



"Hi, honey... I'm Ohm!"

Sinais e Sistemas Electrónicos

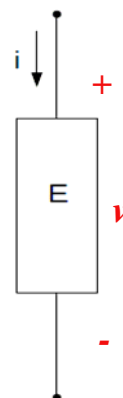
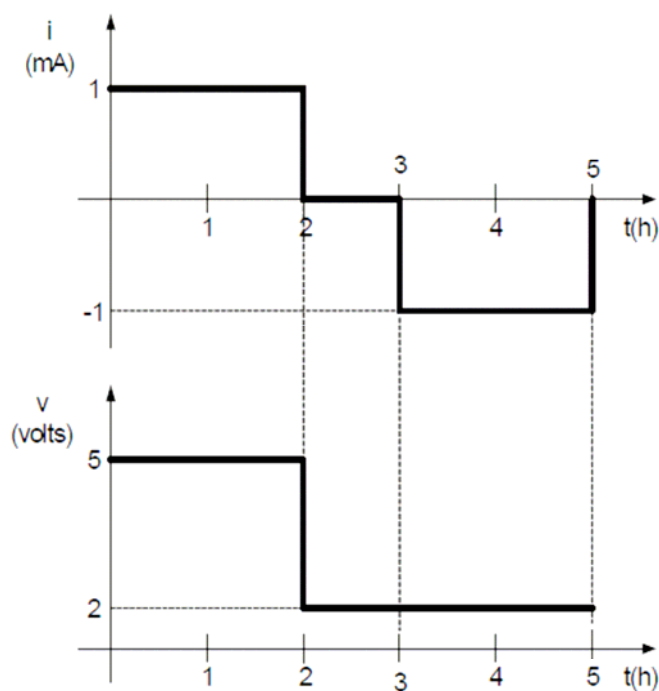
Problemas resolvidos I

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Sinais e Sistemas Electrónicos – 2022/2023

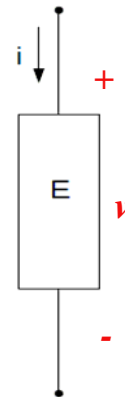
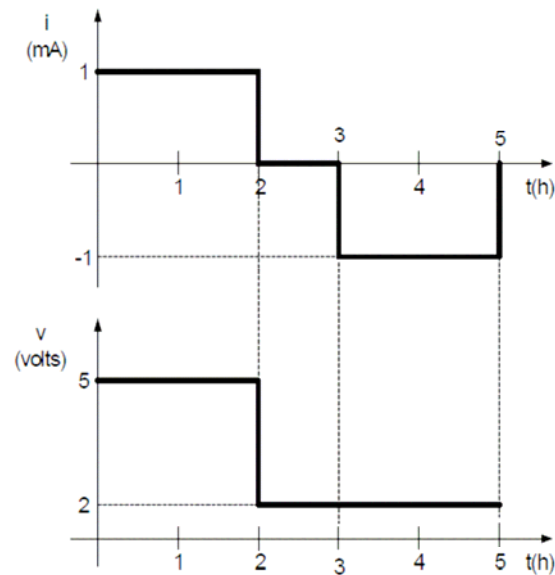
1.1 – Problema 6



a) Qual foi a potência fornecida ao elemento E em cada um dos 3 intervalos ?

1.1 – Problema 6

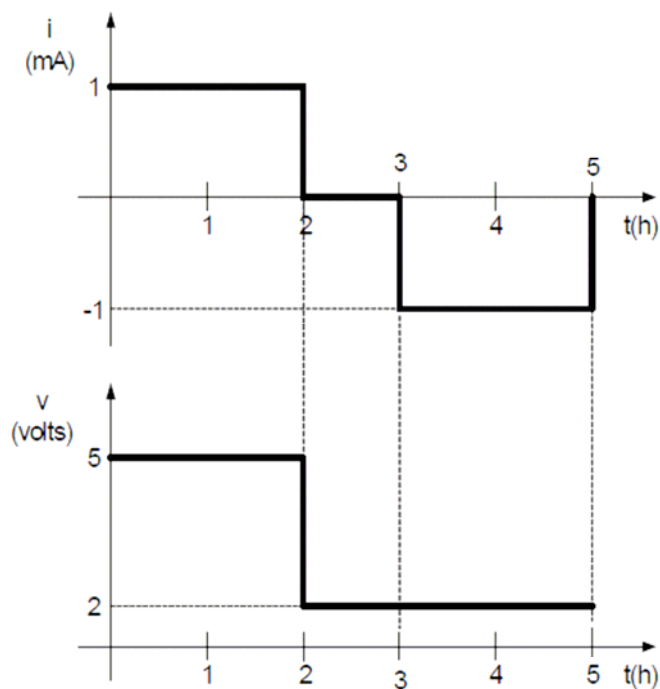
a)



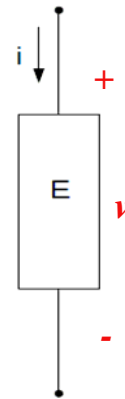
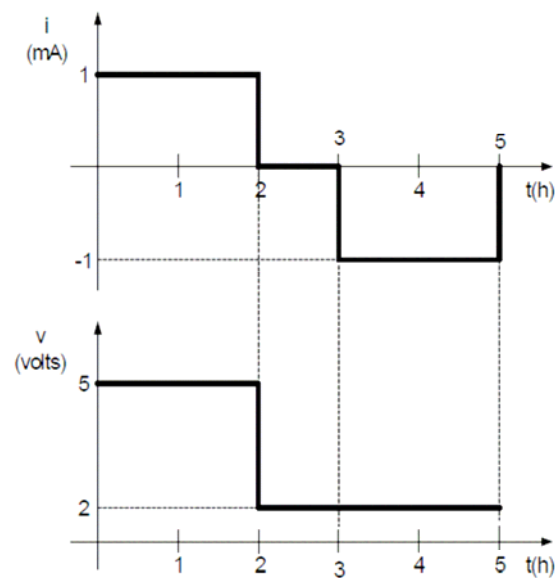
$$P[0, 2] = 5 \times 1mA = 5mW$$

$$P[2, 3] = 2 \times 0 = 0W$$

$P[3, 5] = 2 \times (-1mA) = -2mW$ (neste intervalo o elemento E fornece potência ao exterior)

1.1 – Problema 6

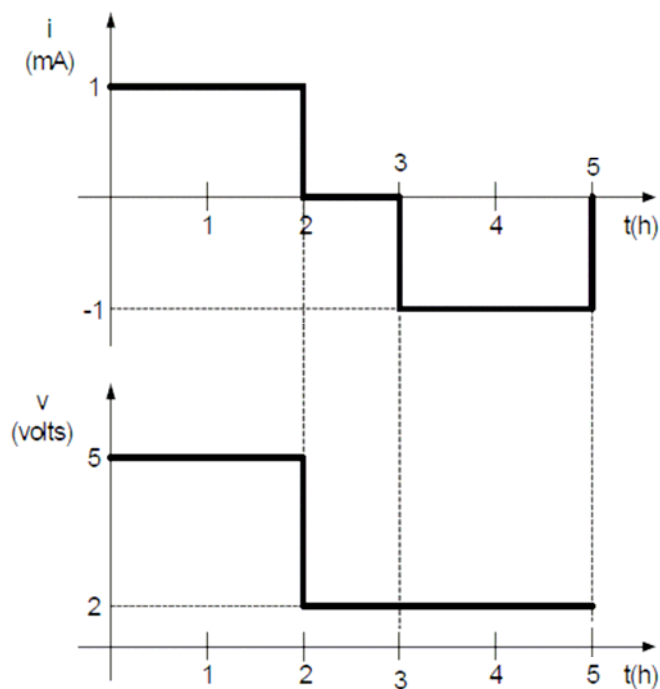
b) Qual foi a energia fornecida ao elemento E durante as primeiras duas horas ?

1.1 – Problema 6

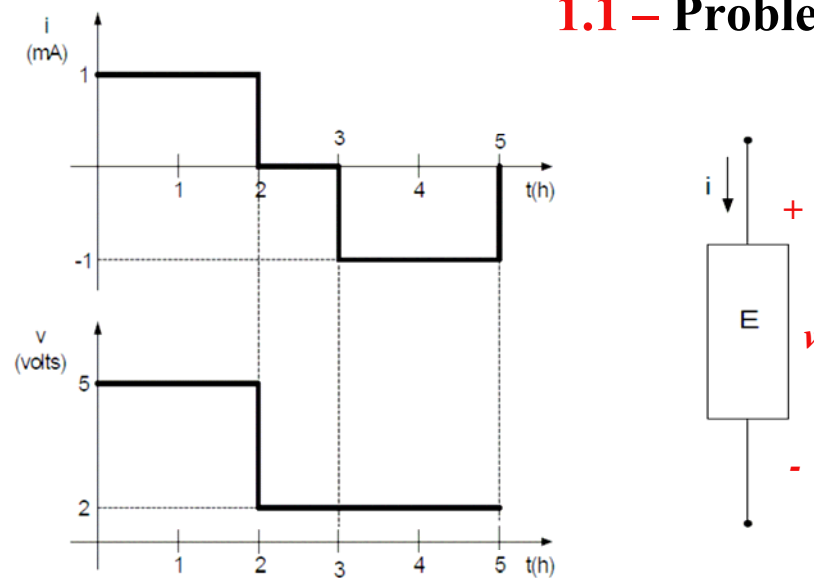
b)

$$P = VI = 5 \times (1\text{mA}) = 5\text{mW}$$

$$E = P \times t = (5\text{mW})(2 \times 60 \times 60) = 36\text{J}$$

1.1 – Problema 6

c) Supondo uma energia inicial nula, qual é a energia que permanece (restante) no elemento E ao fim das 5 horas ?

1.1 – Problema 6

c)

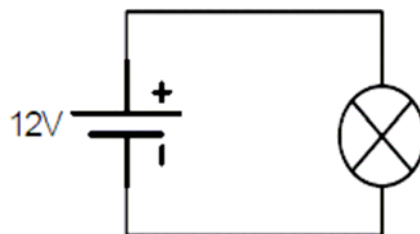
$$E[0, 2] = 36J$$

$$E[3, 5] = -2mW \times 2h \times 60m \times 60s = -14.4J$$

$$E_{restante} = 36J - 14.4J = 21.6J$$

1.2 – Problema 10

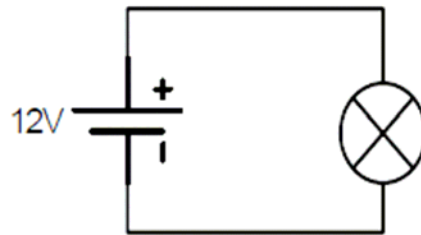
Um circuito composto por um bateria de automóvel de 12Volts e uma lâmpada, apresentado na figura 1.2 fornece à lâmpada uma energia de 460.8Wh durante o período de 8 horas.



a) Qual é a potência fornecida à lâmpada ?

b) Qual é a corrente que percorre a lâmpada ?

1.2 – Problema 10



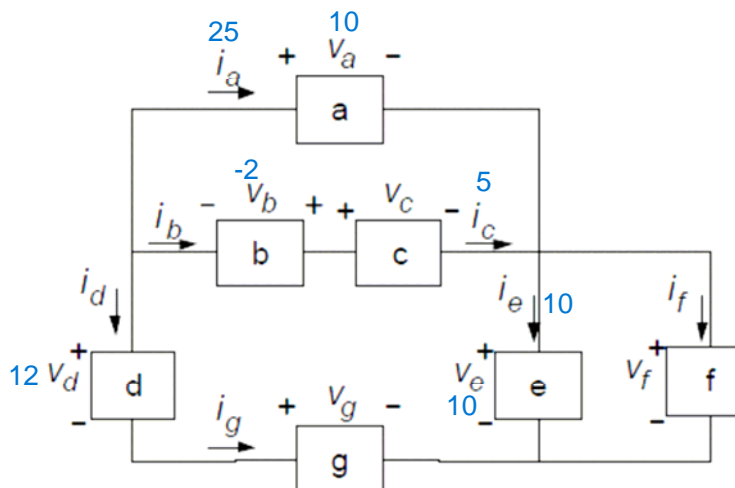
a) Uma vez que a potência é igual à energia a dividir pelo tempo temos:

$$P = \frac{E}{t} = \frac{460.8}{8} = 57.6W$$

b) Uma vez que a corrente é igual à potência a dividir pela tensão:

$$I = \frac{P}{V} = \frac{57.6}{12} = 4.8A$$

1.3

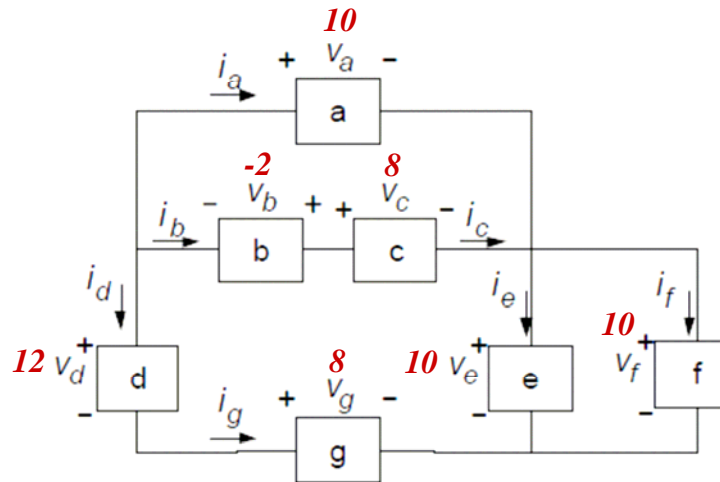


- Calcular valores das tensões, correntes e potências dissipadas.

- Para cada elemento, indicar se está a dissipar ou a fornecer potência (D/F).

Tabela I

Elemento	V (V)	I (A)	Pa (W)	D/F
a	10	25	250	d
b	-2	5	-10	f
c	8	5	40	d
d	12	-30		f
e	10	10	100	d
f		20		
g				



$$V_a - V_c + V_b = 0 \Leftrightarrow 10 - V_c - 2 = 0 \Leftrightarrow V_c = 8V$$

$$V_f = V_e = 10V$$

$$V_a + V_e - V_g - V_d = 0 \Leftrightarrow 10 + 10 - V_g - 12 = 0 \Leftrightarrow V_g = 8V$$

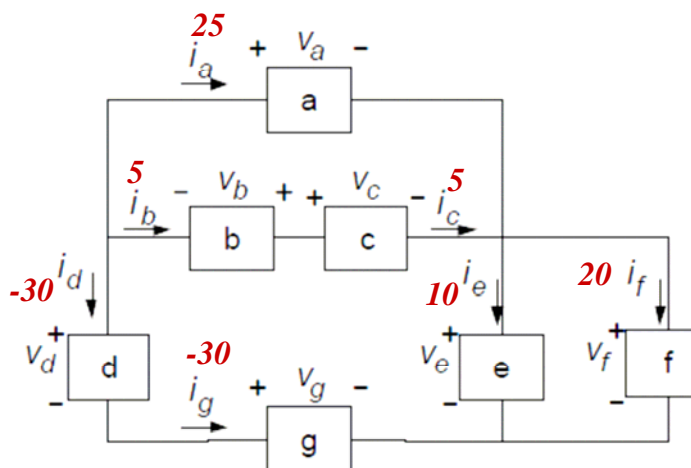


Tabela I

Elemento	V (V)	I (A)	P _d (W)	D/F
a	10	25		
b	-2			
c		5		
d	12			
e	10	10		
f				
g				

$$I_b = I_c = 5A$$

$$I_a + I_b + I_d = 0 \Leftrightarrow 25 + 5 + I_d = 0 \Leftrightarrow I_d = -30A$$

$$I_g = I_d = -30A$$

$$I_e + I_f + I_g = 0 \Leftrightarrow 10 + I_f - 30 = 0 \Leftrightarrow I_f = 20A$$

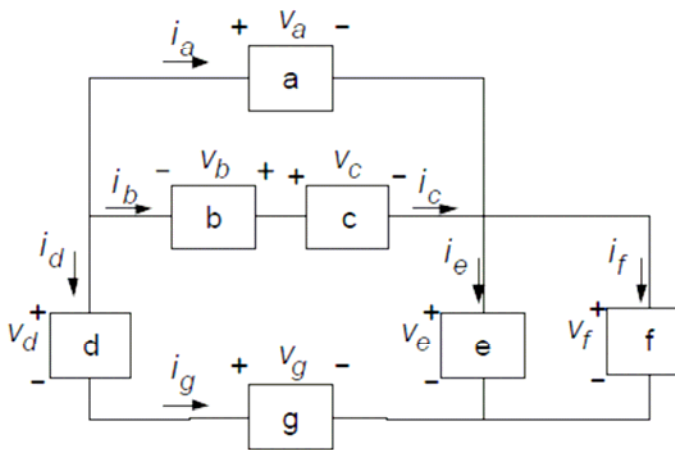
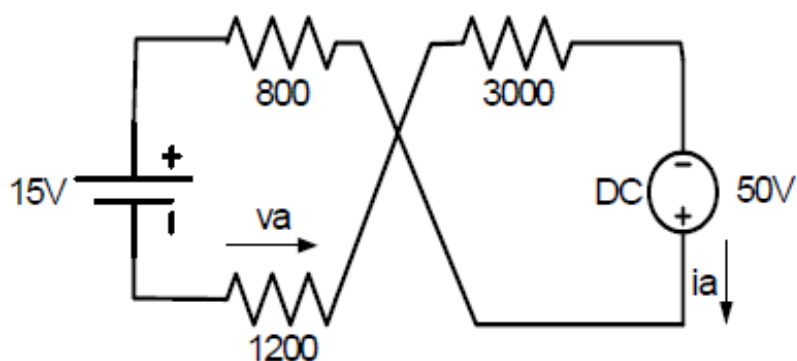


Tabela I

Elemento	V (V)	I (A)	P _d (W)	D/F
a	10	25	250	D
b	-2	5	10	D
c	8	5	40	D
d	12	-30	-360	F
e	10	10	100	D
f	10	20	200	D
g	8	-30	-240	F

1.4 – Problema 16

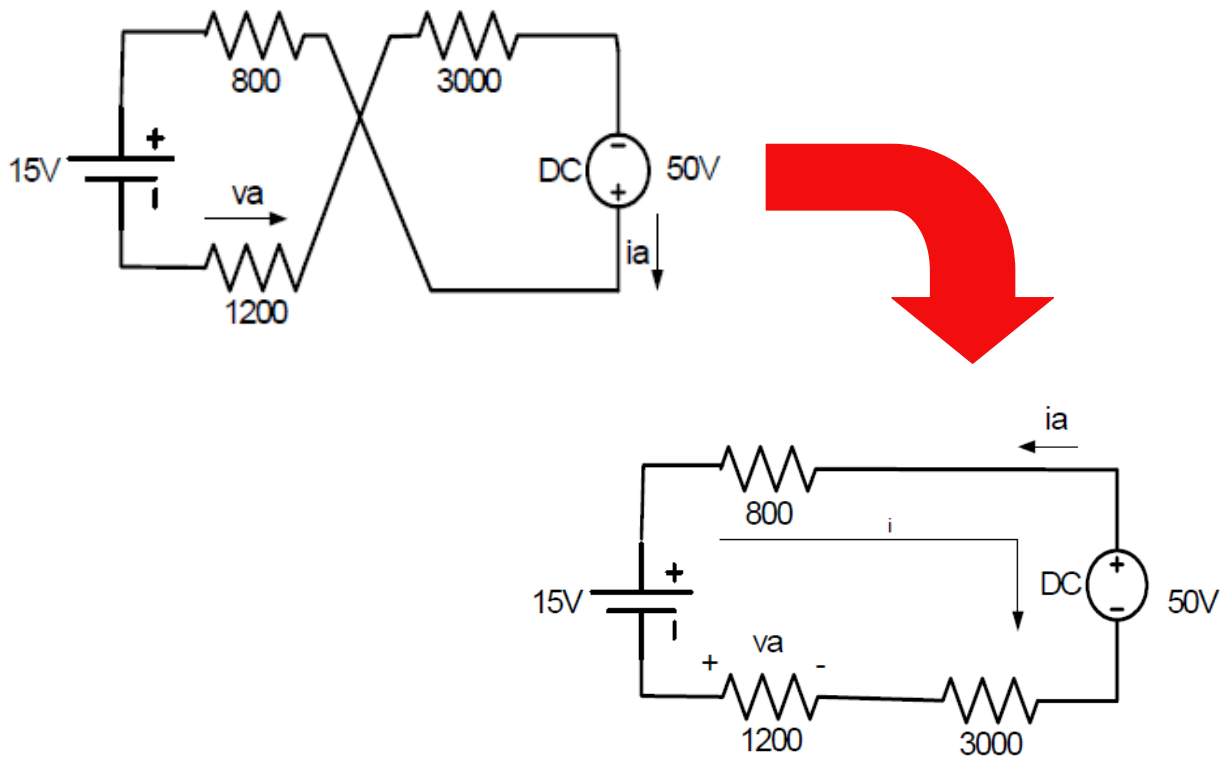
Dado o circuito eléctrico da figura 1.5 em que as unidades das resistências estão todas em ohms (Ω).



Calcular:

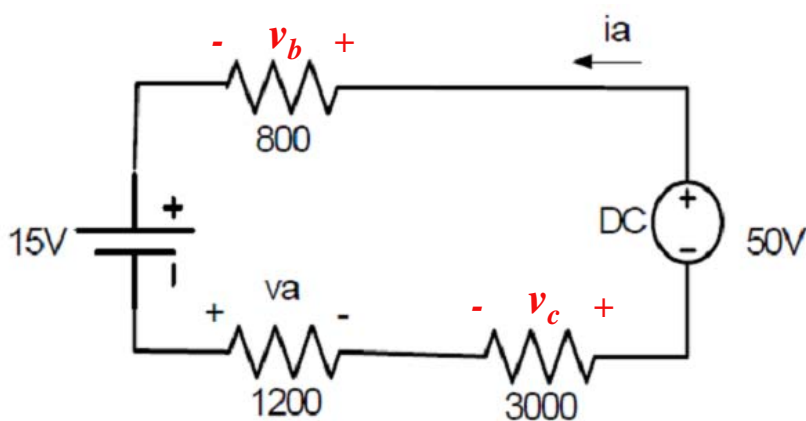
- O valor da corrente i_a .
- O valor da tensão v_a .
- A potência fornecida pela fonte de 15V *olts*.

1.4 – Problema 16



1.4 – Problema 16

a)



$$\text{KVL: } -15 - v_b + 50 + v_c - v_a = 0$$

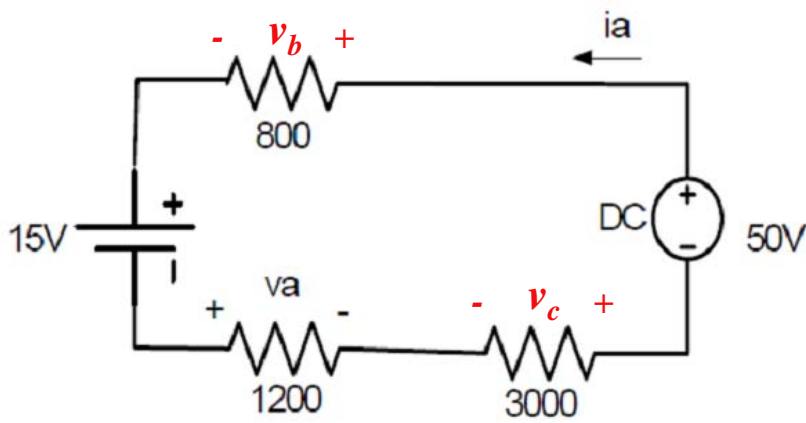
$$v_a = 1200i_a$$

$$v_b = 800i_a$$

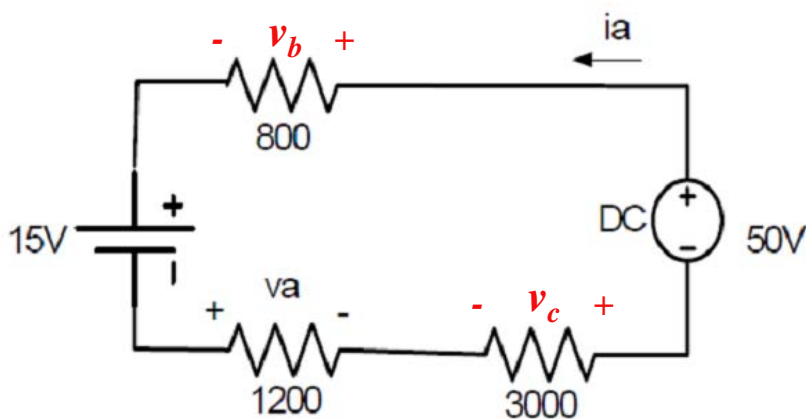
$$v_c = -3000i_a$$

$$-15 - 800i_a + 50 - 3000i_a - 1200i_a = 0$$

$$i_a = 7\text{mA}$$

1.4 – Problema 16**b)**

$$i_a = 7mA \quad v_a = 1200i_a = 1200 \times 0.007 = 8.4V$$

1.4 – Problema 16**c)**

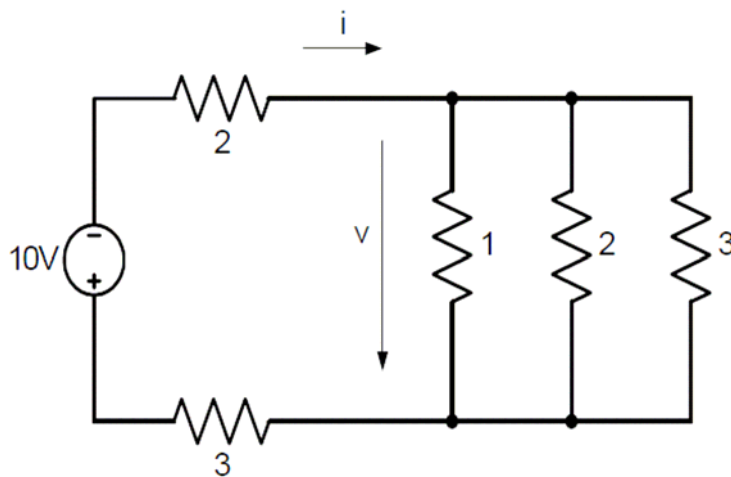
$$i_a = 7mA \quad P_{a(15)} = V \times I = 15 \times 0.007 = 105mW$$

Mas isto é a potência absorvida!

$$P_{f(15)} = -105mW$$

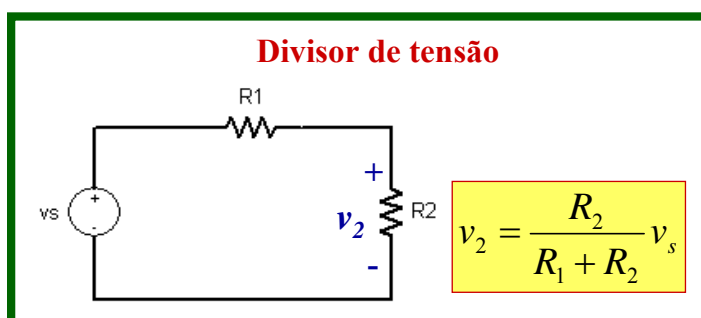
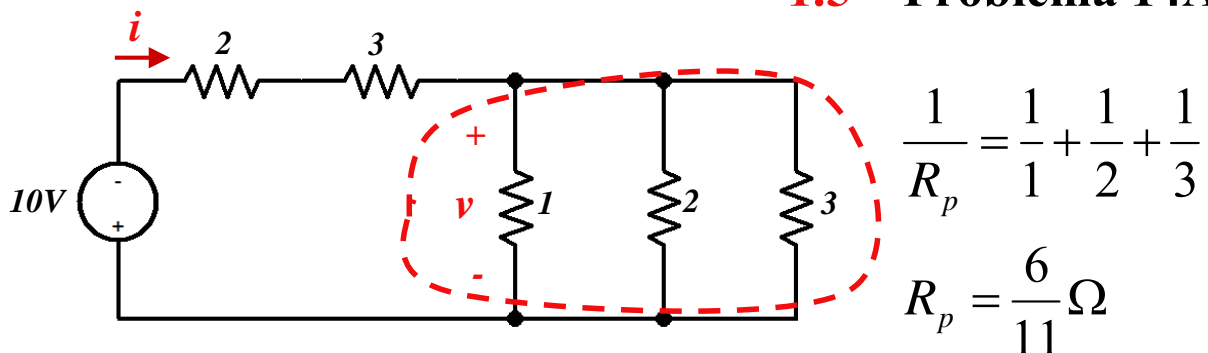
1.5 – Problema 14A

Dado o circuito eléctrico



Calcular a tensão v e a corrente i .

1.5 – Problema 14A

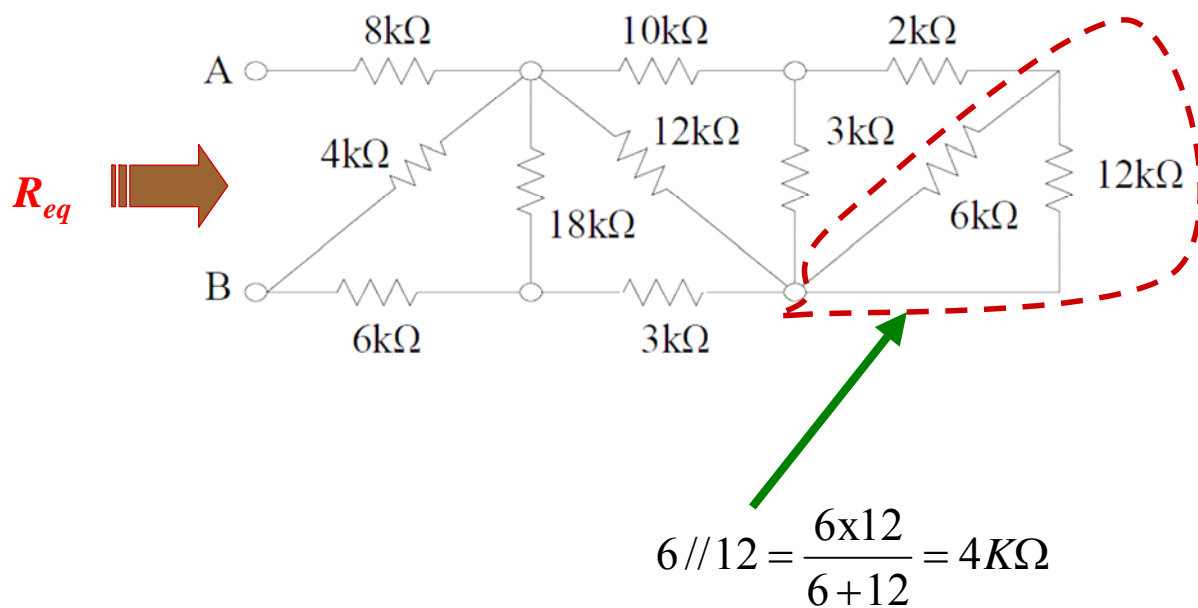
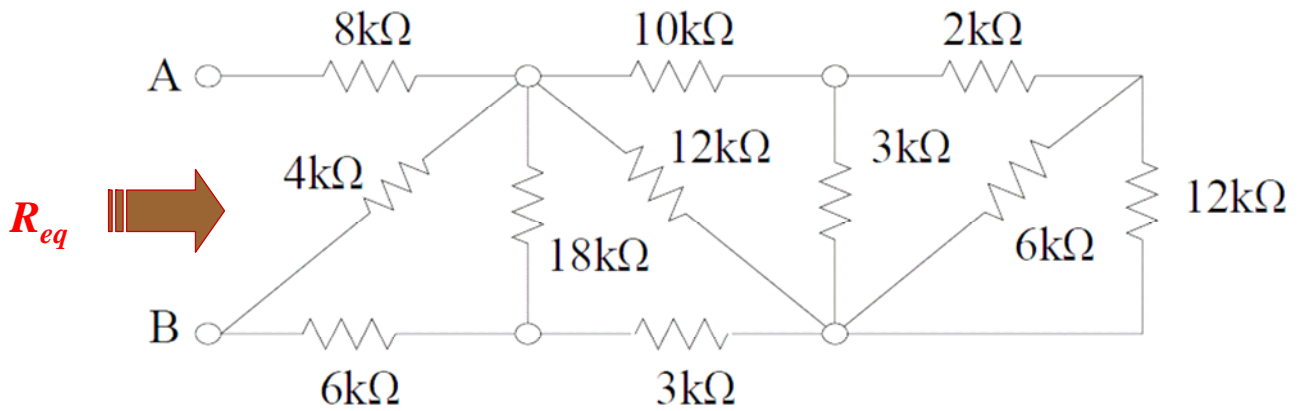


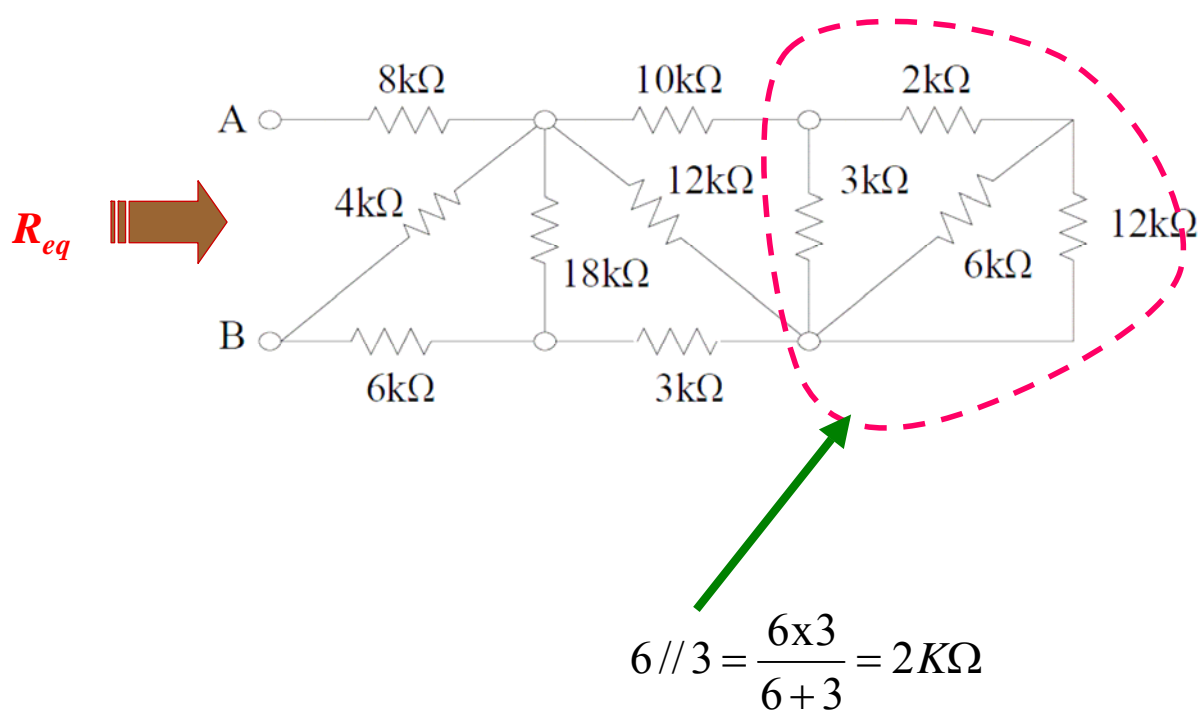
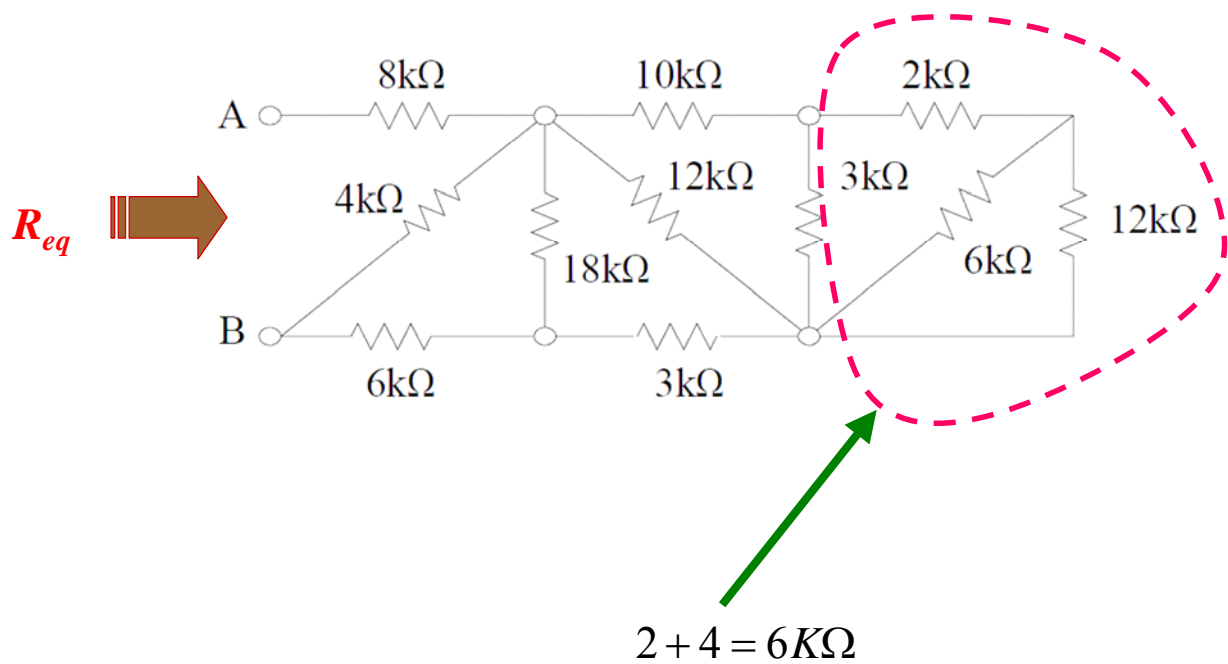
$$v = -\frac{R_p}{2 + 3 + R_p} 10$$

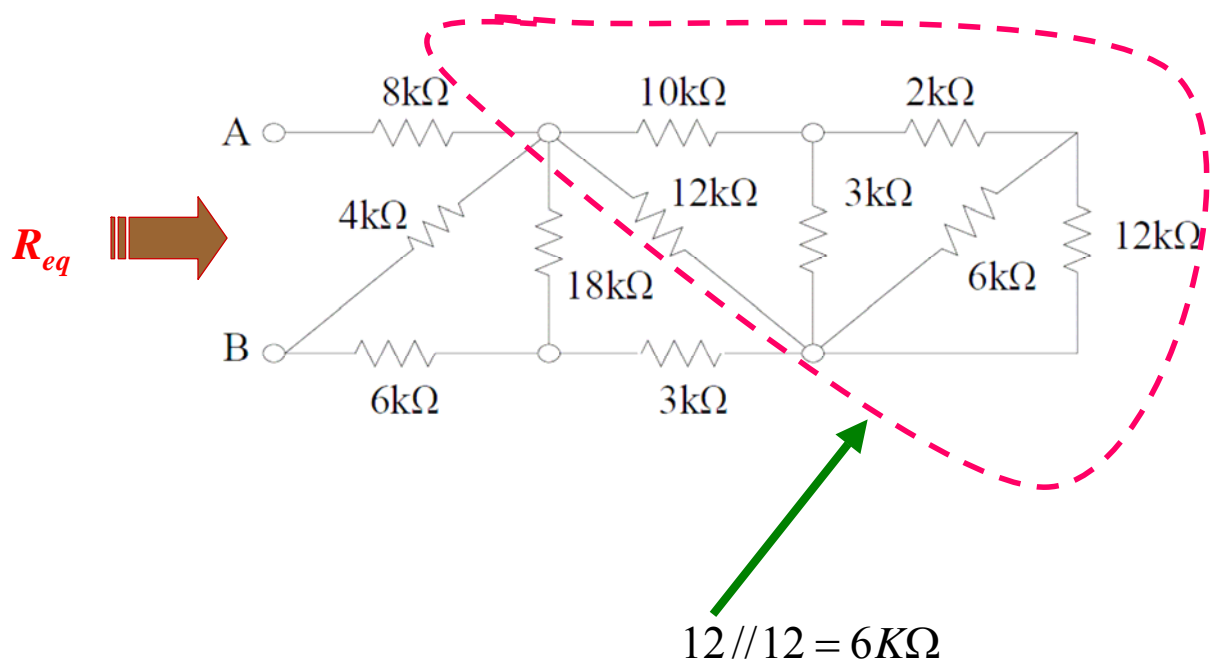
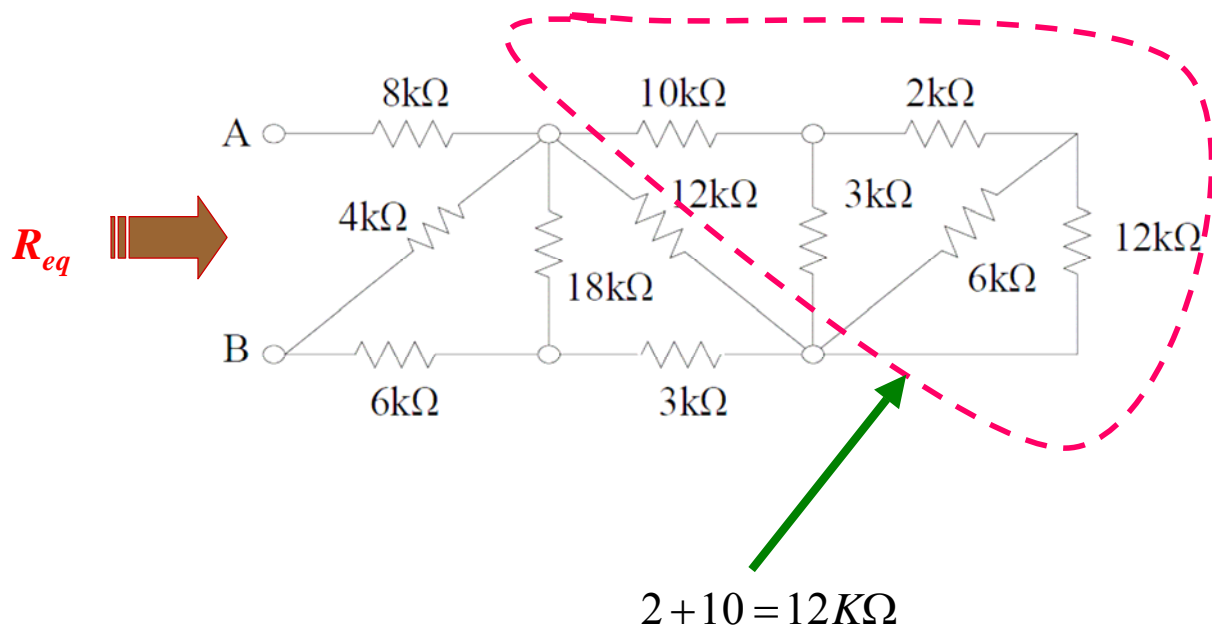
$$v = -0.98V$$

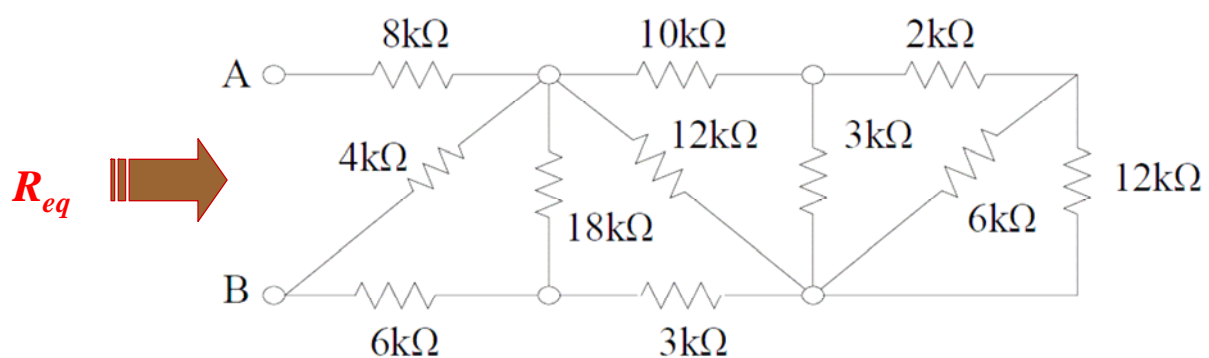
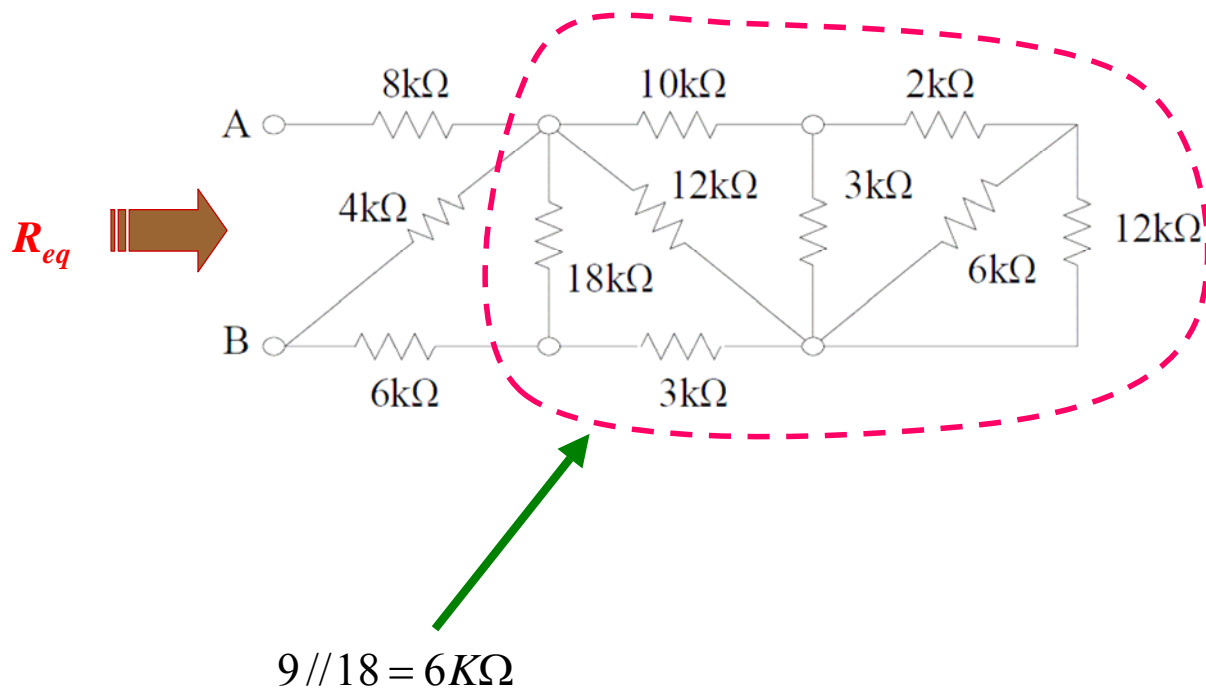
$$i = \frac{v}{R_p} = -1.8A$$

Calcular a resistência equivalente entre A e B









$$R_{eq} = [(6 + 6) // 4] + 8 = 3 + 8 = 11K\Omega$$