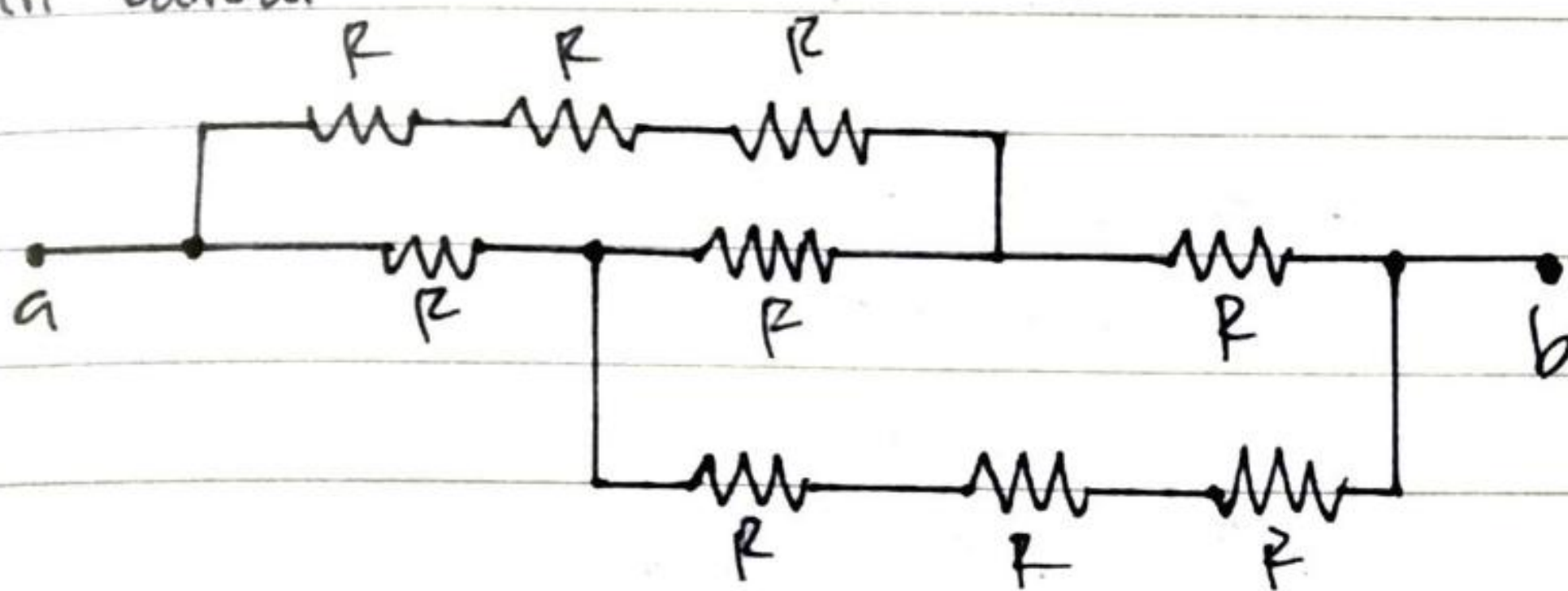
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Prodi: Pendidikan Fisika B

UAS Listrik dan Magnet

1. Perhatikan Gambar

Jika $R = 5 \text{ ohm}$ dan terpasang seperti pada gambar diatas, hitung

a. Hambatan Pengganti

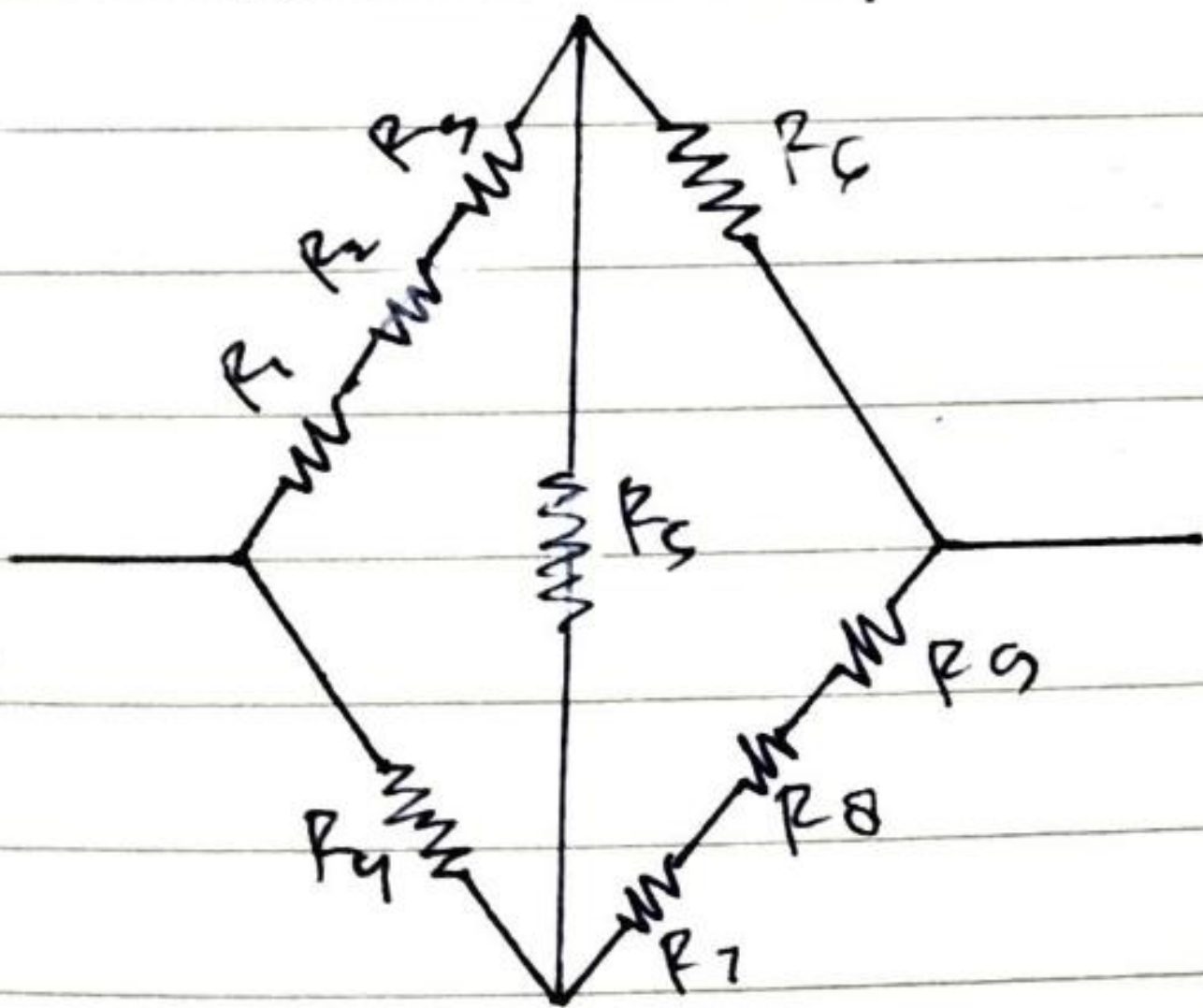
b. Jika $V_{ab} = 10 \text{ Volt}$ bagaimana arus pada setiap hambatan pada rangkaian diatas?

Jawab:

a. Dik: $R = 5 \Omega$

$V = 10 \text{ Volt}$

Gambar diatas dapat disederhanakan:



$$R_{s1} = R_1 + R_2 + R_3$$

$$= 5 + 5 + 5$$

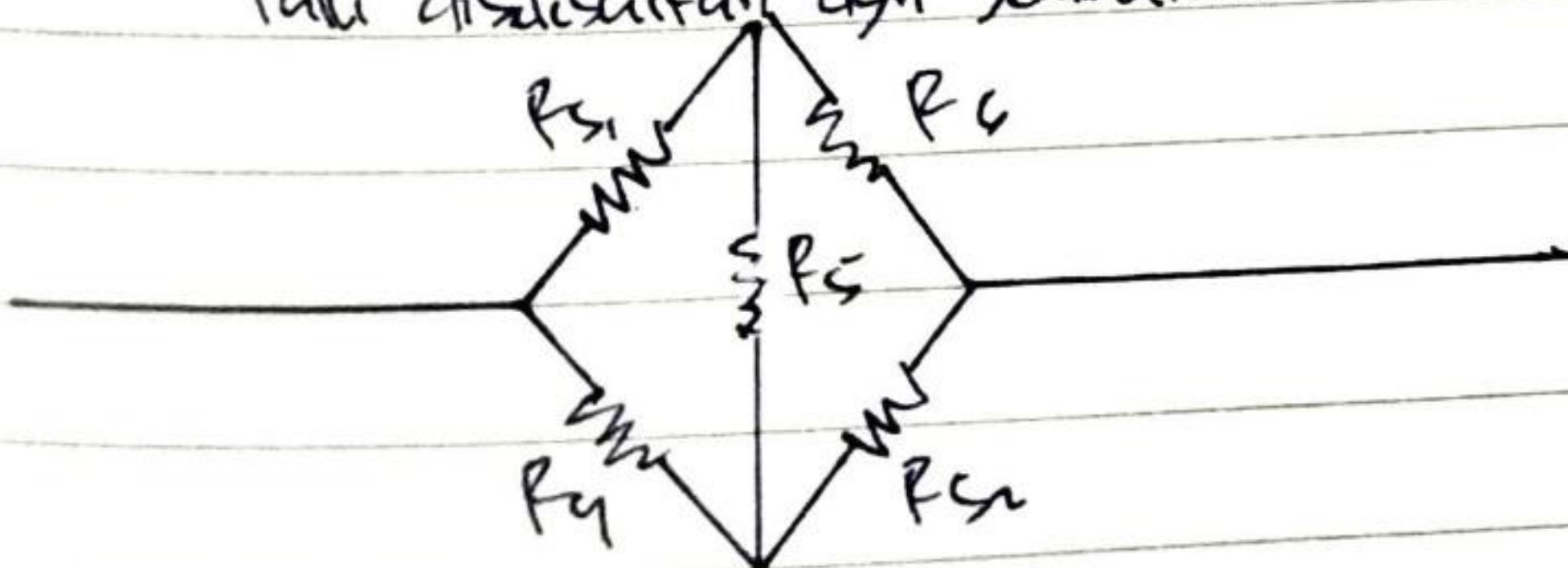
$$= 15 \Omega$$

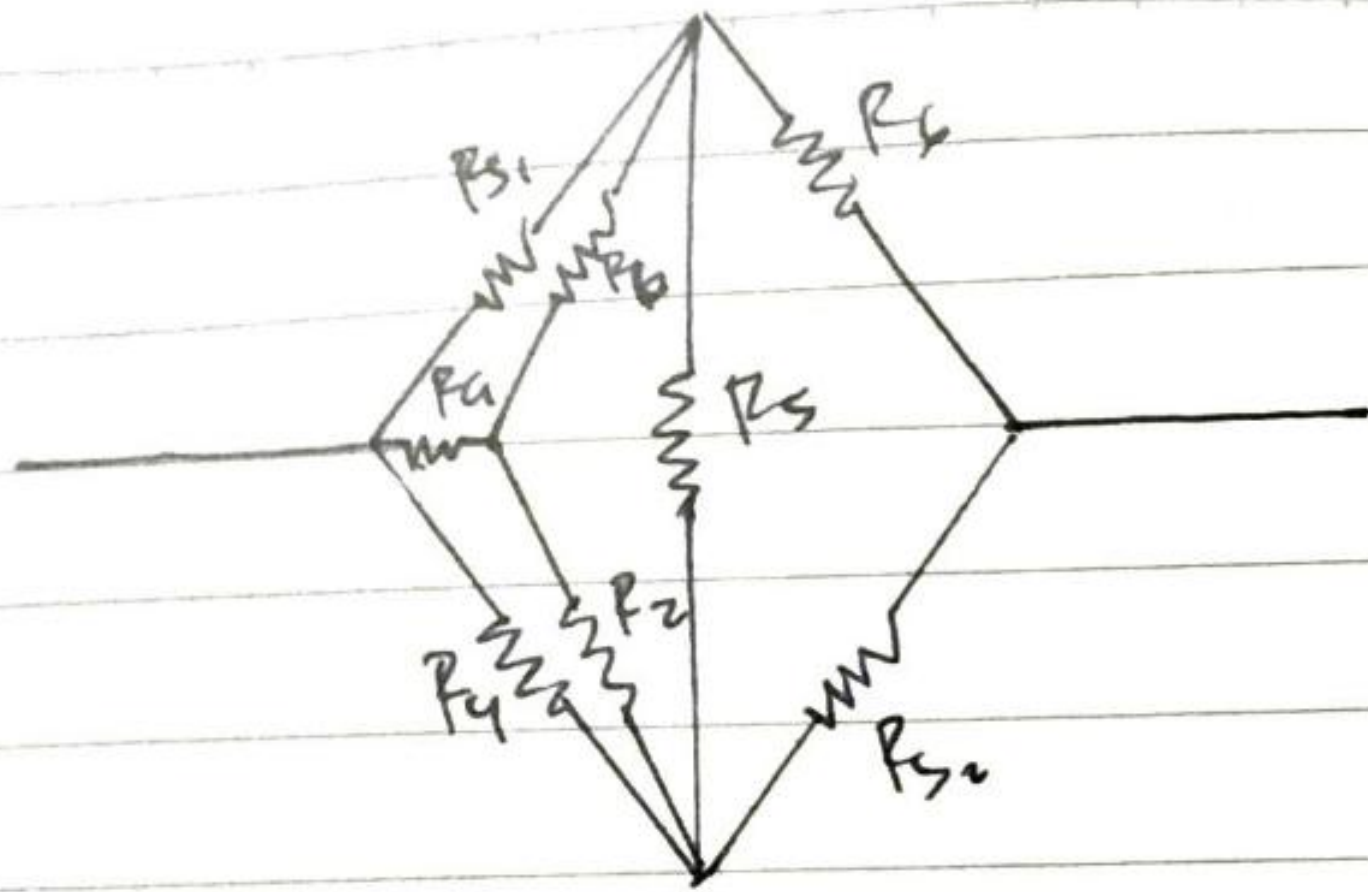
$$R_{s2} = R_7 + R_8 + R_9$$

$$= 5 + 5 + 5$$

$$= 15 \Omega$$

lalu disederhanakan dgn jembatan wheatstone

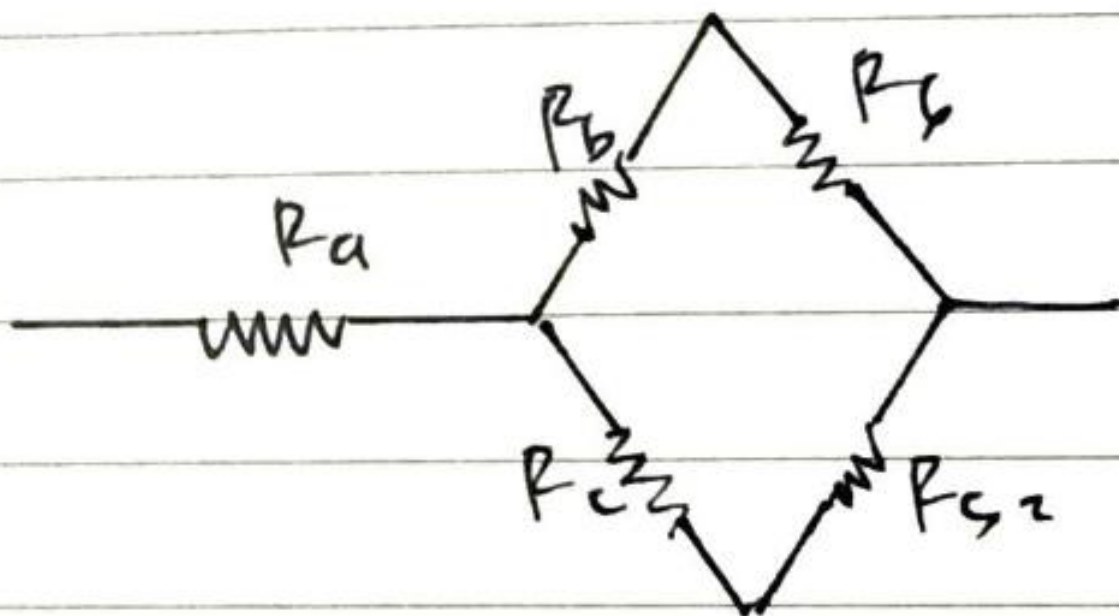




$$R_a = \frac{R_{S1} \cdot R_4}{R_{S1} + R_4 + R_5} = \frac{15 \cdot 5}{15 + 5 + 5} = \frac{75}{25} = 3 \Omega$$

$$R_b = \frac{R_{S1} \cdot R_5}{R_{S1} + R_4 + R_5} = \frac{15 \cdot 5}{15 + 5 + 5} = \frac{75}{25} = 3 \Omega$$

$$R_c = \frac{R_4 \cdot R_5}{R_{S1} + R_4 + R_5} = \frac{5 \cdot 5}{15 + 5 + 5} = \frac{25}{25} = 1 \Omega$$



$$R_{S3} = R_b + R_5$$

$$= 3 + 5$$

$$= 8 \Omega$$

$$R_{S4} = R_c + R_{S2}$$

$$= 1 + 15$$

$$= 16 \Omega$$

$$\frac{1}{R_p} = \frac{1}{R_{S3}} + \frac{1}{R_{S4}}$$

$$= \frac{1}{8} + \frac{1}{16}$$

$$= \frac{2+1}{16}$$

$$\frac{1}{R_p} = \frac{3}{16}$$

$$R_p = \frac{16}{3}$$

$$R_{total} = R_a + R_p$$

$$= 3 + \frac{16}{3}$$

$$= \frac{9+16}{3}$$

$$R_{tot} = \frac{25}{3} \Omega$$

$$= 8.3 \Omega$$

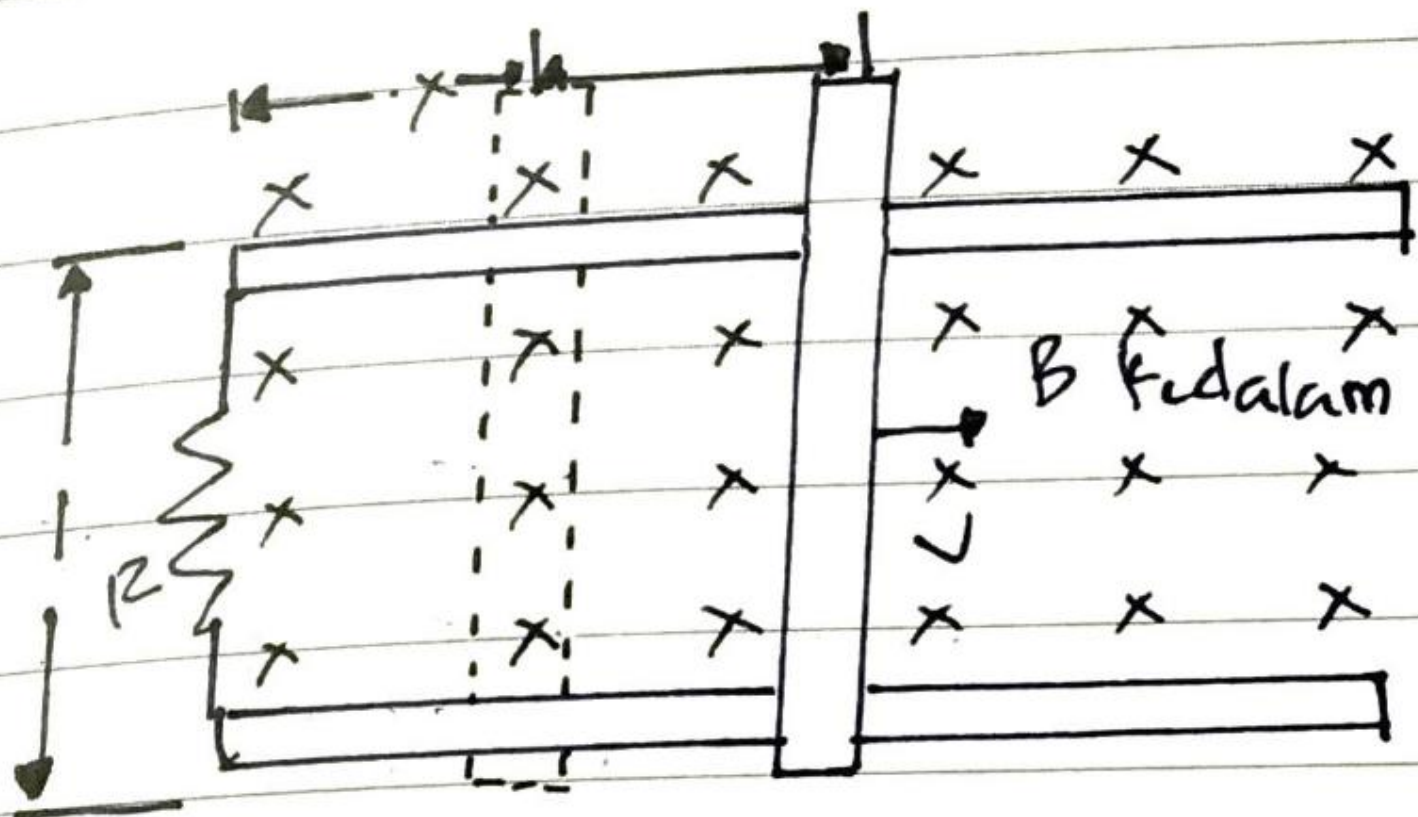
$$b. I = \frac{V}{R_{tot}}$$

$$= \frac{10}{8.3}$$

$$= 1.2 A$$

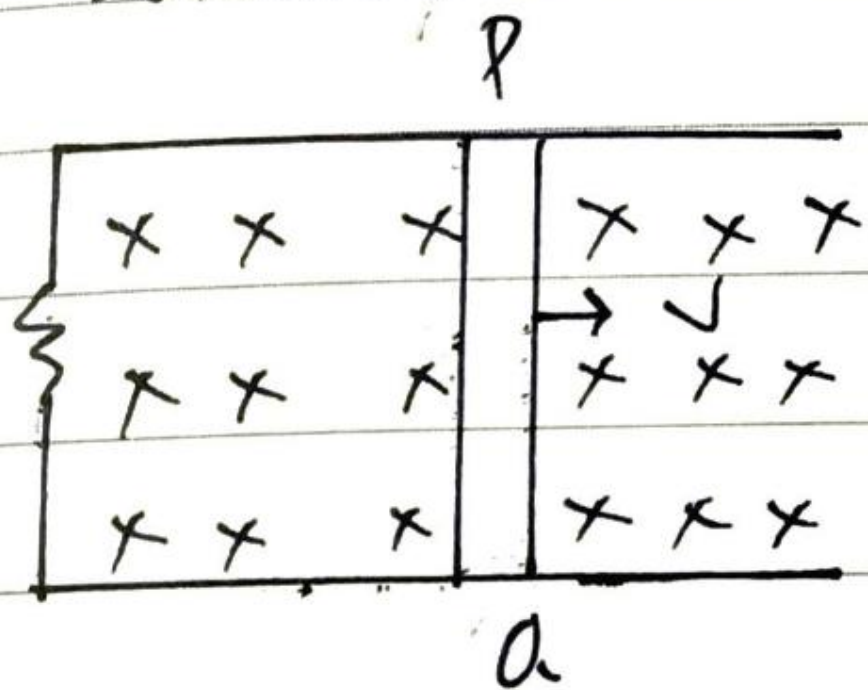
Date

2. Perhatikan gambar rangkaian multisimpul dibawah ini ! Bagaimana arus mengalir pada setiap simpul ?
 $dx = v dt$



Jelaskan bagaimana arus bisa mengalir pada kumparan Gambarkan arah arus pada kumparan tsb ! Jika medan magnet 20 tesla, kecepatan gerakan kawat 10 m/s, Jauh gerakan kawat (l) = 15 m, dan hambatan yg terpasang 10 ohm. Berapa besarnya arus dalam kumparan tsb ?

Jawab :

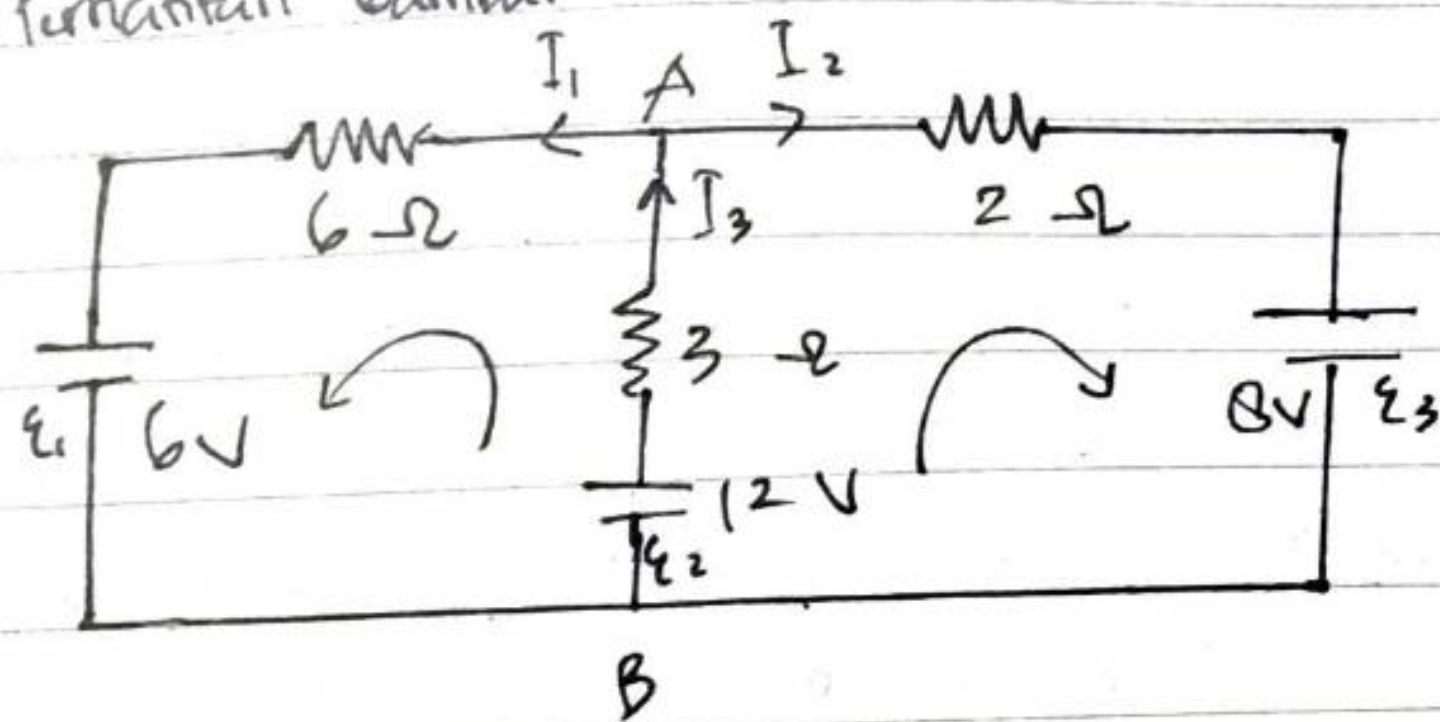


$$\begin{aligned} \mathcal{E} &= Blv \sin \theta \\ &= 20 \cdot 15 \cdot 10 \sin 90^\circ \\ &= 3000 \text{ V} \end{aligned}$$

$$I = \frac{\mathcal{E}}{R} = \frac{3000}{10} = 300 \text{ A}$$

I mengalir dari a ke P sesuai kaidah tangan kanan

3. Perhatikan Gambar



Hitung arus listrik pada setiap hambatan

Pengelompokan :

Hukum Kirchhoff I

$$\sum I_{\text{masuk}} = \sum I_{\text{keluar}}$$

$$I_3 = I_1 + I_2$$

Loop I :

$$\sum \mathcal{E} + \sum IR = 0$$

$$\mathcal{E}_1 - \mathcal{E}_2 + I_1 \cdot 6 + I_3 \cdot 3 = 0$$

$$6 - 12 + 6I_1 + 3(I_1 + I_2) = 0$$

$$-6 + 6I_1 + 3I_1 + 3I_2 = 0$$

$$9I_1 + 3I_2 = 6 \quad \dots (1)$$

Loop II :

$$\sum \mathcal{E} + \sum IR = 0$$

$$\mathcal{E}_3 - \mathcal{E}_2 + I_2 \cdot 2 + I_3 \cdot 3 = 0$$

$$8 - 12 + 2I_2 + 3(I_1 + I_2) = 0$$

$$-4 + 2I_2 + 3I_1 + 3I_2 = 0$$

$$3I_1 + 5I_2 = 4 \quad \dots (2)$$

$$\begin{array}{r|l} 9I_1 + 3I_2 = 6 & \times 1 \\ 3I_1 + 5I_2 = 4 & \times 3 \end{array}$$

$$9I_1 + 3I_2 = 6$$

$$9I_1 + 15I_2 = 12 \quad -$$

$$-12I_2 = -6$$

$$I_2 = 0,5 \text{ A}$$

Pada $R_2 = 2 \Omega$

$$3I_1 + 5I_2 = 4$$

$$3I_1 + 5(0,5) = 4$$

$$3I_1 + 2,5 = 4$$

$$3I_1 = 4 - 2,5$$

$$3I_1 = 1,5$$

$$I_1 = 0,5 \text{ A}$$

Pada $R_1 = 6 \Omega$

$$3 = I_1 + I_2$$

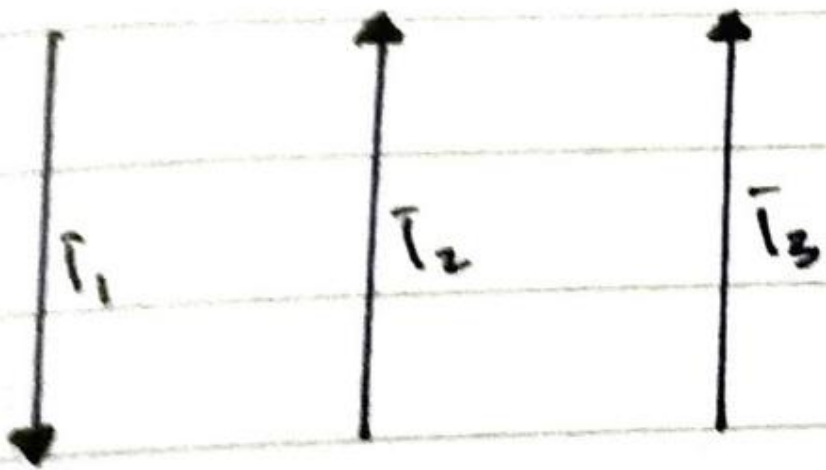
$$= 0,5 + 0,5$$

$$= 1 \text{ A}$$

Pada $R_3 = 3 \Omega$

Date

4. Gambar gaya - gaya yg dialami oleh masing² kawat berikut ini, jika arah dan besar sama besar, kemana arah gerakan kawat 1, 2, dan 3?



Jawab.

