



PENGANTAR TEKNIK ELEKTRO

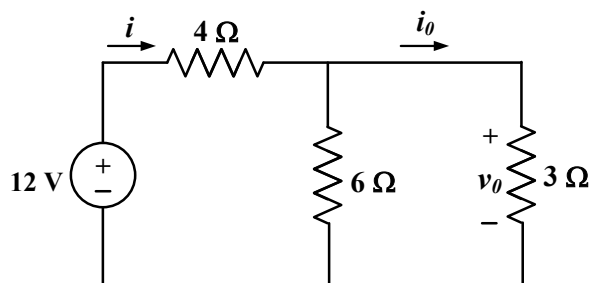
Rangkaian Listrik: Hukum OHM, KCL, KVL dan Rangkaian Seri - Paralel

Wike Handini

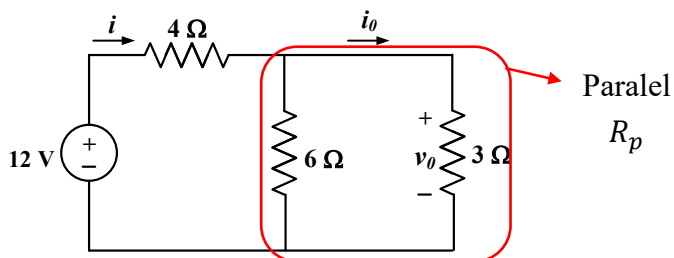
CONTOH 1

Dari rangkaian pada gambar, hitunglah v_0 , i_0 dan daya yang diserap oleh resistor $3\ \Omega$

Solusi

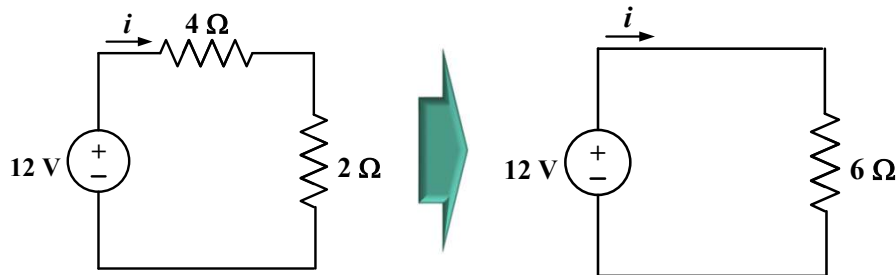


Menghitung resistansi total



$$\begin{aligned} R_p &= \frac{6 \cdot 3}{6 + 3} \\ &= \frac{18}{9} \\ &= 2\ \Omega \end{aligned}$$

SOLUSI CONTOH 1



$$R_{tot} = 2 + 4$$

$$= 6 \Omega$$

Selanjutnya untuk menghitung v_0 dan i_0 dapat digunakan 3 cara

Menghitung i

Hukum Ohm

$$v = i \times R_{tot}$$

$$i = \frac{v}{R_{tot}}$$

$$= \frac{12}{6}$$

$$= 2 \text{ A}$$

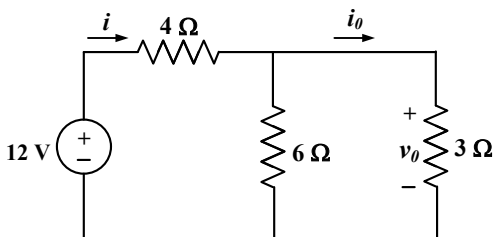
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SOLUSI CONTOH 1

Menghitung v_0 dan i_0

Cara 1

Menggunakan prinsip pembagi arus untuk menghitung i_0



$$i_0 = \frac{6}{3 + 6} i$$

$$= \frac{6 \cdot 2}{3 + 6}$$

$$= \frac{12}{9}$$

$$= \frac{4}{3} = 1,33 \text{ A}$$

$$v_0 = 3 \times i_0$$

$$= 3 \times \frac{4}{3}$$

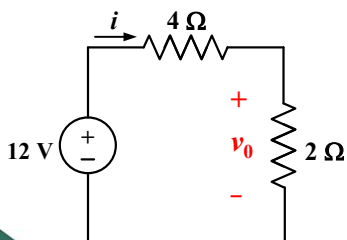
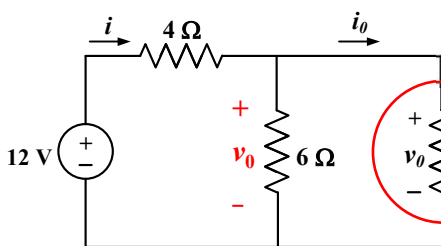
$$= 4 \text{ V}$$

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SOLUSI CONTOH 1

Menghitung v_0 dan i_0

Cara 2



Menggunakan hukum Ohm menghitung v_0

$$\begin{aligned} v_0 &= 2i \\ &= 2 \times 2 \\ &= 4 \text{ V} \end{aligned}$$

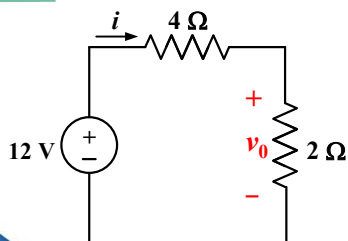
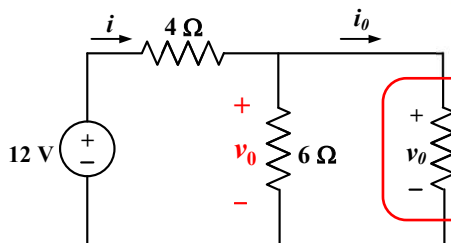
$$\begin{aligned} v_0 &= 3 \times i_0 \\ i_0 &= \frac{v_0}{3} \\ &= \frac{4}{3} = 1,33 \text{ A} \end{aligned}$$

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SOLUSI CONTOH 1

Menghitung v_0 dan i_0

Cara 3



Menggunakan prinsip pembagi tegangan untuk menghitung v_0

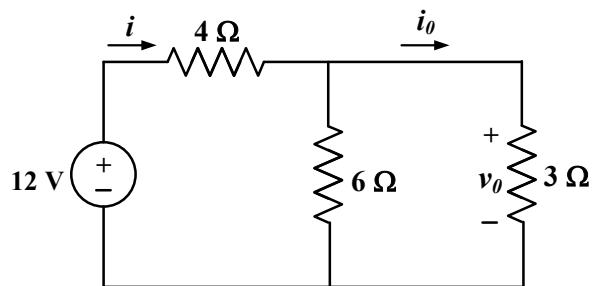
$$\begin{aligned} v_0 &= \frac{2}{2+4} v \\ &= \frac{2 \cdot 12}{2+4} \\ &= \frac{24}{6} = 4 \text{ V} \end{aligned}$$

$$\begin{aligned} v_0 &= 3 \times i_0 \\ i_0 &= \frac{v_0}{3} \\ &= \frac{4}{3} = 1,33 \text{ A} \end{aligned}$$

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SOLUSI CONTOH 1

Menghitung daya yang diserap oleh resistor $3\ \Omega$

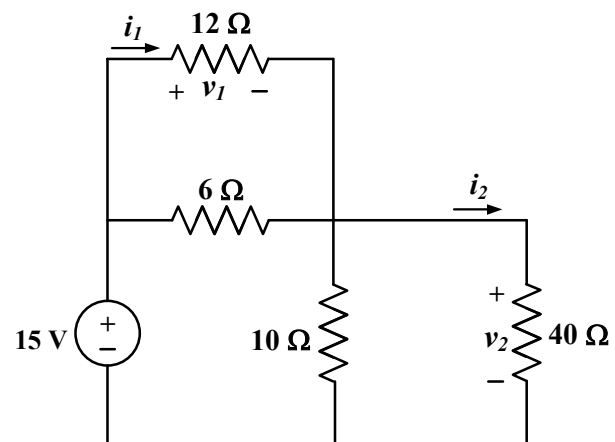


$$\begin{aligned} P &= v_0 \times i_0 \\ &= 4 \times 1,33 \\ &= 5,33\text{ W} \end{aligned}$$

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CONTOH 2

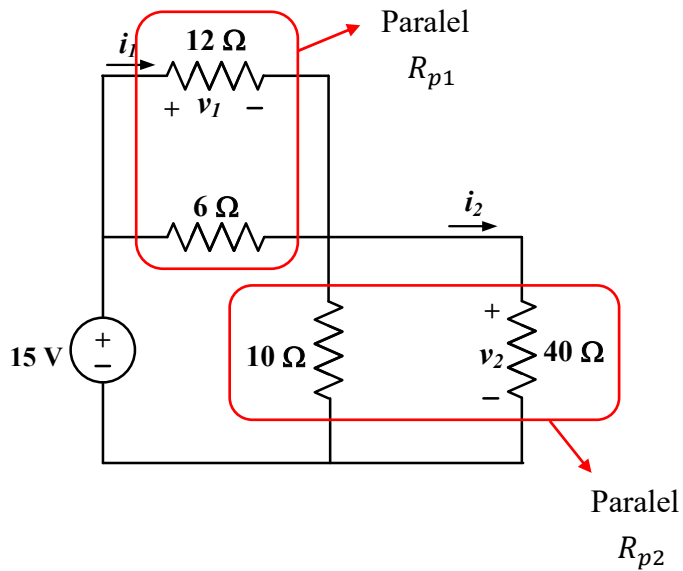
Dari rangkaian pada gambar, hitunglah v_1 , v_2 , i_1 , i_2 serta daya yang diserap oleh resistor $12\ \Omega$ dan $40\ \Omega$



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SOLUSI CONTOH 2

Menghitung resistansi total



$$R_{p1} = \frac{6 \cdot 12}{6 + 12} = \frac{72}{18} = 4 \Omega$$

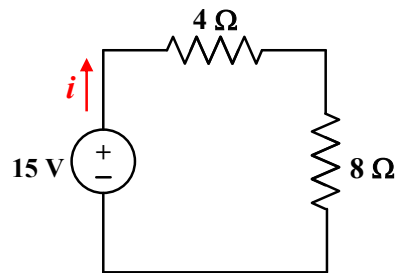
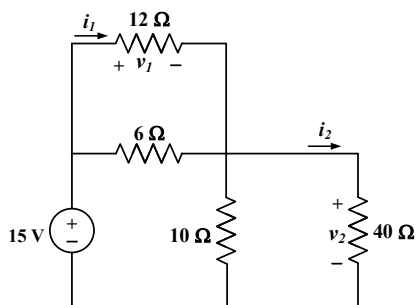
$$R_{p2} = \frac{10 \cdot 40}{10 + 40} = \frac{400}{50} = 8 \Omega$$

Selanjutnya untuk menghitung v_1 , v_2 , i_1 , i_2 dapat digunakan 2 cara

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SOLUSI CONTOH 2

Cara 1



$$R_{tot} = 8 + 4 = 12 \Omega$$

$$v = i \times R_{tot}$$

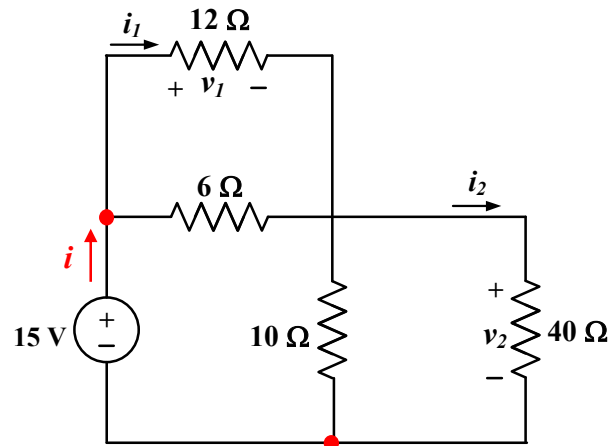
$$i = \frac{v}{R_{tot}}$$

$$= \frac{15}{12} = 1,25 \text{ A}$$

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SOLUSI CONTOH 2

Menghitung i_1 dan i_2 dengan prinsip pembagi arus



$$i_1 = \frac{6}{12 + 6} i$$

$$= \frac{6 \cdot 1,25}{12 + 6} = \frac{7,5}{18} = 0,4167 \text{ A}$$

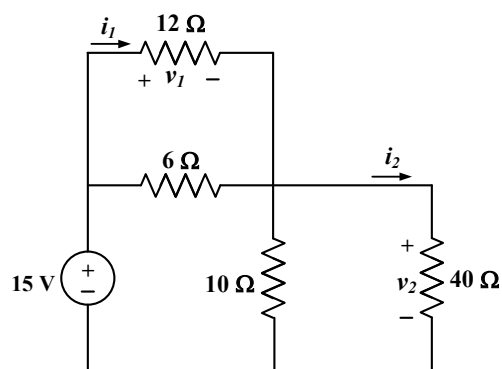
$$i_2 = \frac{10}{40 + 10} i$$

$$= \frac{10 \cdot 1,25}{40 + 10} = \frac{12,5}{50} = 0,25 \text{ A}$$

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SOLUSI CONTOH 2

Menghitung v_1 dan v_2 dengan hukum Ohm



$$P_1 = v_1 \times i_1$$

$$= 5 \times 0,4167 = 2,083 \text{ W}$$

$$P_2 = v_2 \times i_2$$

$$= 10 \times 0,25 = 2,5 \text{ W}$$

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SOLUSI CONTOH 2

Cara 2

Menghitung v_1 dan v_2 dengan prinsip pembagi tegangan

$$v_1 = \frac{4}{4 + 8} v$$

$$= \frac{4 \cdot 15}{4 + 8}$$

$$= \frac{60}{12}$$

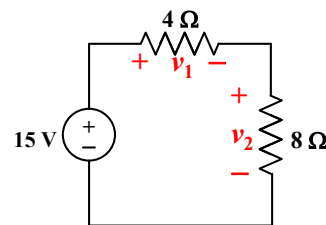
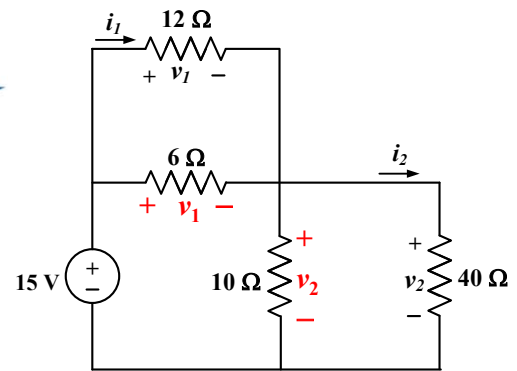
$$= 5 \text{ V}$$

$$v_2 = \frac{8}{4 + 8} v$$

$$= \frac{8 \cdot 15}{4 + 8}$$

$$= \frac{120}{12}$$

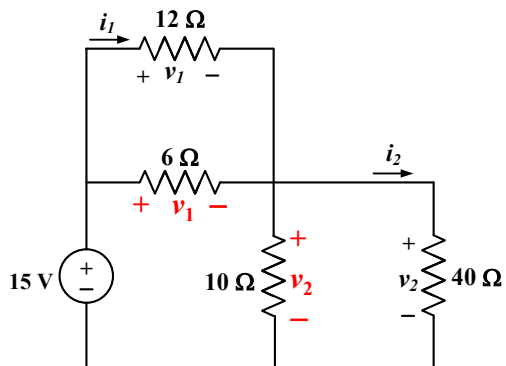
$$= 10 \text{ V}$$



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SOLUSI CONTOH 2

Menghitung i_1 dan i_2 dengan hukum Ohm



$$v_1 = 12i_1$$

$$i_1 = \frac{v_1}{12}$$

$$i_1 = \frac{5}{12}$$

$$= 0,4167 \text{ A}$$

$$v_2 = 40i_2$$

$$i_2 = \frac{v_2}{40}$$

$$i_2 = \frac{10}{40} = 0,25 \text{ A}$$

$$P_1 = v_1 \times i_1$$

$$= 5 \times 0,4167 = 2,083 \text{ W}$$

$$P_2 = v_2 \times i_2$$

$$= 10 \times 0,25 = 2,5 \text{ W}$$

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