

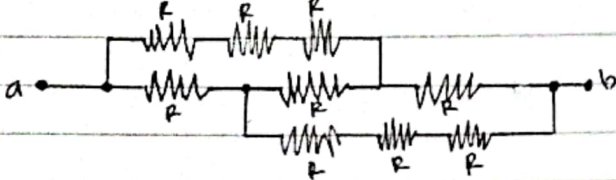
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Kelas: B

UAS Kelistrikan dan Kemagnetan

1) Perhatikan gambar



Dik $R = 5 \Omega$ dan tersambung seperti pada gambar diatas, hitung

a. Hambatan Pengganti

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

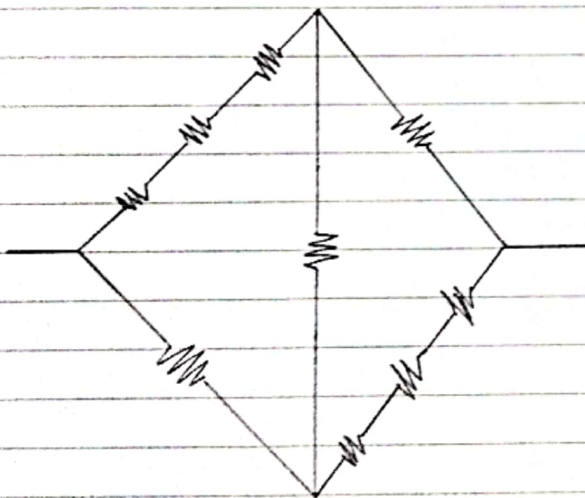
Jawab:

diket. $R = 5 \Omega$

$V = 10 \text{ Volt}$

ditanya: a. hambatan pengganti

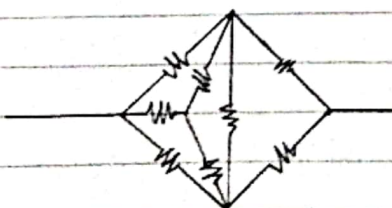
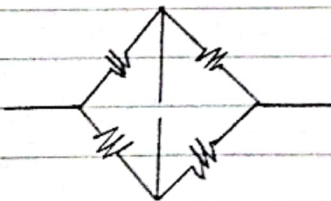
b. Arus pada setiap hambatan



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

$$\begin{aligned} R_{s2} &= R_4 + R_5 + R_6 \\ &= 5 + 5 + 5 \\ &= 15 \Omega \end{aligned}$$

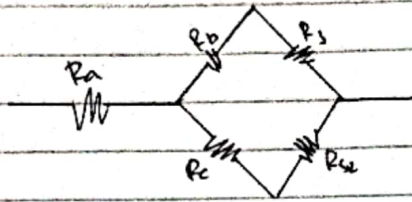
Lalu direduksi dengan hambatan wheatstone



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

$$\rightarrow R_b = \frac{R_4 \cdot R_5}{R_4 + R_4 + R_5} \Rightarrow R_b = \frac{5 \cdot 5}{5 + 5 + 5} = \frac{25}{25} = 1 \Omega //$$

$$R_c = \frac{R_4 \cdot R_5}{R_b + R_4 + R_5} \Rightarrow R_c = \frac{5 \cdot 5}{1 + 5 + 5} = \frac{25}{11} = 2.27 \Omega //$$



$$\begin{aligned} \Rightarrow R_{b3} &= R_b + R_3 \\ &= 3 + 5 \\ &= 8 \Omega \end{aligned}$$

$$\begin{aligned} \Rightarrow R_{c4} &= R_c + R_4 \\ &= 1 + 15 \\ &= 16 \Omega \end{aligned}$$

$$\begin{aligned} \Rightarrow \frac{1}{R_p} &= \frac{1}{R_{b3}} + \frac{1}{R_{c4}} \\ &= \frac{1}{8} + \frac{1}{16} \\ &= \frac{2+1}{16} \end{aligned}$$

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

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

Hambatan total atau hambatan pengganti adalah

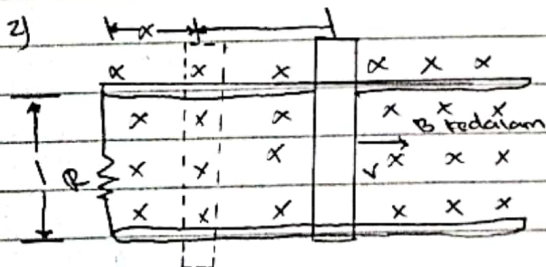
$$R_{\text{total}} = R_a + R_p$$

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

$$= \frac{9+16}{3} = \frac{25}{3}$$

$$= 8,3 \Omega$$

$$b) I = \frac{V}{R_{\text{tot}}} = \frac{10}{8,3} = 1,2 \text{ A}$$



Jelaskan arus mengalir pada setiap simpul?

$$\text{Diket: } B = 20 \text{ T}$$

$$v = 10 \text{ m/s}$$

$$R = 10 \Omega$$

Ditanya : $I \dots ?$

Jawab :

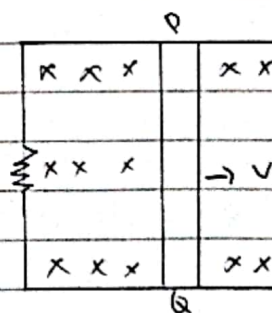
$$\mathcal{E} = Blv \sin \theta$$

$$= 20 \cdot 15 \cdot 10 \sin 90^\circ$$

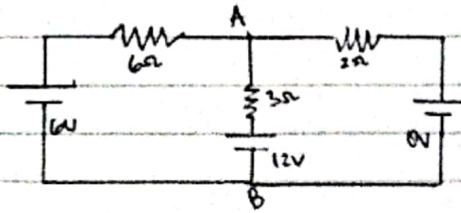
$$= 3000 \text{ V}$$

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

I mengalir dari Q ke P melalui kawat bagian kanan



3)



Hitung arus listrik pada setiap hambatan

Jawab:

diket: $R_1 = 6\Omega$

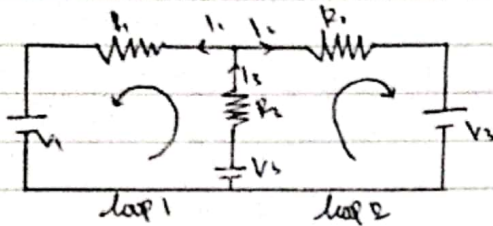
$R_2 = 2\Omega$

$R_3 = 3\Omega$

$V_1 = 6V$

$V_2 = 12V$

$V_3 = 8V$



→ Loop 1

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

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

$3I_3 + 6I_1 = 6$

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

→ Loop 2

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

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

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

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

Subst. Pers (iii) ke Pers (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 Pers (ii) dan (iv)

$I_3 + 2I_1 = 2$

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

$I_3 = \frac{1}{2} A //$

Subst. nilai $I_3 = \frac{1}{2} A$ pada Pers (i)

$I_3 + 2I_1 = 2$

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

$2I_1 = \frac{3}{2}$

$I_1 = \frac{3}{4} A //$

Subst. nilai I_3 dan I_1 dan Pers (iii)

$I_3 = I_1 + I_2$

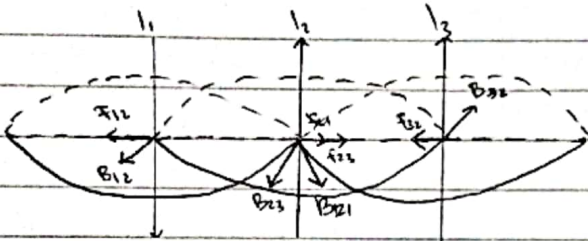
$\frac{1}{2} = \frac{3}{4} + I_2$

$I_2 = \frac{1}{4} - \frac{3}{4}$

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

4) Gambarkan gaya-gaya yang dialami oleh masing-masing kawat tertutup ini, jika anuri dan berat sama besar. kemana arah gerakan kawat 1, 2 dan 3?

Jawab :



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

Arah gaya kawat dua yang dipengaruhi kawat 1 (F_{21}) adalah ke kanan

Arah gaya kawat dua yang dipengaruhi kawat 3 (F_{23}) adalah ke kanan.

Arah gaya kawat 3 dipengaruhi kawat 2 (F_{32}) adalah ke kiri

Arah gerakan sama dg arah gayanya.