Eletricidade Básica
Circuito equivalente de Thèvenin

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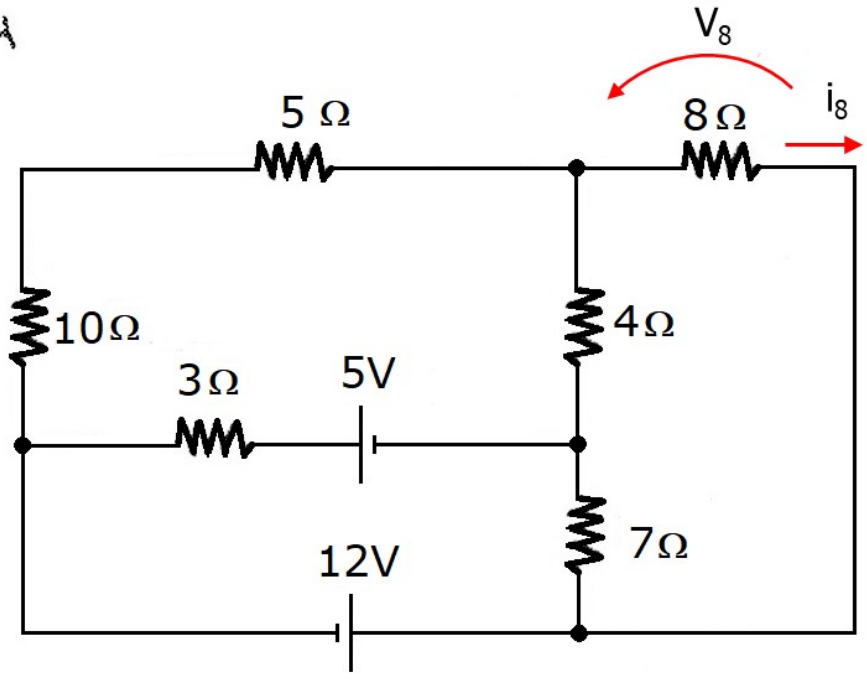
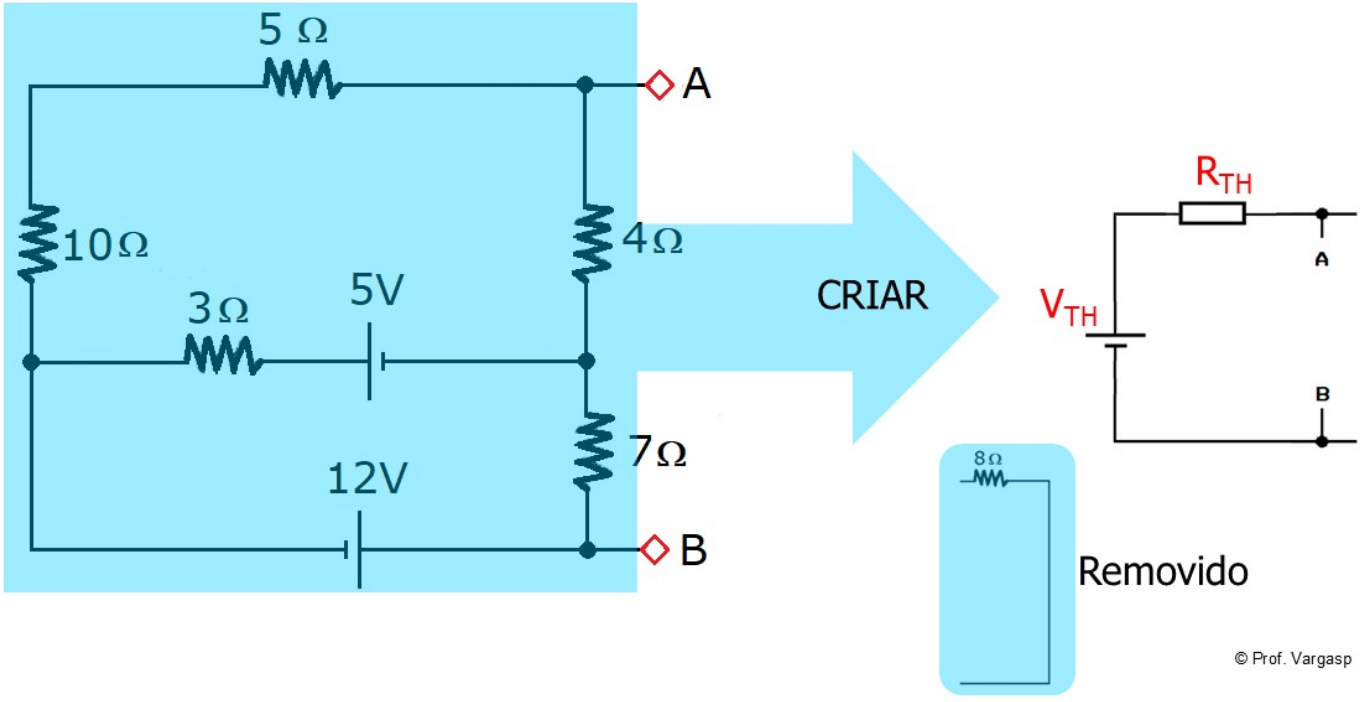
30/04



Aplicando Thèvenin teremos



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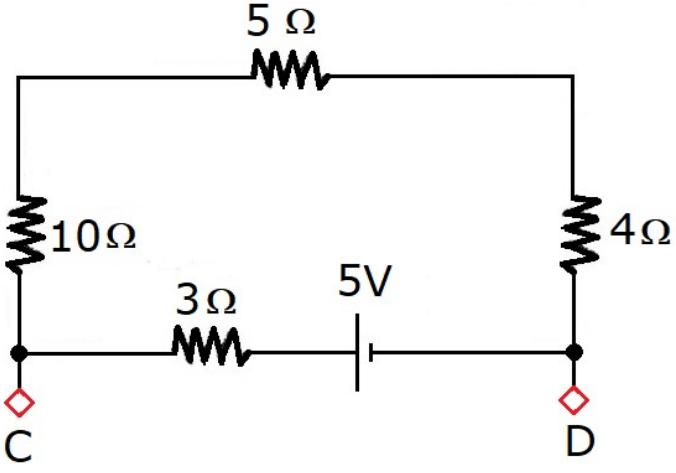
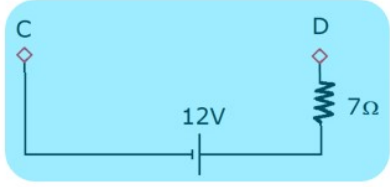
Reaplicando Thèvenin

- Mas veja que temos ainda duas malhas e podemos reaplicar o conceito deixando com uma única malha:





Removido

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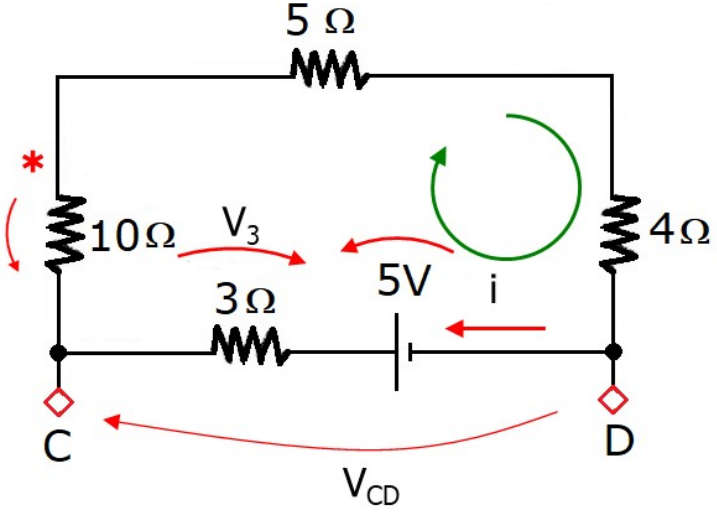


Levantando a equação da malha por Kirchhoff:

$$-10i - 5i - 4i + 5 - 3i = 0$$

$$5 = 10i + 5i + 4i + 3i$$

$$5 = 22i$$

$$\frac{5}{22} = i$$

$$i = 0.2273\ A$$

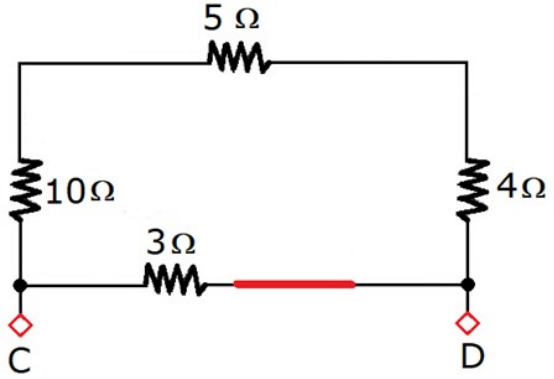
$$V_3 = 3 \times i = 3 \times 0.2273$$

$$V_3 = 0.6818\ \text{V}$$

$$V_{CD} = 5 - 0.6818 = 4.3182\ V$$

$$V_{CD} = V_{TH} = 4.3182\,V$$

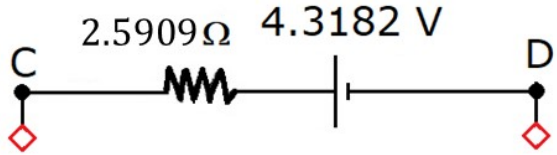
Curto-circuitando a fonte, teremos:



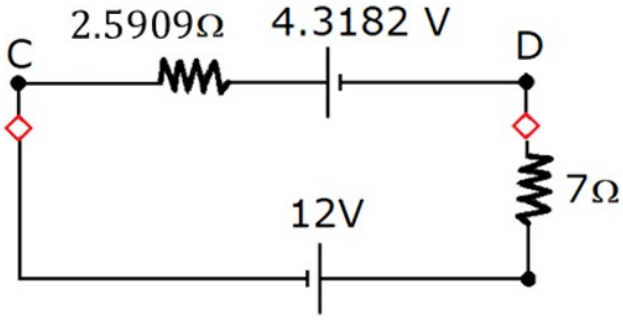
$R_{CD} = R_{TH} = 10 + 4 + 5$ em paralelo com 3 ou :

$$R_{TH} = \frac{1}{\frac{1}{19} + \frac{1}{3}} = 2.5909\,\Omega$$

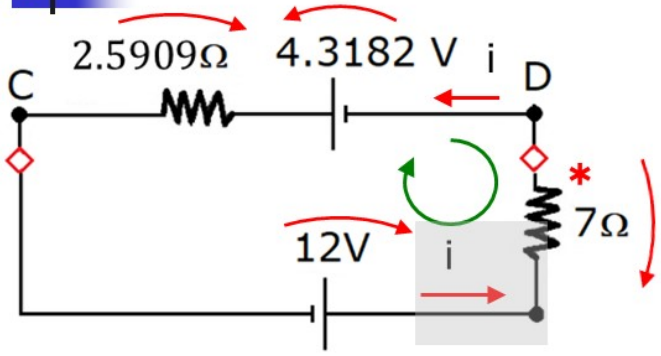
Cujo circuito equivalente de Thèvenin será:



Reconstruindo:



Que nesta condição resulta...



Levantando a equação da malha por Kirchhoff:

$$7i - 12 + 2.5909i - 4.3182 = 0$$

$$9.5909i - 16.3182 = 0$$

$$9.5909i = 16.3182$$

$$i = \frac{16.3182}{9.5909} = 1.7014\ A$$

A tensão sobre 2.5909 Ω será:

$$V_{2.2509} = 2.5909 \times 1.7014$$

$$V_{2.2509} = 4.4082\ \text{V}$$

$$V_{DC} = 4.4082 - 4.3182 = 0.09\ \text{V}$$

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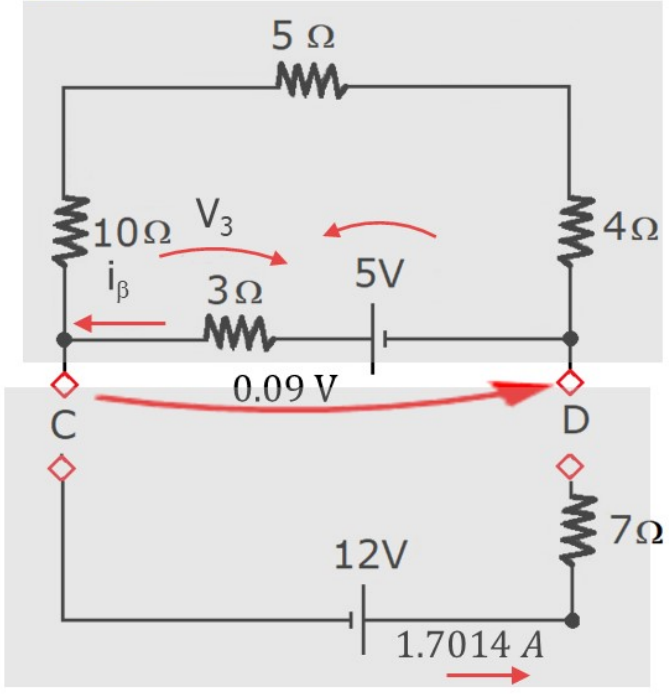
Voltando na origem



Que pelo esquema mostra que a tensão sobre 3Ω será:

$$V_3 - 5 = 0.09$$

$$V_3 = 5.09\ V$$

$$i_\beta = \frac{5{,}09}{3} = 1.6967\ \text{A}$$

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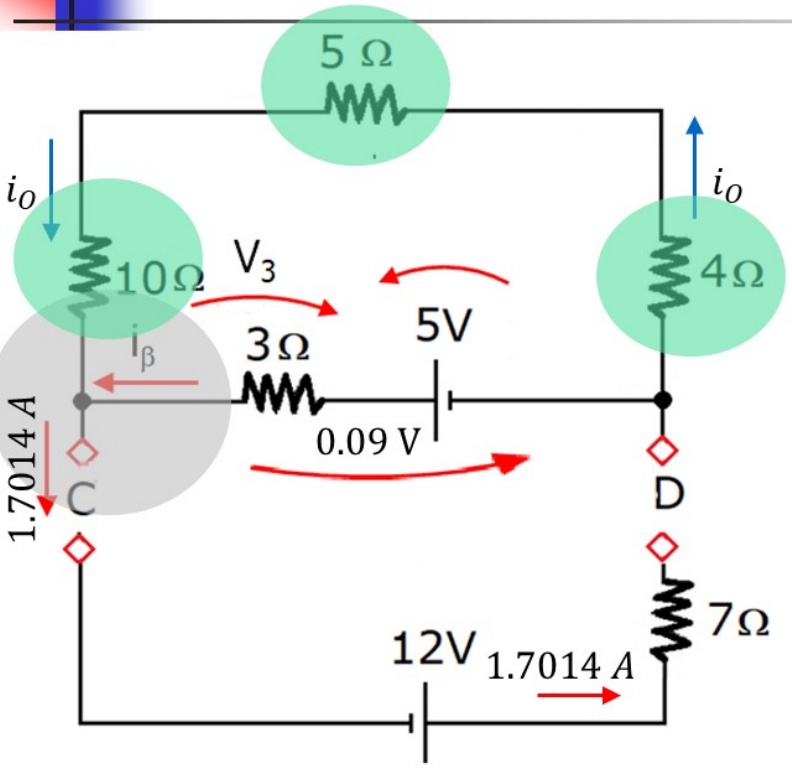
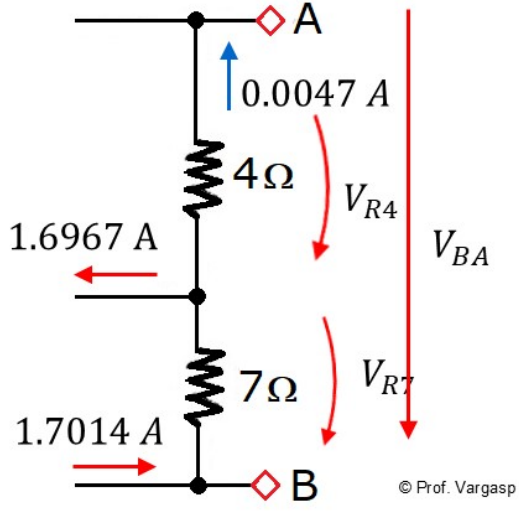
Continuando...



$$i_O = \frac{0{,}09}{10 + 5 + 4} = \frac{0.09}{19}$$

$$i_O = 0.0047\ A$$



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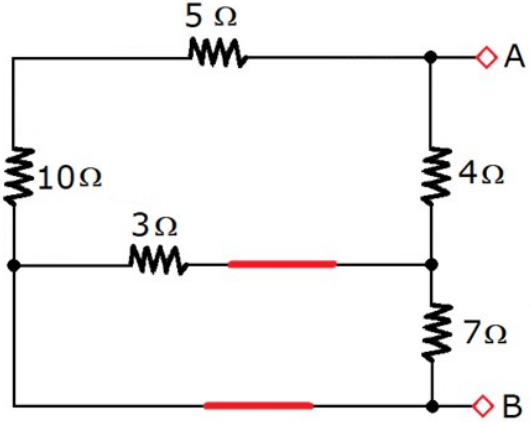
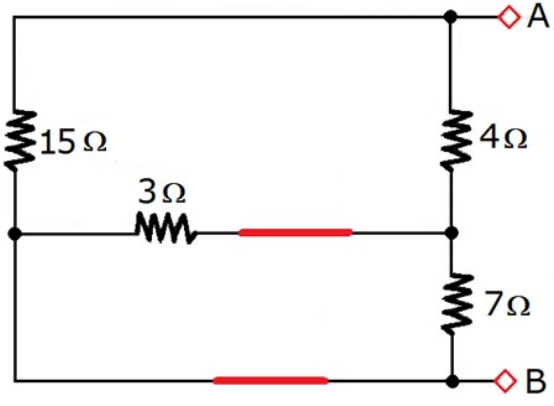
Detalhando

$$V_{R4} = 4 \times 0.0047 = 0.0189 \text{ V}$$

$$V_{R7} = 7 \times 1.7014 = 11.9098 \text{ V}$$

$$V_{BA} = V_{TH} = 11.9098 + 0.0189 = 11.9287 \text{ V}$$





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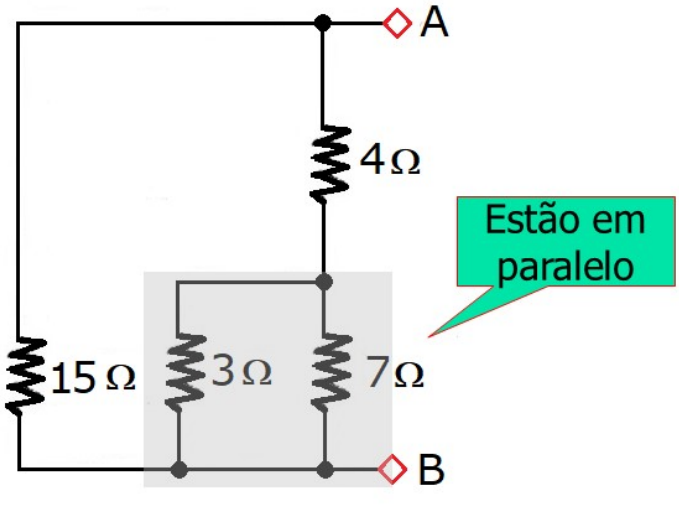
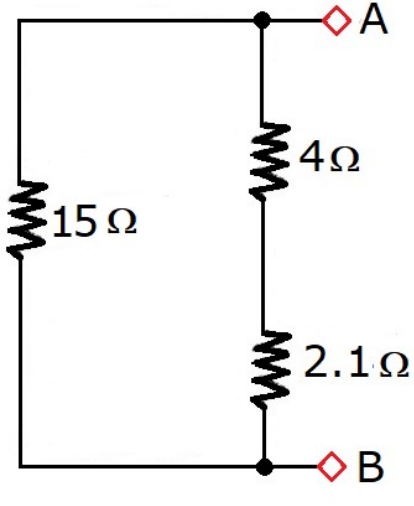
Redesenhando





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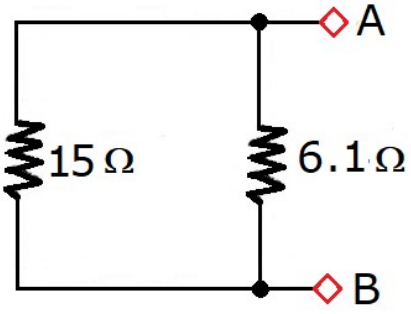
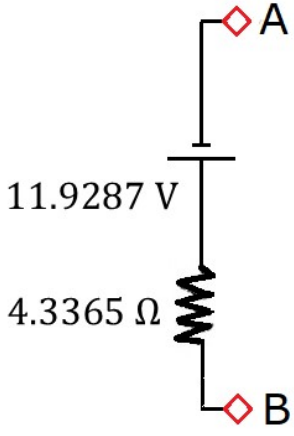
Remontando



$R_{AB} = R_{TH} = 15 \,//\, 6.1$

$$R_{TH} = \frac{1}{\frac{1}{15} + \frac{1}{6.1}} = 4.3365\ \Omega$$



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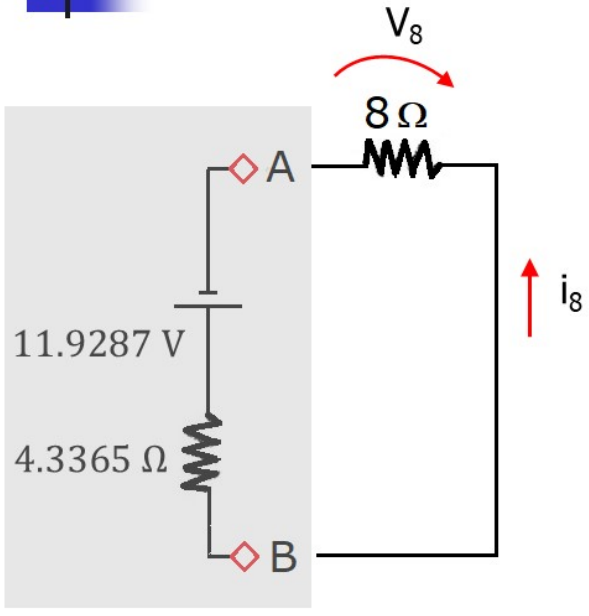
Concluindo



$$i_8 = \frac{11.9287}{8 + 4.3365}$$

$$i_8 = 0.9669\ A$$

$$V_8 = 8 \times 0.9669$$

$$V_8 = 7.7356\ V$$

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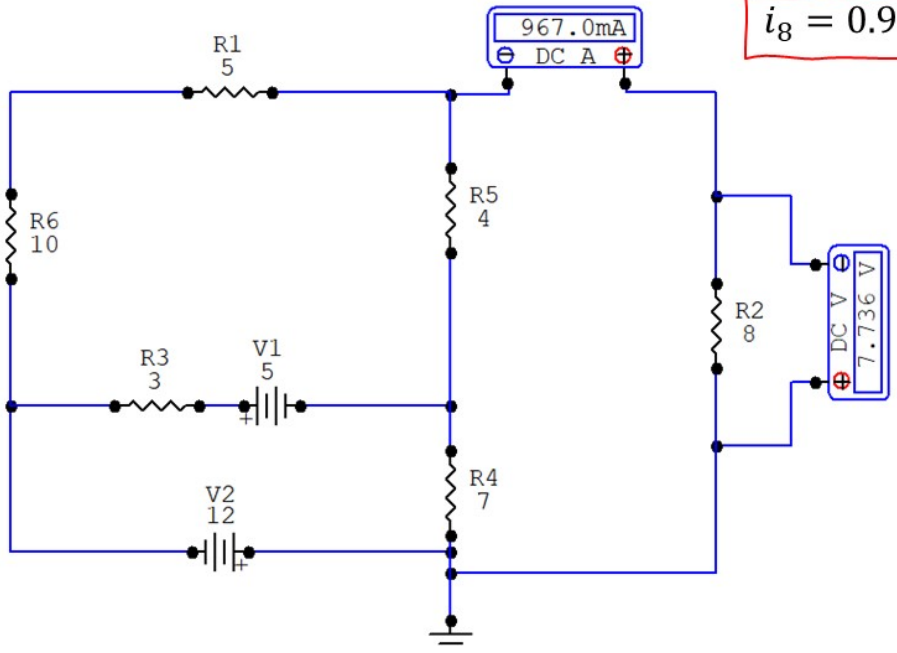
Verificando com o simulador Circuit Maker



$i_8 = 0.9669\ A$

$V_8 = 7.7356\ V$

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