CIRCUITOS DE THEVENIN

1º Encuentre el equivalente Thévenin entre las terminales a y b del circuito de la figura 1.

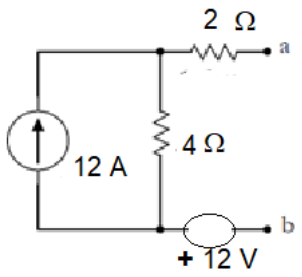


Figura 1

2º a) Encuentre el equivalente Thévenin entre las terminales a y b del circuito de la figura 2. b) Determine el equivalente Norton del circuito de la misma figura 2

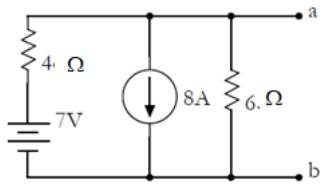


Figura 2

3º Calcular la diferencia de potencial que existe entre los extremos de la resistencia de 3 Ω del circuito de la figura 3.

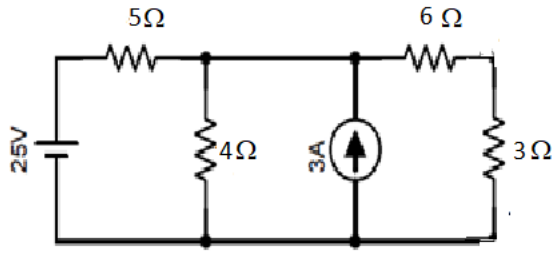


Figura 3

4º Encuentre la potencia que se disipa en la resistencia de 6 ohmios de la Figura 4.

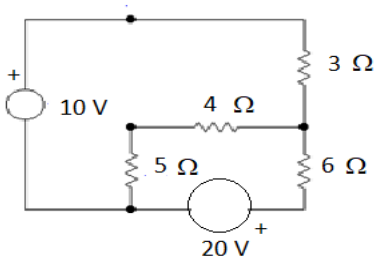


Figura 4

5º Determinar la intensidad que circula por la resistencia de 4 Ω de la Figura 5

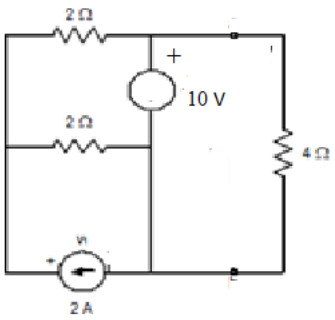


Figura 5

6º Mediante el principio de Thévenin determine el valor de la tensión y corriente en la Resistencia RL = 10 Ω de la figura 6.

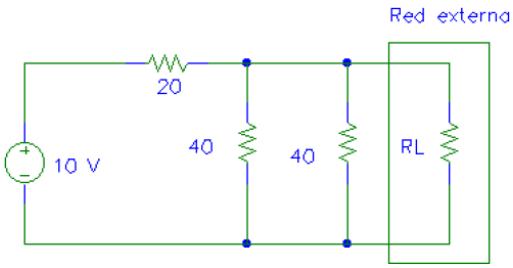
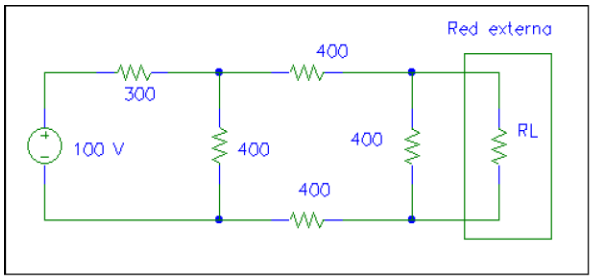


Figura 6

7º Determine la potencia disipada en RL de la figura 7



$R_L = 300\Omega$

Figura 7

8º Mediante el método de potencial de Nudos determina la potencia disipada en R_4 de la figura 8

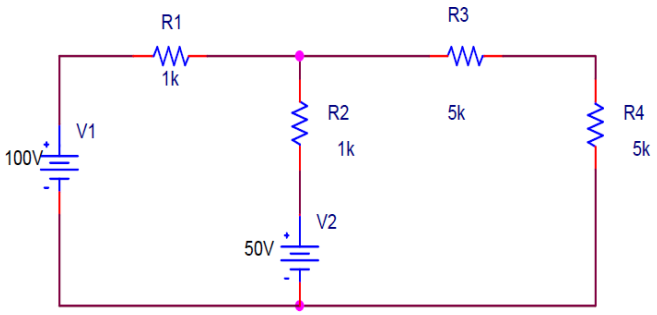


Figura 8

9º Determinar la intensidad que circula por laresistencia de 400Ω (Figura 9)

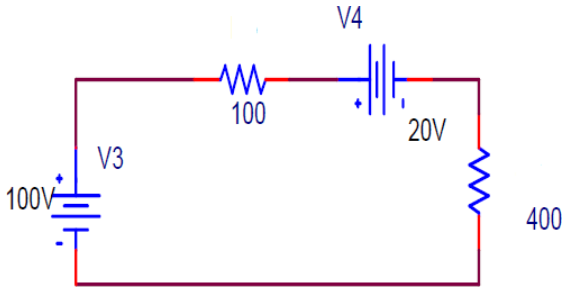


Figura 9

10º Mediante el método de transformación de fuentes determinar el valor de la potencia disipada en la resistencia RL (Figura 10).

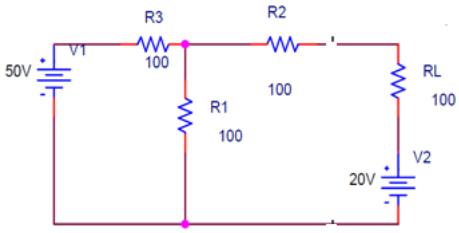
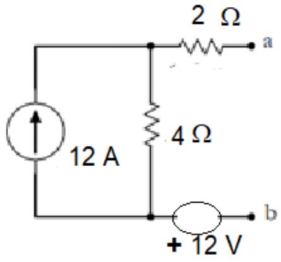
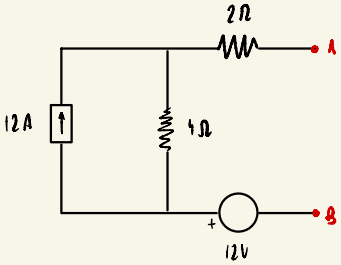
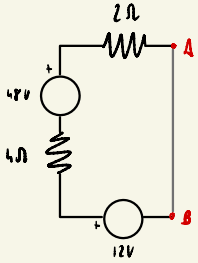


Figura 10

1º Encuentre el equivalente Thévenin entre las terminales a y b del circuito de la figura 1.





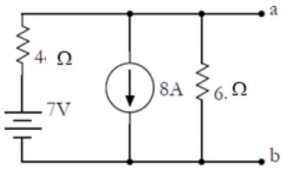


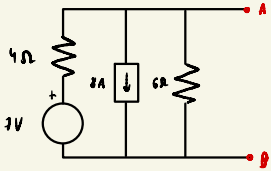
$V_{Th} = 48 + 12 = 60\,V$

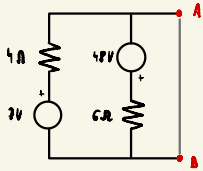
$R_{Th} = 2 + 4 = 6\,\Omega$

$I_N = \frac{V_{Th}}{R_{Th}} = \frac{60}{6} = 10\,A$

2º a) Encuentre el equivalente Thévenin entre las terminales a y b del circuito de la figura 2. b) Determine el equivalente Norton del circuito de la misma figura 2



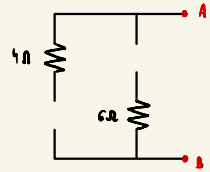




$$\begin{pmatrix} V_1 \\ V_2 \end{pmatrix} = \begin{pmatrix} R_{11} & R_{12} \\ R_{21} & R_{22} \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

$$\begin{pmatrix} 55 \\ 78 \end{pmatrix} = \begin{pmatrix} 10 & 6 \\ 6 & 6 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

$$I_2 = I_N = \frac{\begin{vmatrix} 10 & 55 \\ 6 & 78 \end{vmatrix}}{\begin{vmatrix} 10 & 6 \\ 6 & 6 \end{vmatrix}} = \frac{150}{24} = \frac{25}{4} = 6{,}25\,A$$

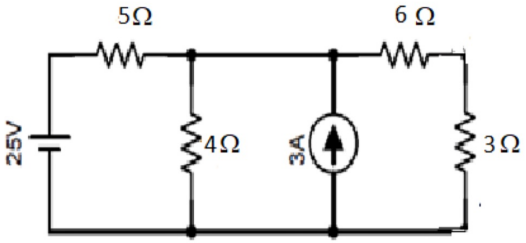


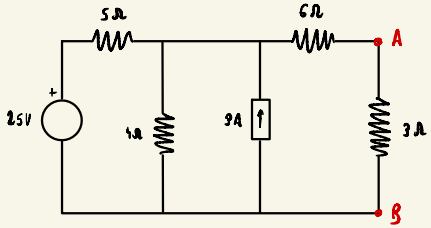
$$\frac{1}{R_{Th}} = \frac{1}{4} + \frac{1}{6} = \frac{5}{12}$$

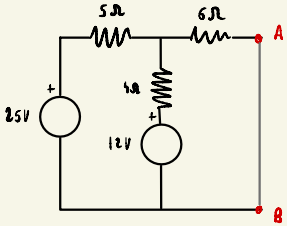
$$R_{Th} = \frac{12}{5} = 2{,}4\,\Omega$$

$$V_{Th} = R_{Th} I_N = 2{,}4 \cdot 6{,}25 = 15\,V$$

3º Calcular la diferencia de potencial que existe entre los extremos de la resistencia de 3 Ω del circuito de la figura 3.

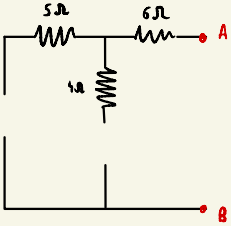






$$\begin{pmatrix} 13 \\ 12 \end{pmatrix} = \begin{pmatrix} 9 & -4 \\ -4 & 10 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

$$I_2 = I_N = \frac{\begin{vmatrix} 9 & 13 \\ -4 & 12 \end{vmatrix}}{\begin{vmatrix} 9 & -4 \\ -4 & 10 \end{vmatrix}} = \frac{160}{74} = 2,\widehat{162}\ A$$

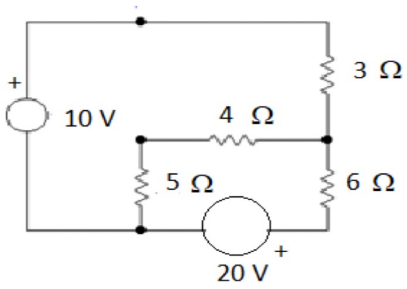


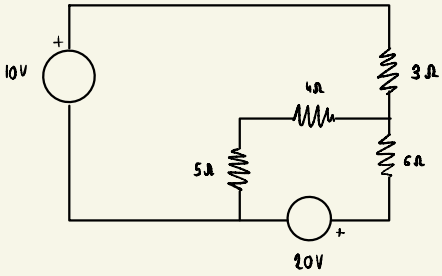
$$\frac{1}{R_{eq}} = \frac{1}{5} + \frac{1}{4} = \frac{9}{20} \rightarrow R_{eq} = \frac{20}{9}\ \Omega$$

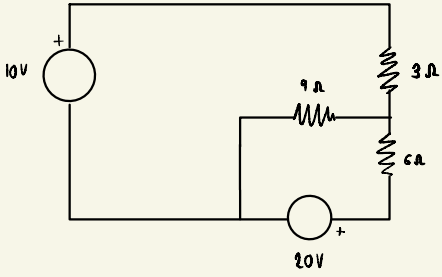
$$R_{Th} = \frac{20}{9} + 6 = \frac{74}{9}\ \Omega$$

$$V_{Th} = V_{AB} = R_{Th}\, I_N = \frac{74}{9}\, 2,162 = 17,7764\ V$$

4º Encuentre la potencia que se disipa en la resistencia de 6 ohmios de la Figura 4.





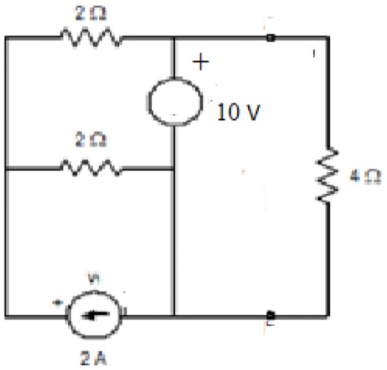


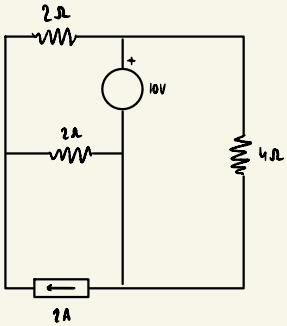
$$\begin{pmatrix} 10 \\ 20 \end{pmatrix} = \begin{pmatrix} 12 & 9 \\ 9 & 15 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

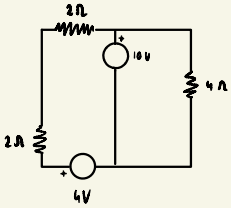
$$I_2 = \frac{\begin{vmatrix} 12 & 10 \\ 9 & 20 \end{vmatrix}}{\begin{vmatrix} 12 & 9 \\ 9 & 15 \end{vmatrix}} = \frac{240 - 90}{180 - 81} = \frac{130}{99} = 1,\widehat{31}\ A$$

$$P_{6\Omega} = I^2 R = 1,3131^2 \cdot 6 = 10,3454\ W$$

5º Determinar la intensidad que circula por la resistencia de 4 Ω de la Figura 5





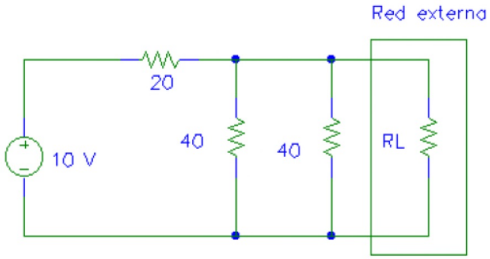


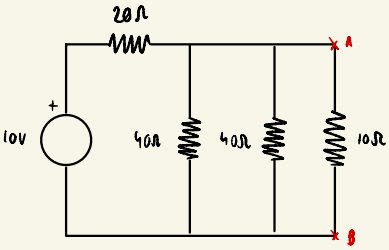
$$\begin{pmatrix} 6 \\ 10 \end{pmatrix} = \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

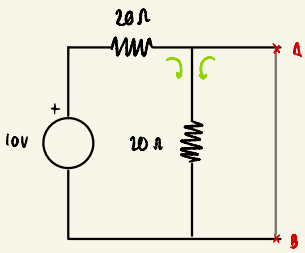
$$I_2 = \frac{\begin{vmatrix} 4 & 6 \\ 0 & 10 \end{vmatrix}}{\begin{vmatrix} 4 & 0 \\ 0 & 4 \end{vmatrix}} = \frac{40}{16} = 2{,}5\ A$$

$$V = RI = 4 \cdot 2{,}5 = 10\ V$$

6º Mediante el principio de Thévenin determine el valor de la tensión y corriente en la Resistencia RL = 10 Ω de la figura 6.





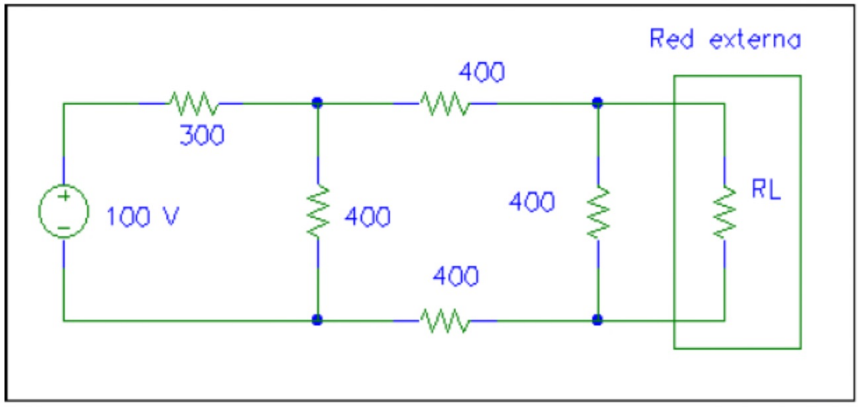


$$\begin{pmatrix} 10 \\ 0 \end{pmatrix} = \begin{pmatrix} 40 & 20 \\ 20 & 20 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

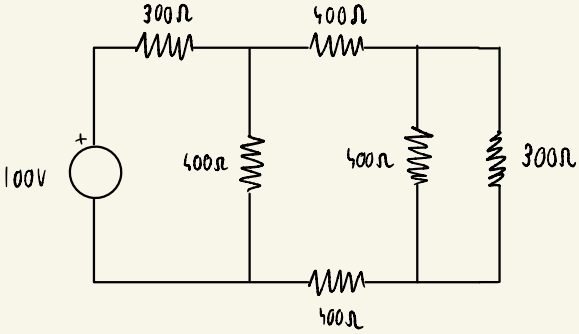
$$I_L = I_N = \frac{\begin{vmatrix} 40 & 10 \\ 20 & 0 \end{vmatrix}}{\begin{vmatrix} 40 & 20 \\ 20 & 20 \end{vmatrix}} = \frac{200}{800 - 400} = \frac{1}{2}\ A$$

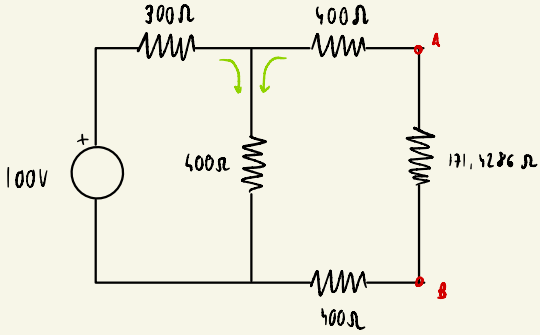
$$V_L = R_L I_N = 10\ \frac{1}{2} = 5\ V$$

7º Determine la potencia disipada en RL de la figura 7



$R_L = 300\Omega$





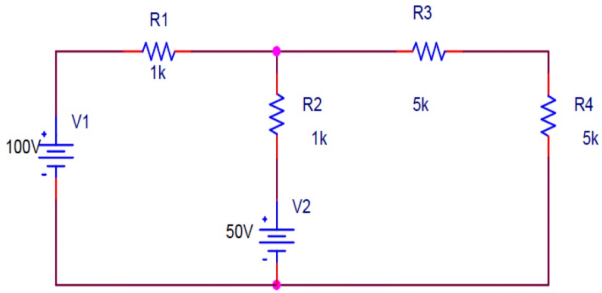
$$\begin{pmatrix} 100 \\ 0 \end{pmatrix} = \begin{pmatrix} 700 & 400 \\ 400 & 1371,4286 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

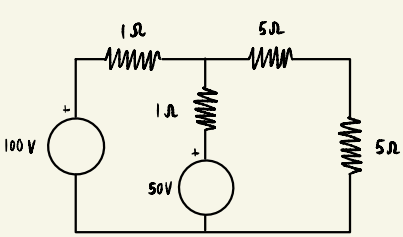
$$I_2 = \frac{\begin{vmatrix} 700 & 100 \\ 400 & 0 \end{vmatrix}}{\begin{vmatrix} 700 & 400 \\ 400 & 1371,4286 \end{vmatrix}} = \frac{-40000}{960035,02 - 160000} = 0,0625\ A$$

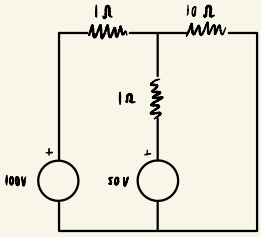
$$V_{AB} = R_{eq}\, I_2 = 171,4286 \cdot 0,0625 = 10,7143\ V$$

$$I_L = \frac{V_{AB}}{R_L} = 3,5714 \cdot 10^{-2}\ A$$

8º Mediante el método de potencial de Nudos determina la potencia disipada en R_4 de la figura 8





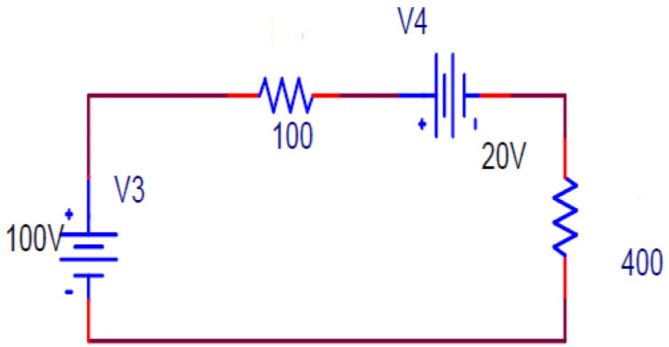


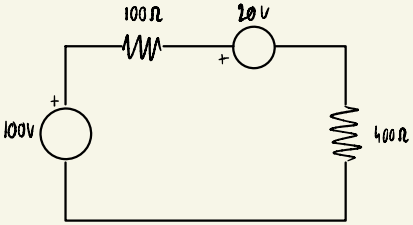
$$\begin{pmatrix} 50 \\ 50 \end{pmatrix} = \begin{pmatrix} 2 & -1 \\ -1 & 11 \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \end{pmatrix}$$

$$I_2 = \frac{\begin{vmatrix} 2 & 50 \\ -1 & 50 \end{vmatrix}}{\begin{vmatrix} 2 & -1 \\ -1 & 11 \end{vmatrix}} = \frac{100+50}{22-1} = 7,1429\ A$$

$$P = I^2 R = 7,1429^2 \cdot 5 = 255,1051\ W$$

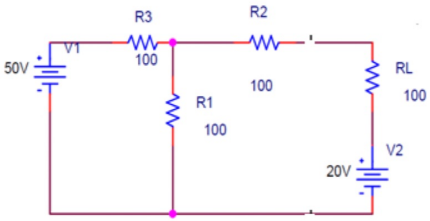
9º Determinar la intensidad que circula por laresistencia de 400Ω (Figura 9)

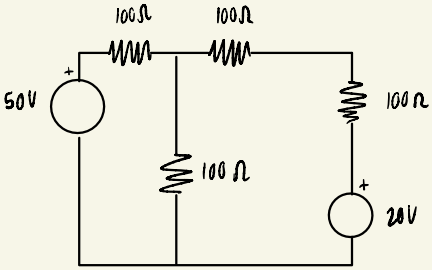


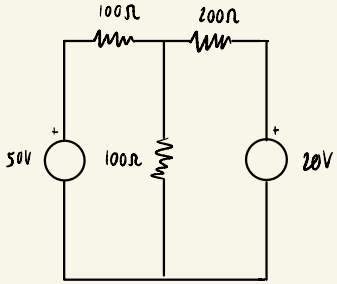


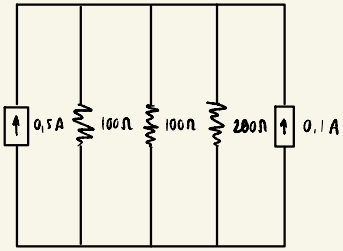
$$I = \frac{V}{R} = \frac{80}{500} = 0,16\ A$$

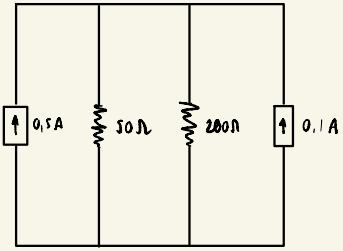
10º Mediante el método de transformación de fuentes determinar el valor de la potencia disipada en la resistencia RL (Figura 10).

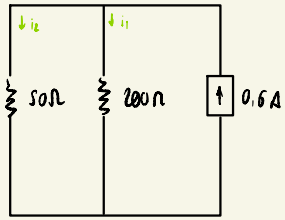












$I_T = i_1 + i_2$

$V_1 = V_2 \;;\; 200\, i_1 = 50\, i_2 \;;\; 4\, i_1 = i_2$

$I_T = i_1 + 4i_1 = 5i_1 = 0,6 \;;\; i_1 = 0,12\ A$