

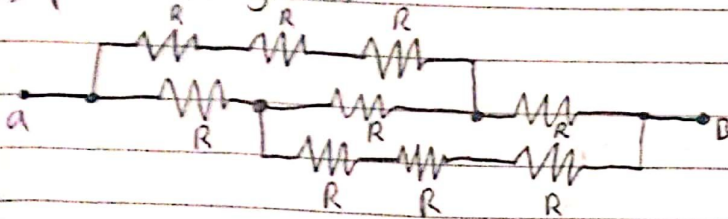
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Kelas : kelas B

UAS Kelistrikan dan Kemagnetan

1) perhatikan gambar

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

a. Hambatan pengganti

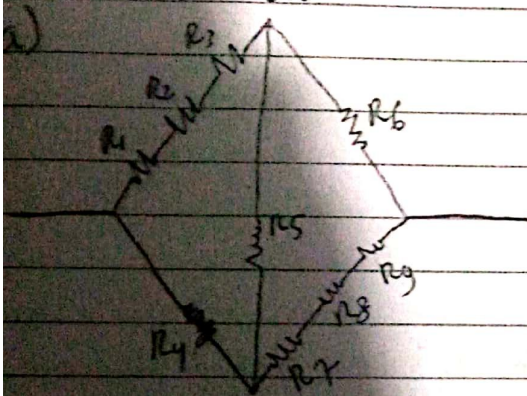
b. jika $V_{ab} = 10 \text{ volt}$ bagaimana arus pada setiap hambatan pada rangkaian diatas?

Jawab :

diket. $R = 5 \Omega$ $V = 10 \text{ volt}$

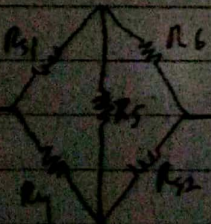
ditanya a. hambatan pengganti

b. arus pada setiap hambatan



$$R_{s1} = R_1 + R_2 + R_3 \\ = 5 + 5 + 5 \\ = 15 \Omega$$

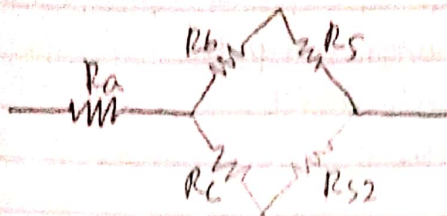
$$R_{s2} = R_7 + R_8 + R_9 \\ = 5 + 5 + 5 \\ = 15 \Omega$$

lalu disederhanakan
dengan jembatan wheatstone

$$R_a = \frac{R_{s1} \cdot R_4}{R_{s1} + R_4 + R_5} \Rightarrow R_a = \frac{15 \cdot 5}{15 + 5 + 5} = \frac{75}{25} = 3 \Omega$$

$$R_b = \frac{R_{s1} \cdot R_5}{R_{s1} + R_4 + R_5} \Rightarrow R_b = \frac{15 \cdot 5}{15 + 5 + 5} = \frac{75}{25} = 3 \Omega$$

$$R_c = \frac{R_4 \cdot R_5}{R_{s1} + R_4 + R_5} = R_c = \frac{5 \cdot 5}{15 + 5 + 5} = \frac{25}{25} = 1 \Omega$$



$$\begin{aligned} \bullet) R_{s3} &= R_b + R_c \\ &= 3 + 5 \\ &= 8 \, \Omega \end{aligned}$$

$$\begin{aligned} \bullet) R_{s4} &= R_c + R_{52} \\ &= 1 + 5 \\ &= 16 \, \Omega \end{aligned}$$

$$\bullet) \frac{1}{R_{p1}} = \frac{1}{R_{s3}} + \frac{1}{R_{s4}}$$

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

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

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

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

$$\begin{aligned} R_{total} &= R_a + R_p \\ &= 3 + \frac{16}{3} \end{aligned}$$

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

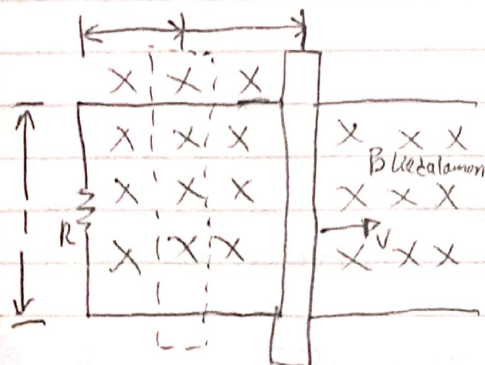
$$R_{total} = \frac{25}{3} \, \Omega$$

$$R_{total} = 8,33 \, \Omega$$

$$B) I = \frac{V}{R_{tot}} = \frac{10}{8,33} = 1,2 \, A$$

2) perhatikan gambar rangkaian multi simpul di bawah ini! bagaimana arus mengalir pada setiap simpul?

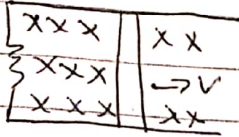
$$dx = v dt$$



Jelaskan bagaimana arus bisa mengalir pada kumparan? Gambarkan arah arus pada kumparan tersebut! Jika medan magnet 20 tesla, kecepatan gerakan kawat $10 \, \text{m/s}$ jauh gerakan kawat $(l) = 15 \, \text{m}$, dan hambatan yang terpasang $10 \, \Omega$ berapa besarnya arus dalam kumparan tersebut?

Jawaban

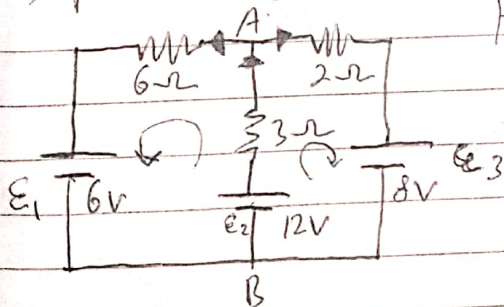
$$\begin{aligned}\mathcal{E} &= B l v \sin \theta \\ &= 20 \cdot 15 \cdot 10 \sin 90^\circ \\ &= 3000 \text{ V}\end{aligned}$$



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

I mengalir dari Q ke P sesuai kaidah tangan kanan

3) perhatikan gambar



Hitung arus listrik pada setiap hambatan

Jawab

$$\begin{aligned}\text{diket} &= R_1 = 6 \Omega & V_1 &= 6 \text{ V} \\ &R_2 = 2 \Omega & V_3 &= 12 \text{ V} \\ &R_3 = 3 \Omega & V_2 &= 8 \text{ V}\end{aligned}$$

1) loop 1

$$\sum E + \sum IR = 0$$

$$-12 + 6 + 3I_3 + 6I_1 = 0$$

$$3I_3 + 6I_1 = 6$$

$$I_3 + 2I_1 = 2 \dots (i)$$

2) loop 2

$$\sum E + \sum IR = 0$$

$$-12 + 8 + 3I_3 + 2I_2 = 0$$

$$3I_3 + 2I_2 = 4 \dots (ii)$$

$$3) I_3 = I_1 + I_2 \dots (iii)$$

Substitusi persamaan (iii) ke persamaan (ii)

$$3I_3 + 2I_2 = 4$$

$$3I_3 + 2(I_3 - I_1) = 4$$

$$3I_3 + 2I_3 - 2I_1 = 4$$

$$5I_3 - 2I_1 = 4 \dots (iv)$$

Eliminasi persamaan (i) dan (iv)

$$I_3 + 2I_1 = 2$$

$$\begin{array}{r} 5I_3 - 2I_1 = 4 \\ \hline 6I_3 = 6 \end{array}$$

$$I_3 = 1A$$

Substitusi nilai $I_3 = 1A$ pada persamaan (i)

$$I_3 + 2I_1 = 2$$

$$1 + 2I_1 = 2$$

$$2I_1 = 1$$

$$I_1 = \frac{1}{2}A$$

Substitusi nilai I_2 dan I_1 pada pers (iii)

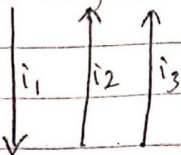
$$I_3 = I_1 + I_2$$

$$I_2 = I_3 - I_1$$

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

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

4) gambar 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?



Jawab

