

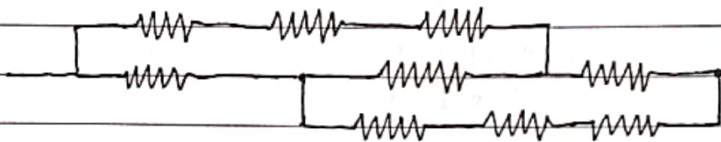
Nama: OKTAVIA SULISTYA HANDAYANI

NPM: 2013022052

Kelas B

Ujian Akhir Semester

1. Perhatikan Gambar

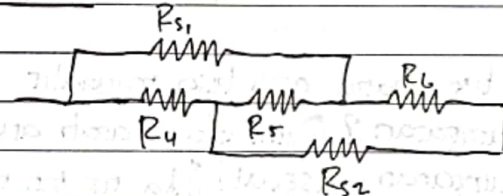
Jika $R = 5\ \Omega$ dan terpasang seperti pada gambar diatas, hitung

a.) Hambatan penggantiya

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

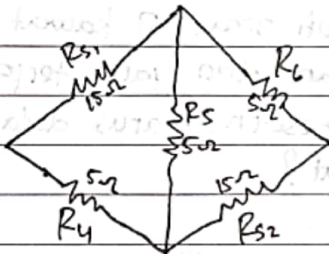
Jawaban:

a.)



$$R_{s1} = R_1 + R_2 + R_3 = 15\ \Omega$$

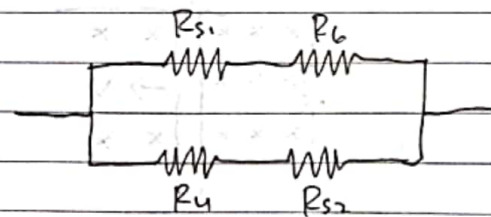
$$R_{s2} = R_7 + R_8 + R_9 = 15\ \Omega$$



$$R_{s1} \cdot R_6 = R_4 \cdot R_{s2}$$

$$15 \cdot 5 = 5 \cdot 15$$

$$75 = 75$$

Sehingga R_5 tidak dialiri arus.

$$R_{s3} = R_{s1} + R_6$$

$$= 15 + 5$$

$$= 20$$

$$R_{s4} = R_4 + R_{s2}$$

$$= 5 + 15$$

$$= 20$$



$$\frac{1}{R_t} = \frac{1}{R_{s3}} + \frac{1}{R_{s4}}$$

$$= \frac{1}{20} + \frac{1}{20} = \frac{2}{20}$$

$$R_t = 10\ \Omega$$

b.) $V_{ab} = 10 \text{ Volt}$

$$I_t = \frac{V_{ab}}{R_t} = \frac{10}{10} = 1 \text{ A}$$

$$I_{R_{33}} = \frac{R_{33}}{R_{33} + R_{34}} \cdot 1 = \frac{20}{20 + 20} \cdot 1 = 0,5 \text{ A}$$

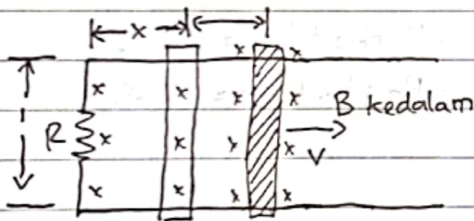
$$I_{R_{34}} = 1 - 0,5 \text{ A} \\ = 0,5 \text{ A}$$

$$I_1 = I_2 = I_3 = I_6 = I_{R_{33}} = 0,5 \text{ A}$$

$$I_4 = I_7 = I_8 = I_9 = I_{R_{34}} = 0,5 \text{ A}$$

$$I_5 = 0 \text{ A}$$

2. Gambar rangkaian multisimpal! Bagaimana arus mengalir pada setiap simpal?



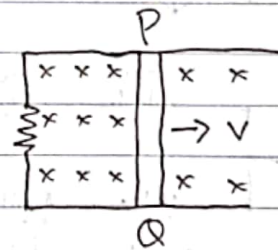
Jelaskan bagaimana arus bisa mengalir pada kumparan? Gambarkan arah arus pada kumparan tersebut! Jika medan magnet magnet 20 tesla, kecepatan gerakan kawat 10 m/s, jauh gerakan kawat (l) = 15 m, dan hambatan yang terpasang 10 ohm. Berapa besarnya arus dalam kumparan tersebut?

Jawaban :

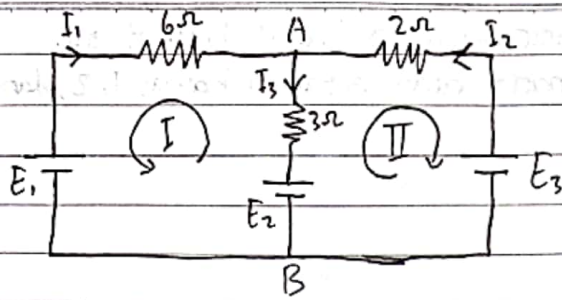
$$\begin{aligned} \mathcal{E} &= Blv \sin \theta \\ &= 20 \cdot 15 \cdot 10 \sin 90^\circ \\ &= 3000 \text{ V} \end{aligned}$$

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

I mengalir dari Q ke P sesuai kaidah tangan kanan



3.



$$\text{Loop I} = \sum \varepsilon + \sum IR = 0$$

$$\Rightarrow \varepsilon_1 - \varepsilon_2 + I_1 \cdot 6 + I_3 \cdot 3 = 0$$

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

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

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

$$\text{Loop II} = \sum \varepsilon + \sum IR = 0$$

$$\Rightarrow \varepsilon_3 - \varepsilon_2 + I_2 \cdot 2 + I_3 \cdot 3 = 0$$

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

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

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

Eliminasi:

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

$$3I_1 + 5I_2 = 4 \quad | \times 3 | \quad 9I_1 + 15I_2 = 12$$

$$-12I_2 = -6$$

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

$$\text{pada } R = 2 \Omega$$

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

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

$$I_1 = \frac{1,5}{3}$$

$$= 0,5 \text{ A (pada } R = 6 \Omega)$$

$$I_3 = I_1 + I_2$$

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

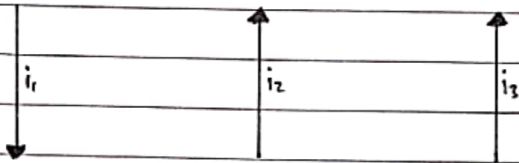
$$= 1 \text{ A (pada } R = 3 \Omega)$$

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

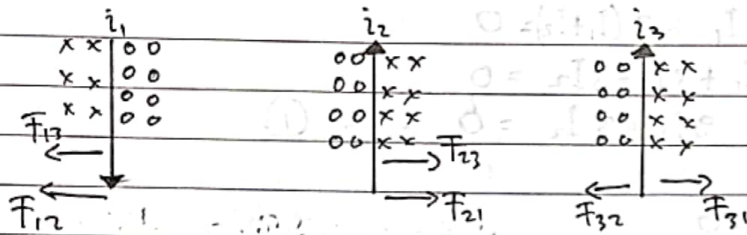
$$I_2 = 0,5 \text{ A}$$

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

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



Jawaban:



F_{13} = gaya pada kawat I oleh kawat 3

Kawat I bergerak ke kiri $\Rightarrow F_{12} + F_{13}$

Kawat II bergerak ke kanan $\Rightarrow F_{23} + F_{21}$

$$\text{Kawat III} \Rightarrow F_{32} = \frac{\mu_0 I_3 I_2}{2a} = F$$

$$F_{31} = \frac{\mu_0 I_3 I_1}{2 \cdot 2a} = \frac{1}{2} F$$

dengan arus dan jarak antar kawat sama

$F_{32} > F_{31} \Rightarrow$ Sehingga kawat 3 bergerak ke kiri