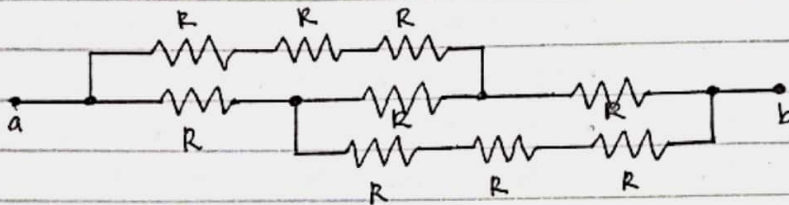


Nama : Umi Nur Aini
 NPM : 2013022012
 Prodi : Pendidikan Fisika
 Kelas : B

*.) UAS KELISTRIKAN DAN KEMAGNETAN

1.) Perhatikan Gambar



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

- Hambatan pengganti
- Jika $V_{ab} = 10 \text{ Volt}$, bagaimana arus pada setiap hambatan pada rangkaian di atas?

*.) Penyelesaian :

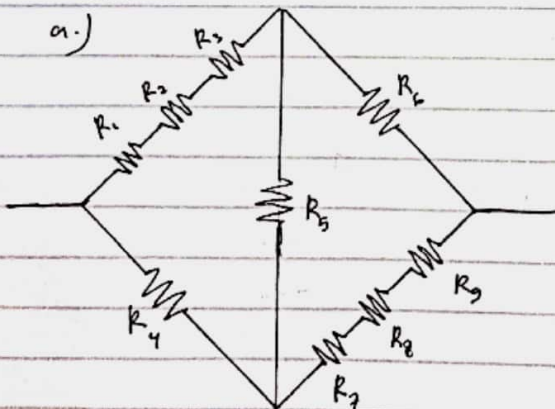
- Diketahui : $R = 5 \Omega$

$V = 10 \text{ Volt}$

- Ditanya : a. Hambatan pengganti
 b. Arus pada setiap hambatan

- Jawab :

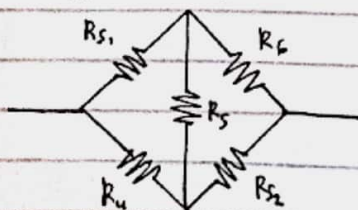
a.)



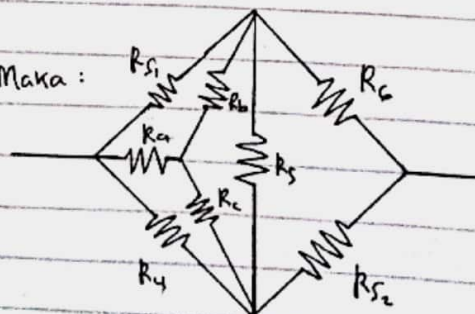
$$\begin{aligned} R_{s1} &= R_1 + R_2 + R_3 \\ &= 5 \Omega + 5 \Omega + 5 \Omega \\ &= 15 \Omega \end{aligned}$$

$$\begin{aligned} R_{s2} &= R_7 + R_8 + R_9 \\ &= 5 \Omega + 5 \Omega + 5 \Omega \\ &= 15 \Omega \end{aligned}$$

• Menggunakan Jembatan Wheatstone, Maka :



$\Rightarrow$



$$\bullet R_a = \frac{R_{S1} \cdot R}{R_{S1} + R + R_{S2}}$$

$$R_a = \frac{15 \cdot 5}{15 + 5 + 5}$$

$$R_a = \frac{75}{25}$$

$$R_a = 3 \Omega$$

$$\bullet R_b = \frac{R_{S1} \cdot R_{S2}}{R_{S1} + R_{S2} + R_{S3}}$$

$$R_b = \frac{15 \cdot 5}{15 + 5 + 5}$$

$$R_b = \frac{75}{25}$$

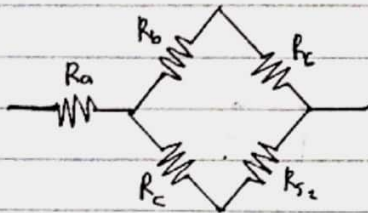
$$R_b = 3 \Omega$$

$$\bullet R_c = \frac{R_{S1} \cdot R_{S2}}{R_{S1} + R_{S2} + R_{S3}}$$

$$R_c = \frac{5 \cdot 5}{15 + 5 + 5}$$

$$R_c = \frac{25}{25}$$

$$R_c = 1 \Omega$$



$$\bullet R_{S3} = R_b + R_c = 3 \Omega + 5 \Omega = 8 \Omega$$

$$\bullet R_{S4} = R_c + R_{S2} = 1 + 15 = 16 \Omega$$

$$\bullet \frac{1}{R_{p1}} = \frac{1}{R_{S3}} + \frac{1}{R_{S4}} = \frac{1}{8} + \frac{1}{16} = \frac{2+1}{16} = \frac{3}{16}$$

$$R_{p1} = \frac{16}{3} \Omega$$

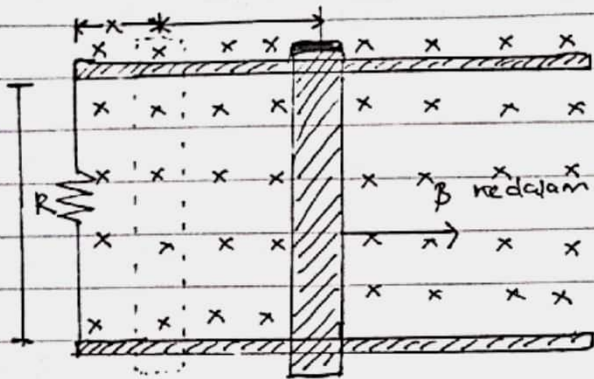
$$\begin{aligned} \text{4.}) R_{\text{pengganti}} &= R_a + R_{p1} \\ &= 3 \Omega + \frac{16}{3} \Omega \\ &= \frac{9 + 16}{3} \\ &= \frac{25}{3} \Omega \end{aligned}$$

b.) Diket: $V = 10 \text{ Volt}$

Jawab:

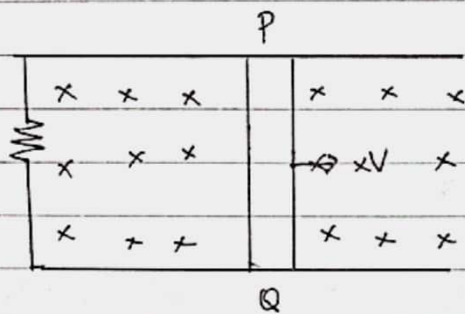
$$\bullet I_t = \frac{V}{R_{\text{tot}}} = \frac{10}{8,3} = 1,2 \text{ A}$$

2.) Perhatikan gambar rangkaian multisimpul di bawah ini ! Bagaimana arus mengalir pada setiap simpul



Jelaskan bagaimana arus bisa mengalir pada kumparan? Gambarkan arah arus pd kumparan tsb !
Jika medan magnet 20 Tesla, kecepatan Gerakan kawat 10 m/s, jauh Gerakan kawat 15 m, dan hambatan yang terpasang 10 ohm. Berapa besarnya arus dalam kumparan tersebut ?

*) Penyelesaian :



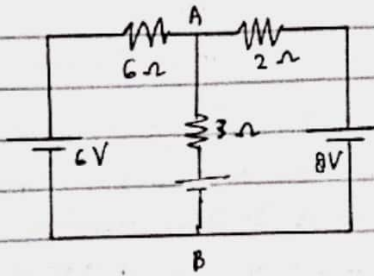
$$\begin{aligned} \bullet \quad \mathcal{E} &= B L v \sin \theta \\ &= (20)(15)(10) \sin 90^\circ \\ &= 3000 \cdot 1 \\ &= 3000 \text{ V} \end{aligned}$$

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

Jadi, I mengalir dari Q ke P sesuai kaidah tangan kanan sebesar 300 A.

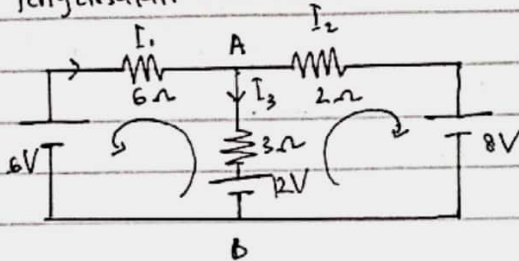


3.) Perhatikan gambar



Hitung arus listrik pada setiap hambatan!

*.) Penyelesaian:



•) Loop I

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

$$(\mathcal{E}_1 - \mathcal{E}_2) + I_1 R_1 + I_3 R_3 = 0$$

$$(6 - 12) + I_1 \cdot 6 + I_3 \cdot 3 = 0$$

$$-6 + 6I_1 + 3I_3 = 0$$

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

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

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

•) Loop II

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

$$(\mathcal{E}_3 - \mathcal{E}_2) + I_2 R_2 + I_3 R_3 = 0$$

$$(8 - 12) + I_2 \cdot 2 + I_3 \cdot 3 = 0$$

$$-4 + 2I_2 + 3I_3 = 0$$

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

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

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

•) Eliminasi Pers. (1) dan Pers. (2):

$$9I_1 + 3I_2 = 6 \quad | \times 1$$

$$3I_1 + 5I_2 = 4 \quad | \times 3$$

↳

$$9I_1 + 3I_2 = 6$$

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

$$-12I_2 = -6$$

$$I_2 = \frac{1}{2}$$

$\times 12$

$$I_2 = \frac{1}{2} = 0,5 \text{ A}$$

•) Mensubstitusikan:

$$9I_1 + 3I_2 = 6$$

$$9I_1 + 3(0,5) = 6$$

$$9I_1 + 1,5 = 6$$

$$9I_1 = 4,5$$

$$I_1 = \frac{1}{2} = 0,5 \text{ A}$$

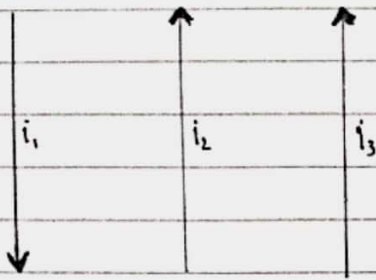
• Sehingga,

$$I_3 = I_1 + I_2$$

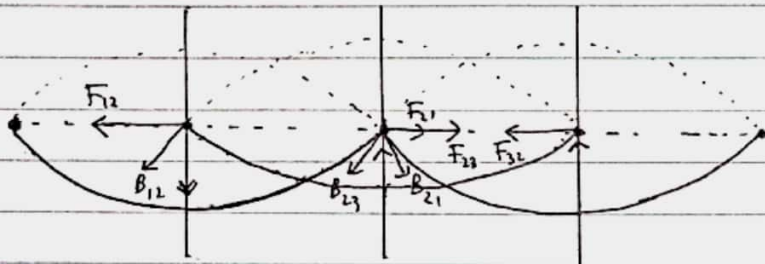
$$I_3 = 0,5 + 0,5$$

$$I_3 = 1 \text{ A}$$

4.) Gambar gaya-gaya yang dialami oleh masing-masing kawat berikut ini, jika arus 1 dan jarak sama besar. kemana arah gerakan kawat 1, 2 dan 3?



*.) Penyelesaian:



Arah gaya kawat (1) yang dipengaruhi kawat (2) $\rightarrow F_{12}$ adalah ke kiri

Arah gaya kawat (2) yang dipengaruhi kawat (1) $\rightarrow F_{21}$ adalah ke kanan

Arah gaya kawat (2) yang dipengaruhi kawat (3) $\rightarrow F_{23}$ adalah ke kanan

Arah gaya kawat (3) yang dipengaruhi kawat (2) $\rightarrow F_{32}$ adalah ke kiri.

—