



PENGANTAR TEKNIK ELEKTRO

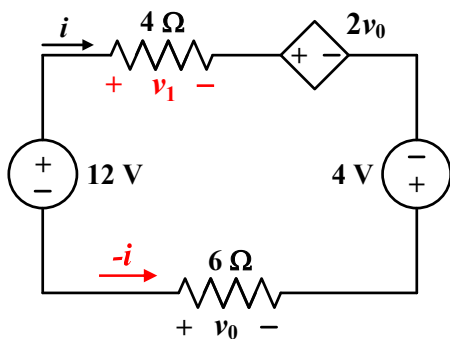
Rangkaian Listrik: Hukum OHM, KCL, KVL dan Rangkaian Seri - Paralel

Wike Handini

CONTOH 3

Hitunglah i dan v_0 dari rangkaian pada gambar

Solusi



KVL

$$-12 + v_1 + 2v_0 - 4 - v_0 = 0$$

Hukum
Ohm

Substitusi

$$v_1 = 4i$$

$$v_0 = -6i$$

CONTOH 3 → Solusi

$$-12 + v_1 + 2v_0 - 4 - v_0 = 0$$

$$-16 + 4i + 2(-6i) - (-6i) = 0$$

$$-16 + 4i - 12i + 6i = 0$$

$$-16 - 2i = 0$$

$$-2i = 16$$

$$i = -\frac{16}{2}$$

$$= -8 \text{ A}$$

$$v_0 = -6i$$

$$= -6(-8)$$

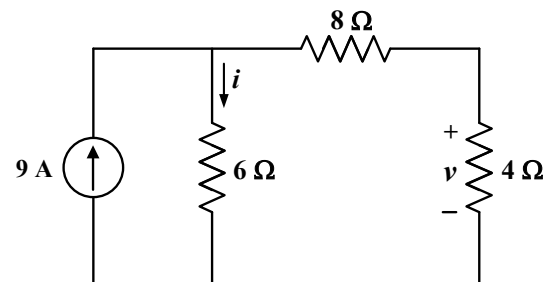
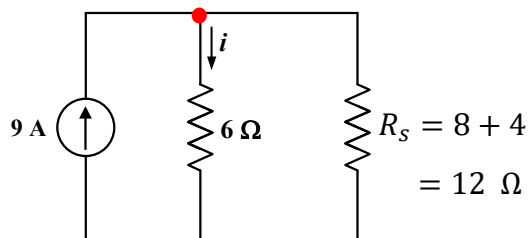
$$= 48 \text{ V}$$

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CONTOH 4

Dari rangkaian pada gambar, hitunglah i , v dan daya yang diserap oleh resistor 6Ω

Solusi

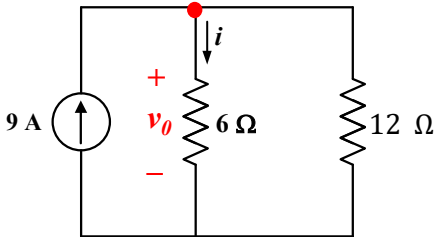


Menghitung i dengan prinsip pembagi arus

$$i = \frac{12}{6 + 12} \times 9$$
$$= \frac{108}{18} = 6 \text{ A}$$

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CONTOH 4 → Solusi



Menghitung v_0 dengan Hukum Ohm

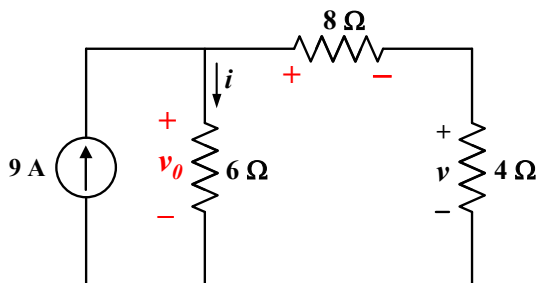
$$\begin{aligned}v_0 &= 6 \times i \\&= 6 \times 6 = 36 \text{ V}\end{aligned}$$

Menghitung daya yang diserap resistor 6 Ω

$$\begin{aligned}P &= v_0 \times i \\&= 36 \times 6 = 216 \text{ W}\end{aligned}$$

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CONTOH 4 → Solusi 1 Menghitung v

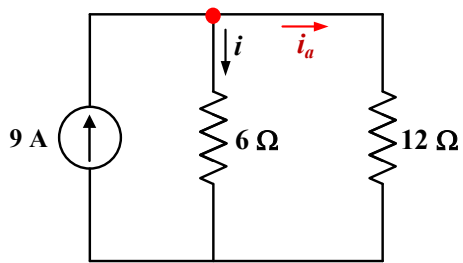


Menghitung v dengan konsep pembagi tegangan

$$\begin{aligned}v &= \frac{4}{8 + 4} v_0 \\&= \frac{4 \times 36}{12} \\&= \frac{144}{12} = 12 \text{ V}\end{aligned}$$

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CONTOH 4 → Solusi 2 Menghitung v

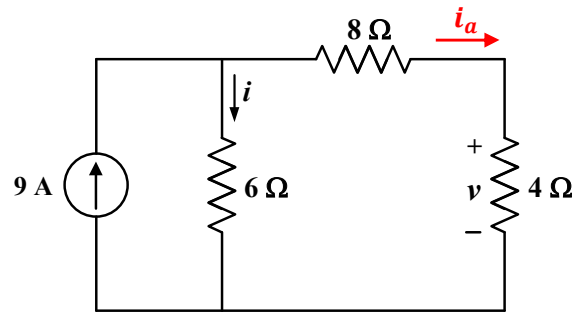


Menghitung i_a dengan KCL

$$i + i_a = 9$$

$$i_a = 9 - i$$

$$= 9 - 6 = 3 \text{ A}$$



Menghitung v dengan Hukum Ohm

$$v = 4 \times i_a$$

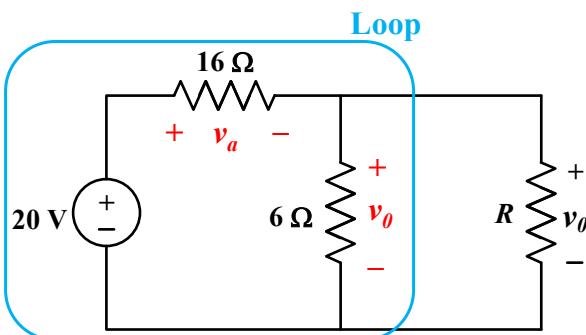
$$= 4 \times 3 = 12 \text{ V}$$

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CONTOH 5

Dari rangkaian pada gambar, hitunglah R jika $v_0 = 4 \text{ V}$

Solusi



KVL pada loop

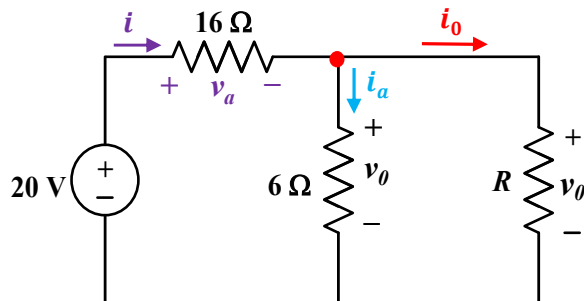
$$v_a + v_0 = 20$$

$$v_a = 20 - v_0$$

$$= 20 - 4 = 16 \text{ V}$$

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CONTOH 5 → Solusi



Hukum Ohm

$$v_a = 16 \times i$$

$$i = \frac{v_a}{16}$$

$$= \frac{16}{16} = 1 \text{ A}$$

Menghitung i_a dengan Hukum Ohm

$$i_a = \frac{v_0}{6}$$

$$= \frac{4}{6} = 0,667 \text{ A}$$

Menghitung i_0 dengan KCL

$$i_a + i_0 = i$$

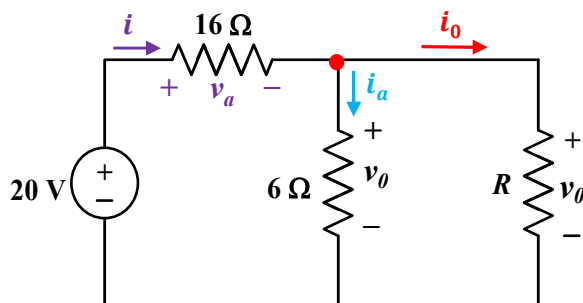
$$i_0 = i - i_a$$

$$= 1 - 0,667$$

$$= 0,333 \text{ A}$$

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CONTOH 5 → Solusi



Menghitung R dengan Hukum Ohm

$$v_0 = R \times i_0$$

$$R = \frac{v_0}{i_0}$$

$$= \frac{4}{0,333}$$

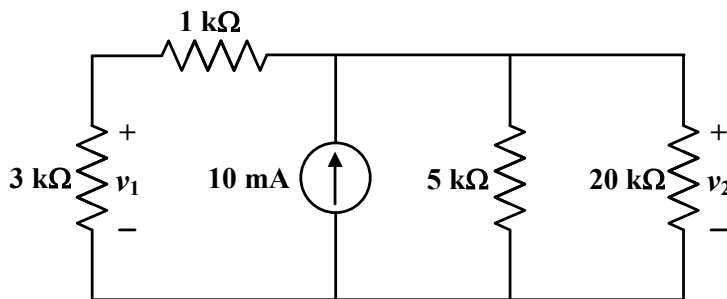
$$= 12 \text{ } \Omega$$

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CONTOH 6

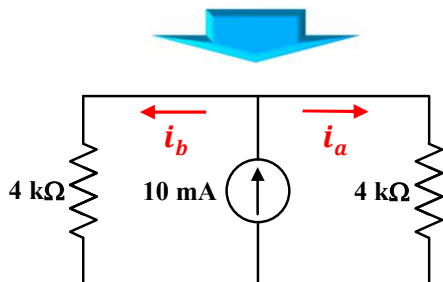
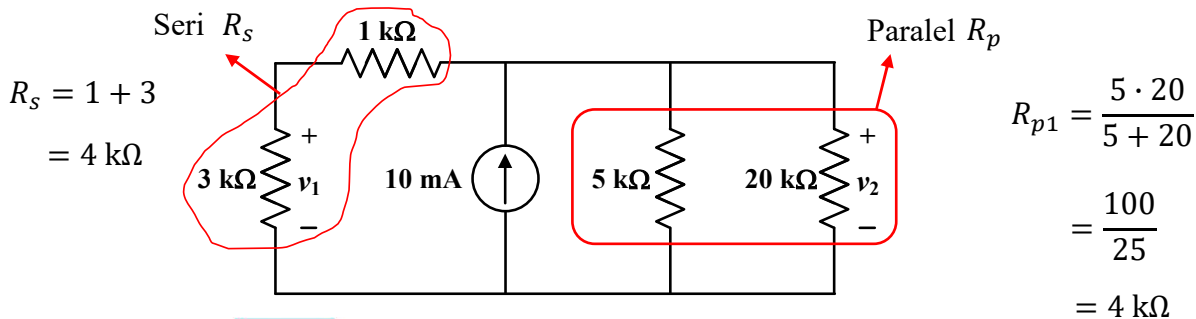
Dari rangkaian pada gambar, hitunglah:

- v_1 dan v_2
- Daya yang diserap resistor $3 \text{ k}\Omega$ dan $20 \text{ k}\Omega$
- Daya yang dipasok oleh sumber arus 10 mA



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CONTOH 6 → Solusi a

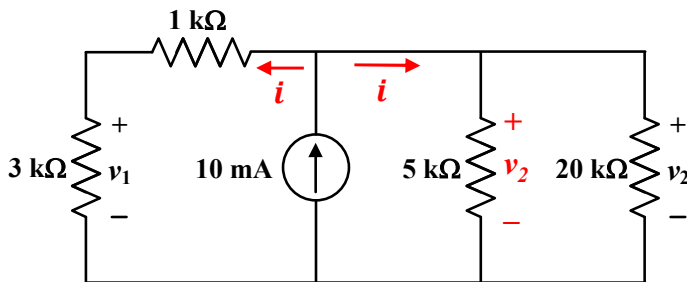


Karena arus cabang sama nilainya yaitu sebesar $4 \text{ k}\Omega$, maka $i_a = i_b = i$

$$i = \frac{10}{2} = 5 \text{ mA} = 0,005 \text{ A}$$

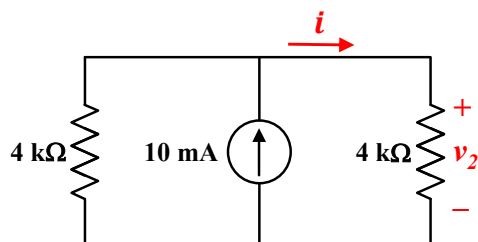
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CONTOH 6 → Solusi a



Menghitung v_1

$$\begin{aligned} v_1 &= Ri \\ &= 3000 \times 0,005 \\ &= 15 \text{ V} \end{aligned}$$

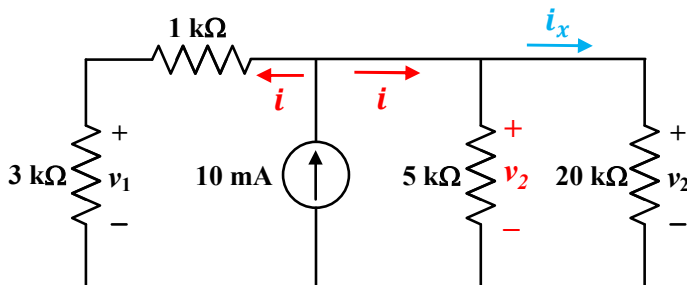


Menghitung v_2

$$\begin{aligned} v_2 &= Ri \\ &= 4000 \times 0,005 = 20 \text{ V} \end{aligned}$$

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CONTOH 6 → Solusi b



Daya yang diserap
resistor 3 kΩ

$$\begin{aligned} P_{3\Omega} &= v_1 i \\ &= 15 \times 0,005 \\ &= 0,075 \text{ W} = 75 \text{ mW} \end{aligned}$$

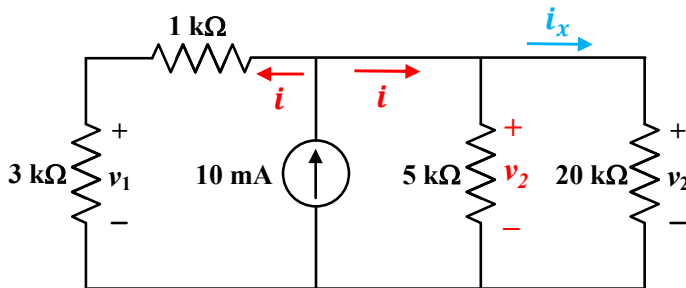
Menghitung

i_x

$$\begin{aligned} i_x &= \frac{5}{5 + 20} i \\ &= \frac{5 \cdot 0,005}{25} = \frac{0,025}{25} = 0,001 \text{ A} = 1 \text{ mA} \end{aligned}$$

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CONTOH 6 → Solusi b

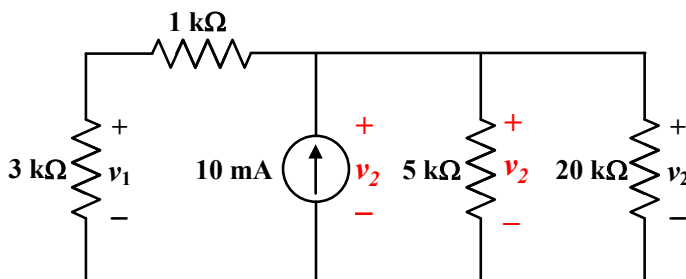


Daya yang diserap
resistor 20 kΩ

$$\begin{aligned}
 P_{20\Omega} &= v_2 i_x \\
 &= 20 \times 0,001 \\
 &= 0,02 \text{ W} \\
 &= 20 \text{ mW}
 \end{aligned}$$

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CONTOH 6 → Solusi c



Daya yang dipasok oleh
sumber arus 10 mA

$$\begin{aligned}
 P_{sumber} &= v_2 \times i_{sumber} \\
 &= 20 \times 0,01 \\
 &= 0,2 \text{ W} \\
 &= 200 \text{ mW}
 \end{aligned}$$

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