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

Sinais e Sistemas Electrónicos

Problemas resolvidos I

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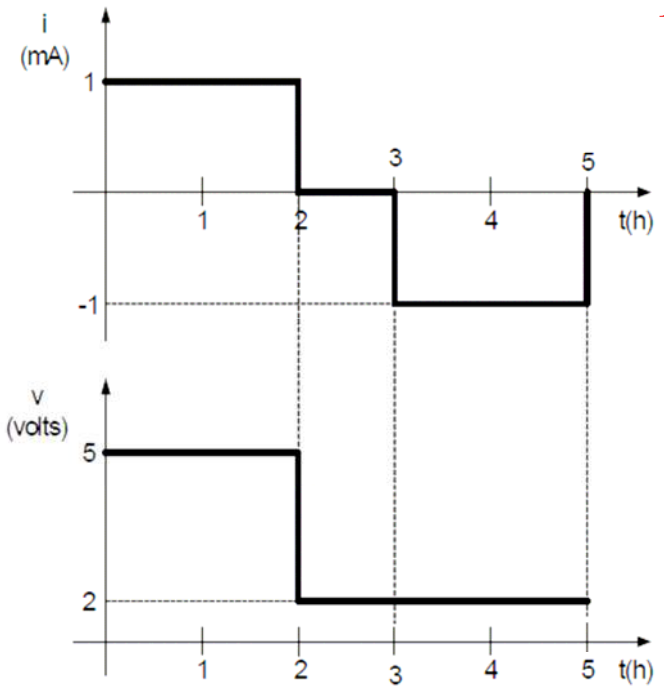
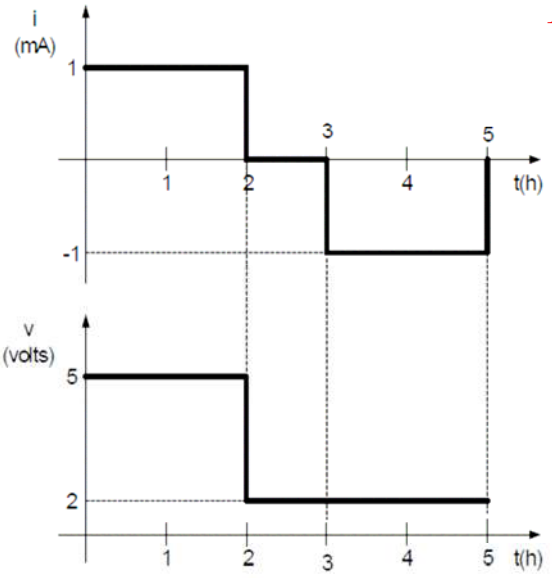
1.1 – Problema 6



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

1.1 – Problema 6



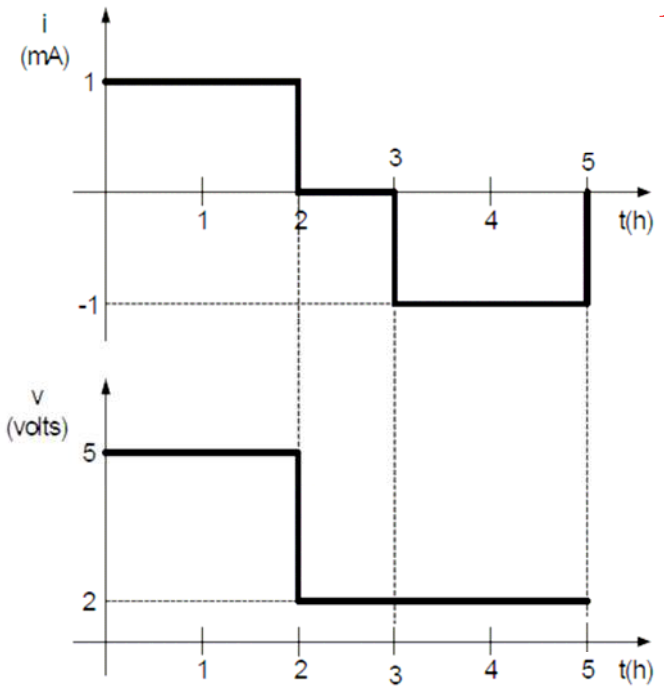
a)

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

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

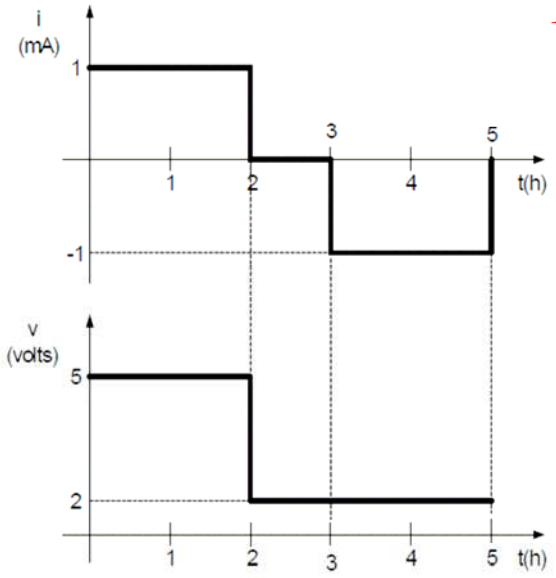
$P[3,5] = 2 \times (-1mA) = -2mW$ (neste intervalo o elemento E fornece potência ao exterior)

1.1 – Problema 6



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

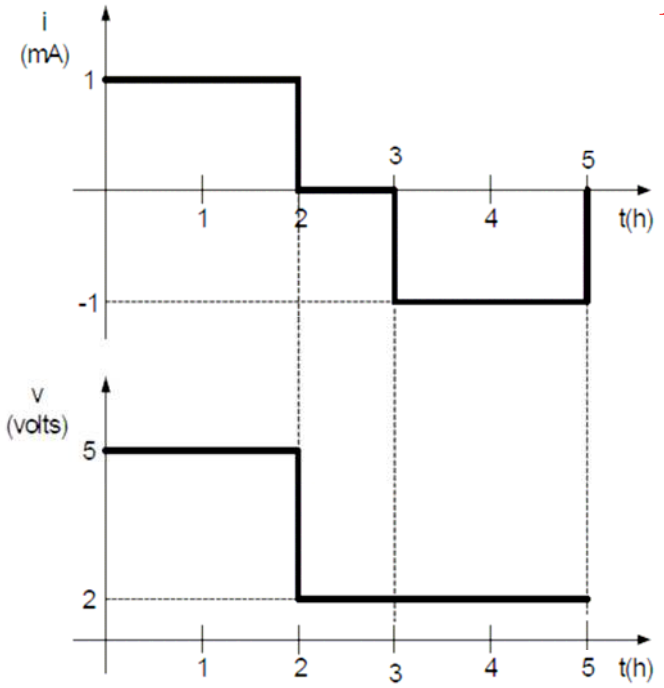
1.1 – Problema 6



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

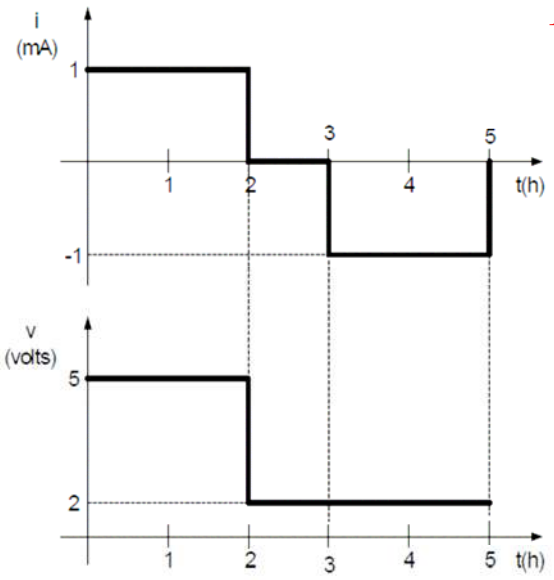
$$E = P\text{x}t = (5mW)(2\text{x}60\text{x}60) = 36J$$

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

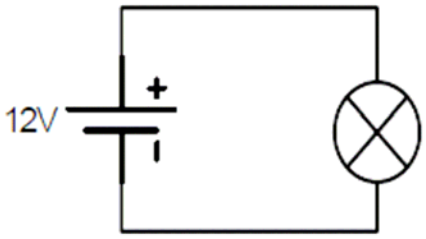


c)

$$E[0,2] = 36J$$
$$E[3,5] = -2mW \times 2h \times 60m \times 60s = -14.4J$$
$$E_{restante} = 36J - 14.4J = 21.6J$$

1.2 – Problema 10

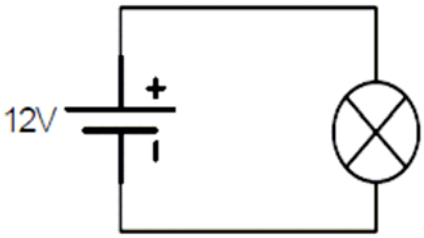
Um circuito composto por um bateria de automóvel de $12Volts$ e uma lâmpada, apresentado na figura 1.2 fornece à lâmpada uma energia de $460.8Wh$ durante o período de 8 horas.



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

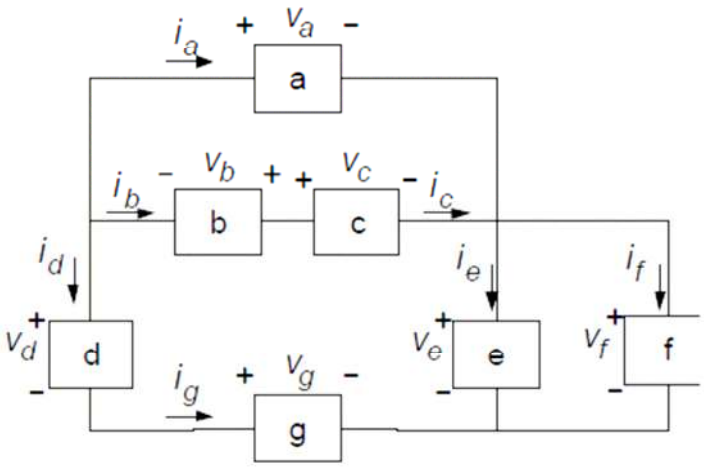
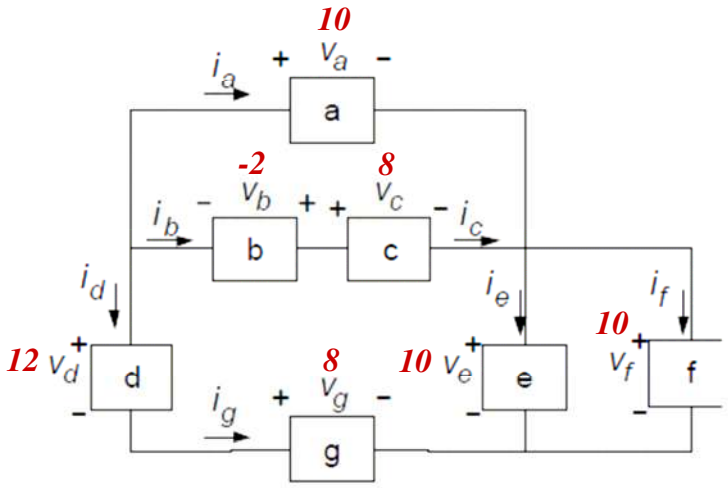


Tabela I

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

- Calcular valores das tensões, correntes e potências dissipadas.
- Para cada elemento, indicar se está a dissipar ou a fornecer potência (D/F).



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

$$V_f = V_e = 10V$$

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

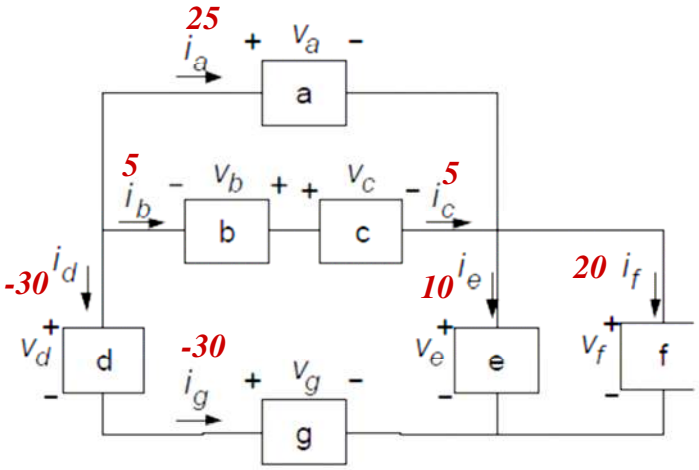


Tabela I

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

$$I_b = I_c = 5A$$

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

$$I_g = I_d = -30A$$

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

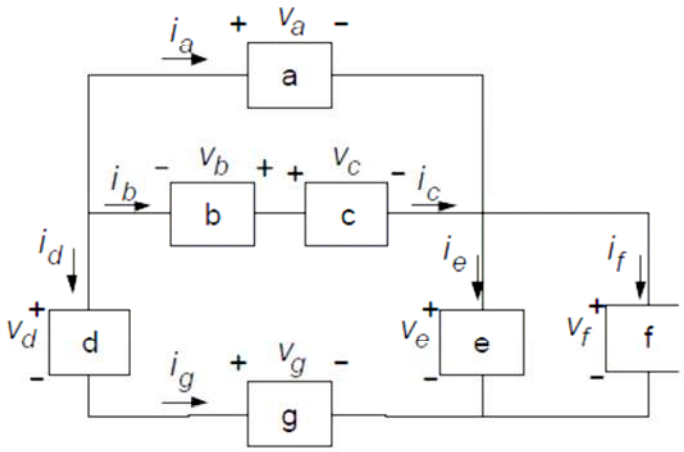
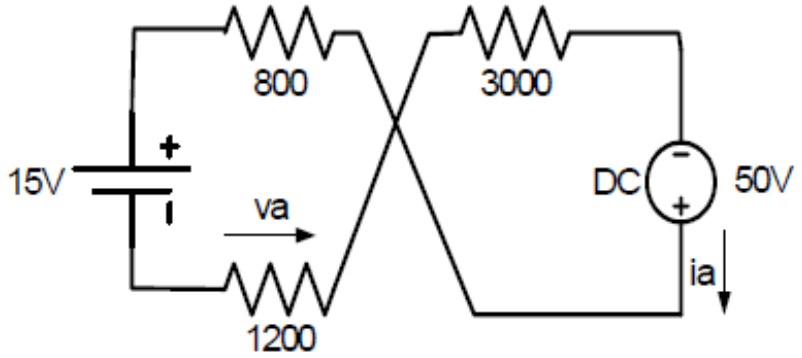


Tabela I

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).



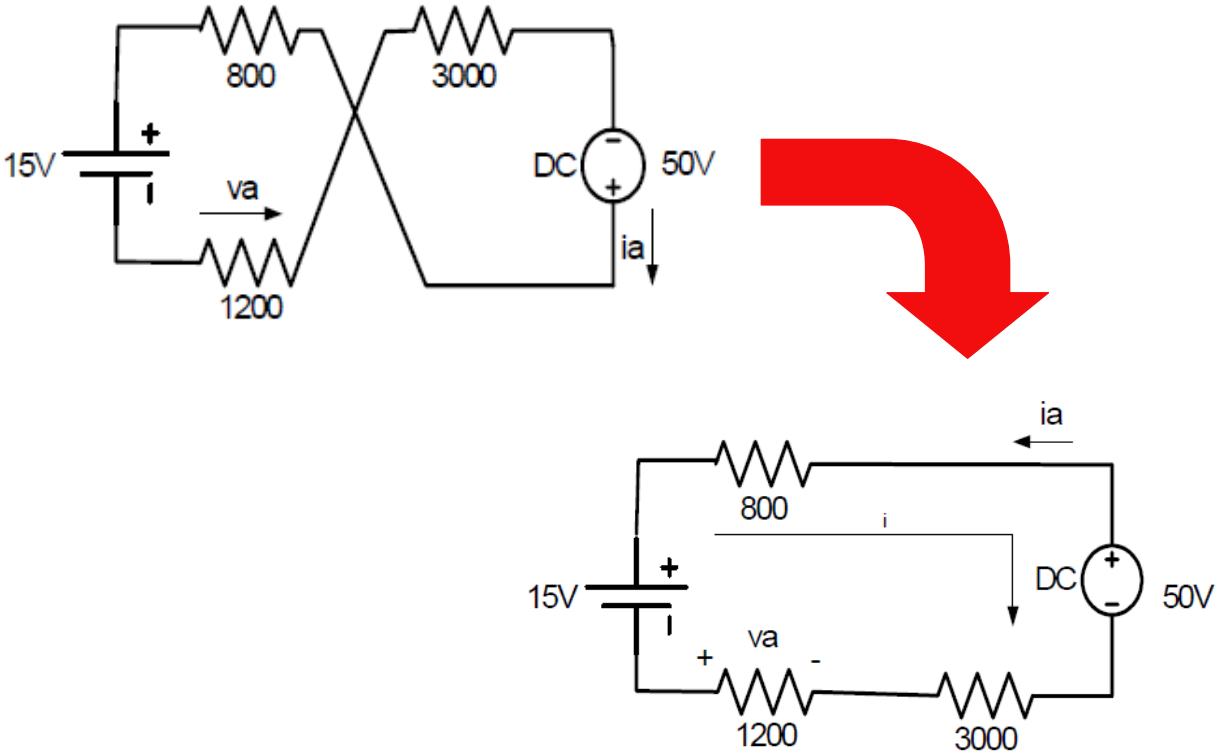
Calcular:

a) O valor da corrente *ia*.

b) O valor da tensão *va*.

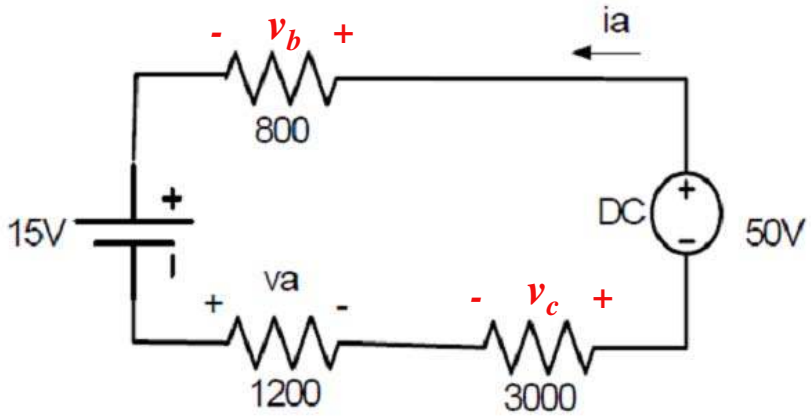
c) A potência fornecida pela fonte de 15*Volts*.

1.4 – Problema 16



1.4 – Problema 16

a)



KVL: $-15-v_b+50+v_c-v_a=0$

$v_a = 1200 i_a$

$v_b = 800 i_a$

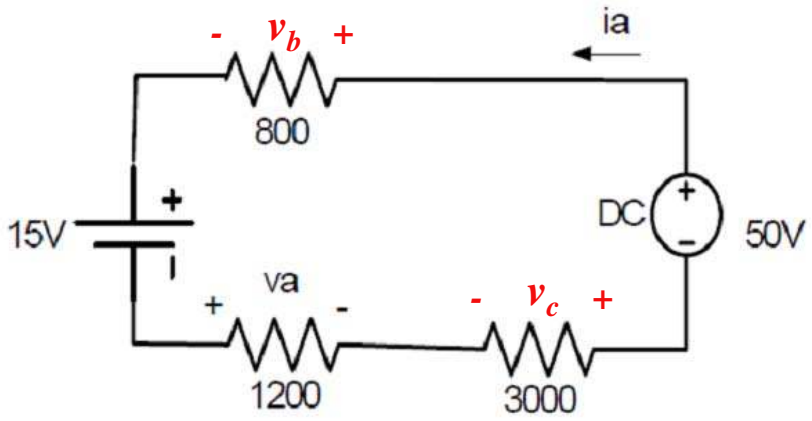
$v_c = -3000 i_a$

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

$$i_a = 7mA$$

1.4 – Problema 16

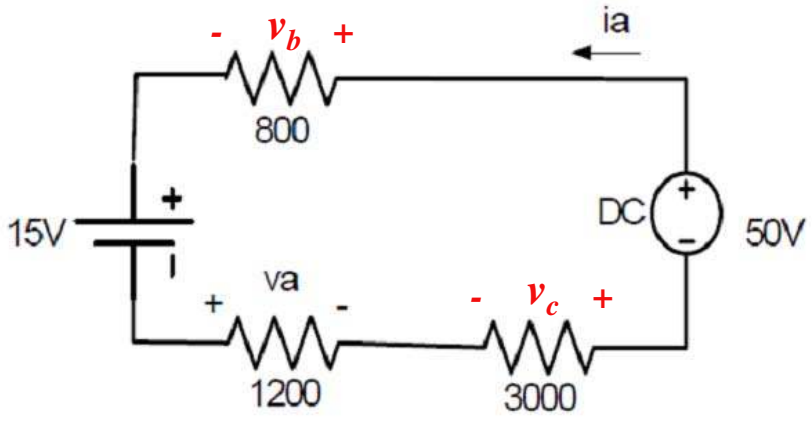
b)



$$i_a = 7mA \qquad v_a = 1200 i_a = 1200\text{x}0.007 = 8.4V$$

1.4 – Problema 16

c)



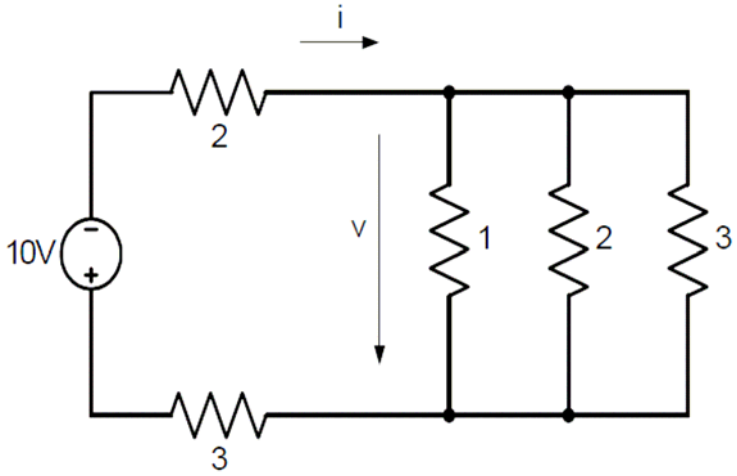
$$i_a = 7mA \qquad P_{a(15)} = V\text{x}I = 15\text{x}0.007 = 105mW$$

Mas isto é a potência absorvida!

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

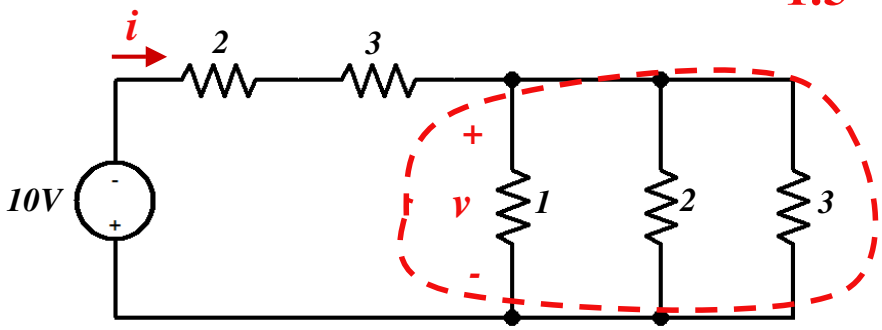
1.5 – Problema 14A

Dado o circuito eléctrico



Calcular a tensão v e a corrente i.

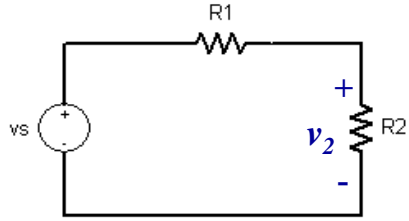
1.5 – Problema 14A



$$\frac{1}{R_p} = \frac{1}{1} + \frac{1}{2} + \frac{1}{3}$$

$$R_p = \frac{6}{11}\Omega$$

Divisor de tensão



$$v_2 = \frac{R_2}{R_1 + R_2} v_s$$

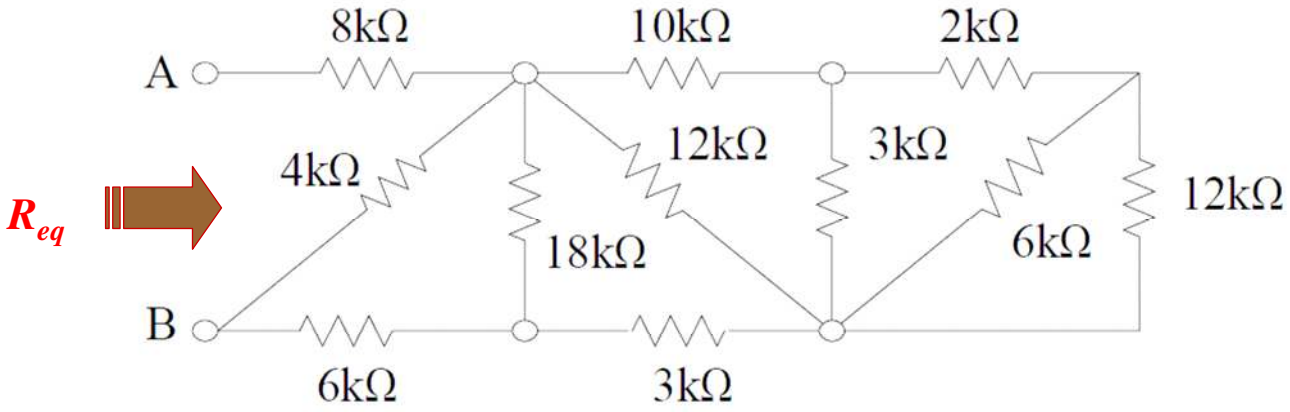
$$v = -\frac{R_p}{2+3+R_p} 10$$

$$v = -0.98V$$

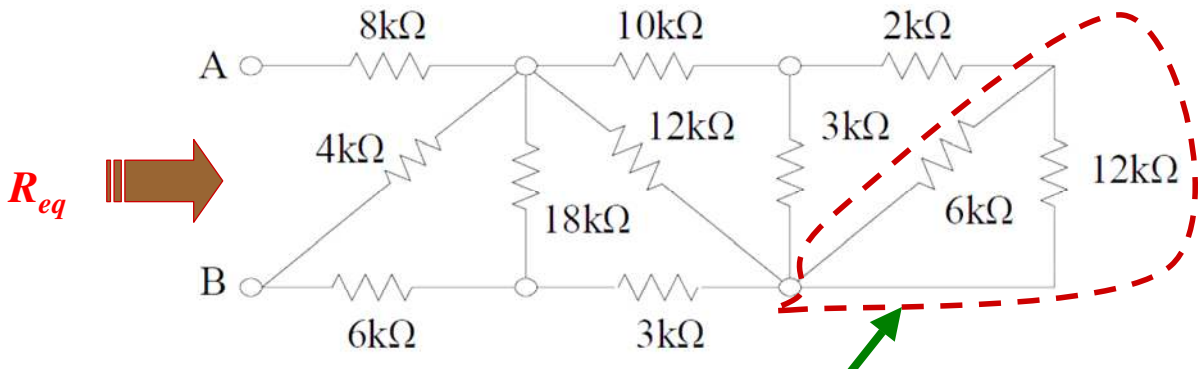
$$i = \frac{v}{R_p} = -1.8A$$

1.6

Calcular a resistência equivalente entre A e B

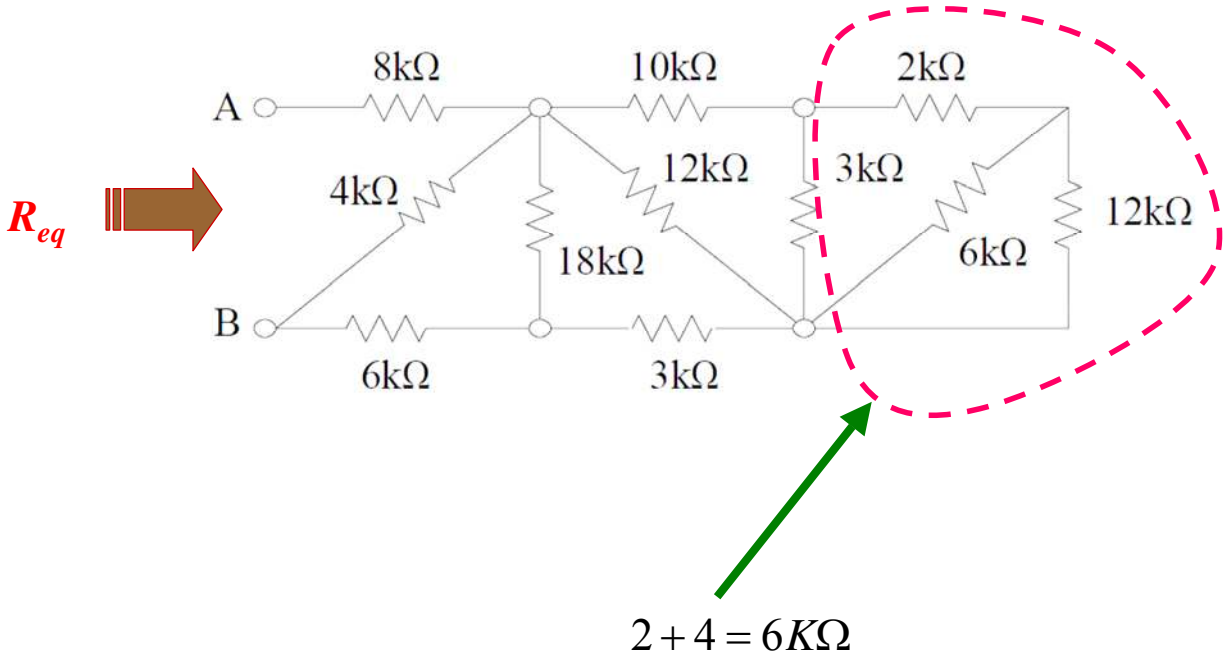


1.6



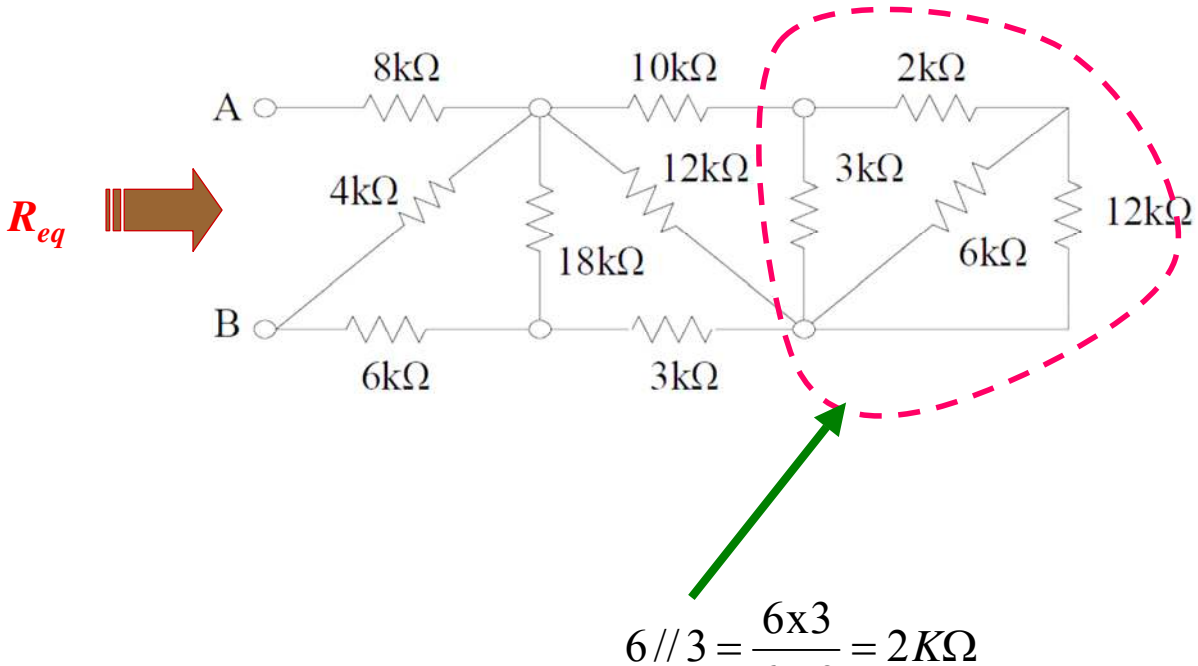
$$6//12 = \frac{6x12}{6+12} = 4K\Omega$$

1.6



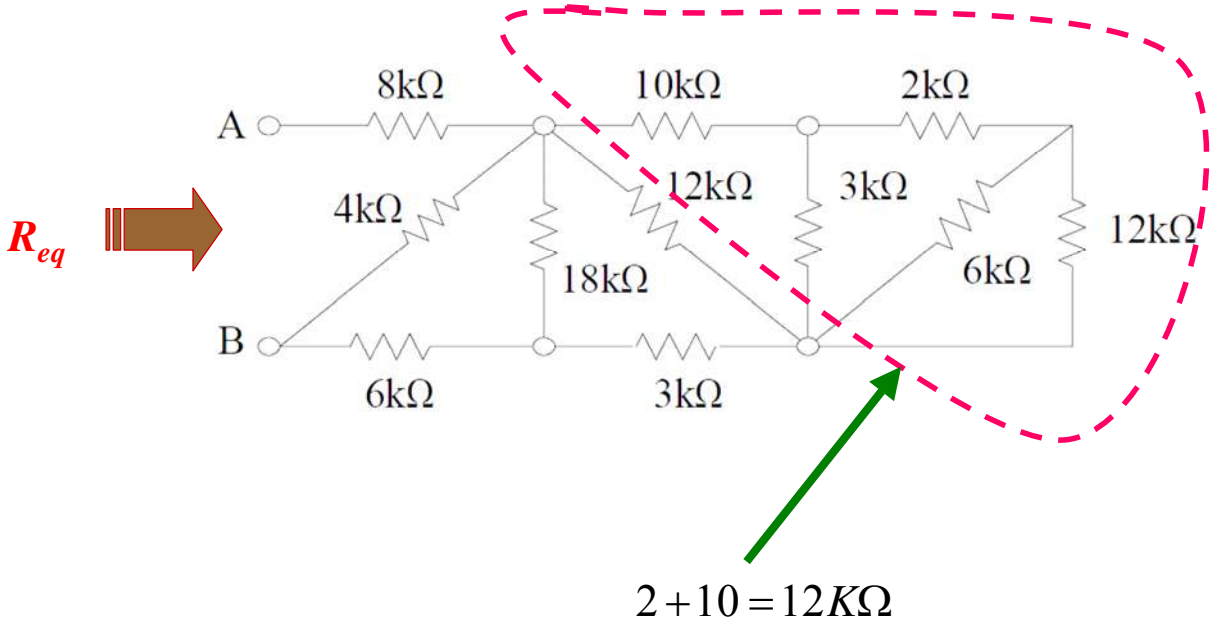
$$2+4=6K\Omega$$

1.6



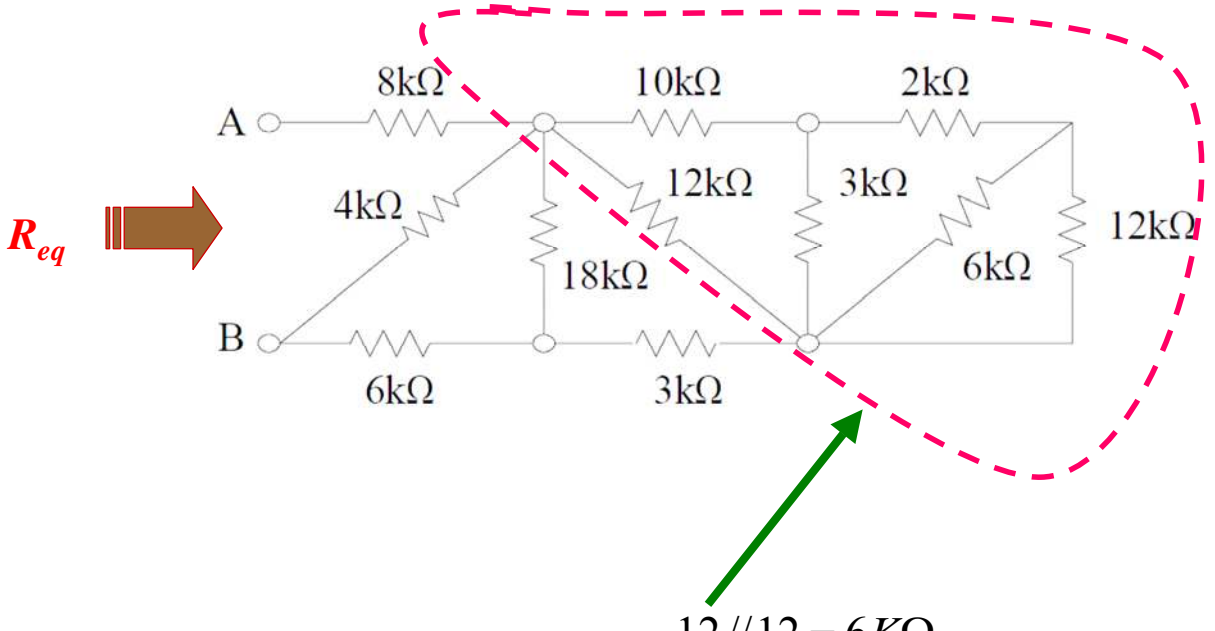
$$6//3=\frac{6x3}{6+3}=2K\Omega$$

1.6



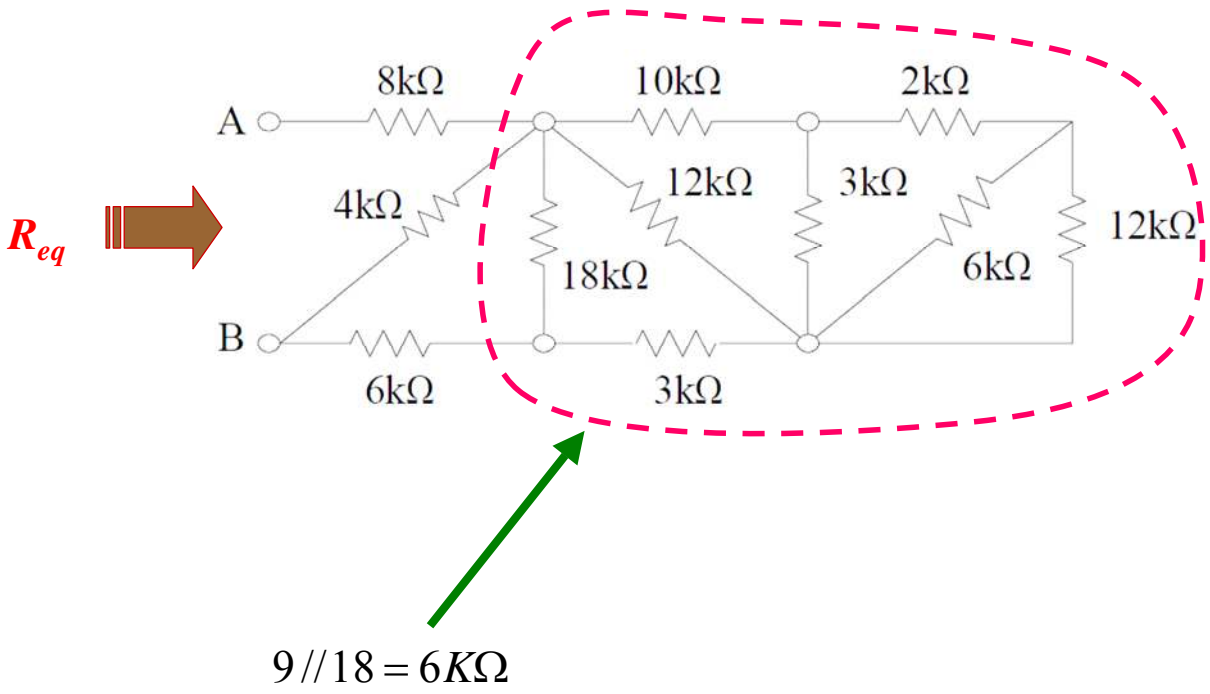
$$2+10=12K\Omega$$

1.6



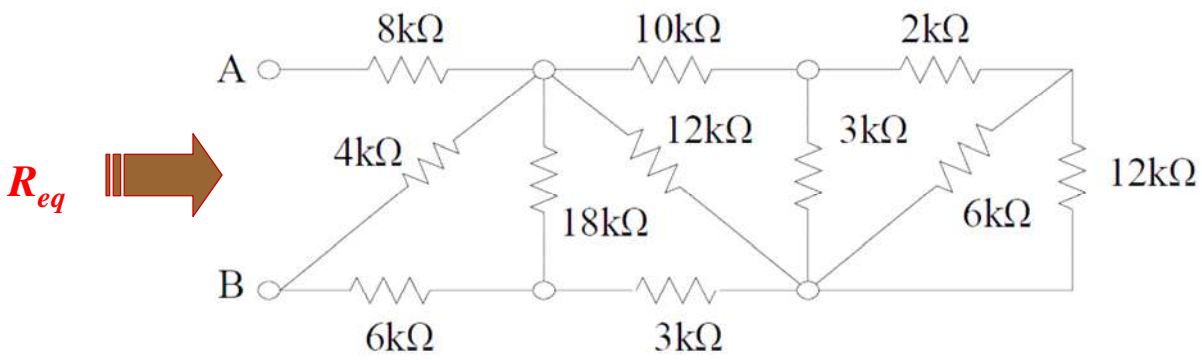
$$12//12=6K\Omega$$

1.6



$$9 // 18 = 6K\Omega$$

1.6



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