Conversiones de fuentes

1) Una fuente de voltaje tiene los valores $V_s = 300V$ y $R_s = 50\Omega$. Conviertala en una fuente de corriente equivalente

$$I_s = \frac{V_s}{R_s} \Rightarrow I_s = \frac{300}{50}$$

$$\Rightarrow I_s = 6\,A$$

3) Una bateria tipo D nueva tiene entre sus terminales un voltaje de 1,6V y puede suministrar hasta 8 A a un cortocircuito durante muy poco tiempo. ¿Cual es la resistencia interna de la bateria?

$$I = \frac{V}{R} \Rightarrow R = \frac{V}{I}$$

$$\Rightarrow R = \frac{1,6}{8} \Rightarrow R_{interna} = 0,2\,\Omega$$

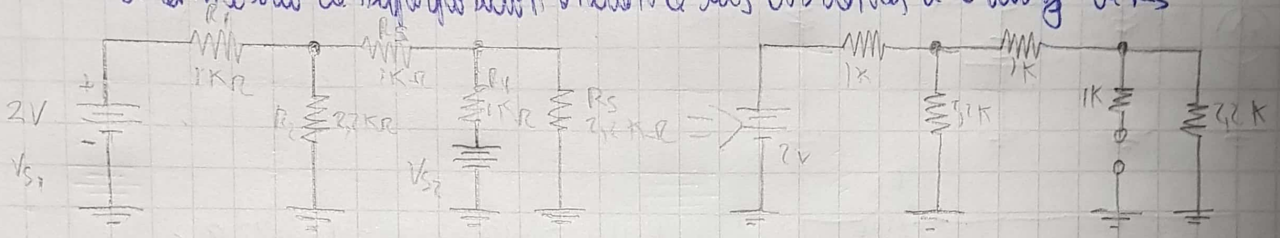
5) Una fuente de corriente tiene una I_s de 600mA y una R_s de 1,2 KΩ. Conviertala en una fuente de voltaje equivalente

$$V_s = I_s \cdot R_s \Rightarrow V_s = 600 \cdot 1,2K$$

$$V_s = 720\,V$$

Teorema de superposición

7) Con el método de superposición encuentre las corrientes a través de R_s



Calculamos R_T

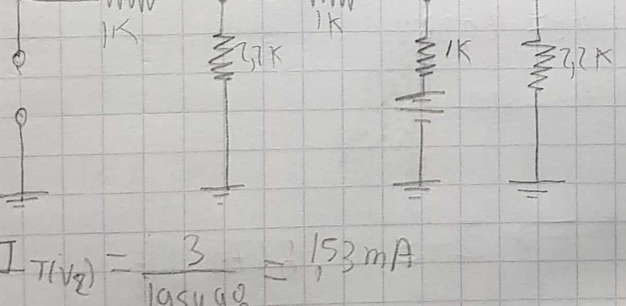
$R_4 \| R_S = \frac{(1K)(2,2K)}{1K+2K} = 687,5\,\Omega$ $\quad R_{3+4\|S} = 687,5 + 1000 = 1687,5\,\Omega$

$R_T = R_1 + (R_2 \| R_{3+4\|S}) = 1000 + \frac{(2,2K)(1687,5)}{2,2K+1687,5} = 1954,98\,\Omega$ //

$I_{T(V_{S_1})} = \frac{2}{1954,98} = 1,02\,mA$ //

$I_{S(V_{S_1})} = \frac{1K}{1K+2,2K} \cdot 0,701\,mA = 0,219\,mA$ //

$I_{3(V_{S1})} = \frac{2,2K}{2,2K+1K} \times 1,02\,mA = 0,701\,mA$ //



Calculamos R_T

$R_1 \| R_2 = \frac{1K(2,2K)}{1K+2,2K} = 687,5\,\Omega$

$R_{1\|2+3} = 687,5 + 1000 = 1687,5\,\Omega$

$R_T = 1000 + \frac{2,2K(1687,5)}{2,2K+1687,5} = 1954,98\,\Omega$

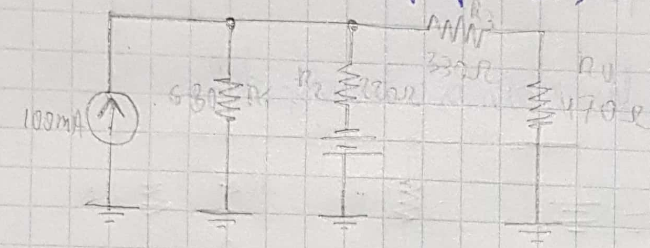
$I_{T(V_2)} = \frac{3}{1954,98} = 1,53\,mA$

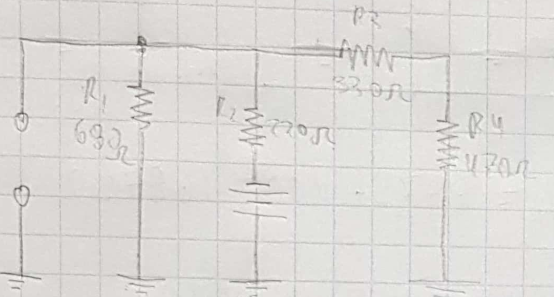
$I_{S(V_2)} = \frac{1687,5}{1687,5+2,2K} = 0,664\,mA$

$I_S = I_{S(V_{S1})} + I_{S(V_{S2})}$

$I_S = 0,219 + 0,664 = 0,883\,mA$ //

9) Con el teorema de superposición, determina la corriente a través de R_3





$R_1 || R_2 = \frac{680 \cdot 220}{680+220} = 166{,}22\,\Omega$

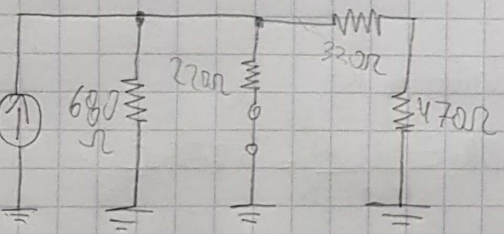
$R_3 + R_4 = 330+470 = 800\,\Omega$

$R_T = (R_1||R_2)||R_{3+4} = \frac{800(166{,}22)}{800+166{,}22} = 137{,}625\,\Omega$

$I_{T(S1)} = \frac{V_{S1}}{R_{T(S1)}} = \frac{20}{137{,}625} = 1{,}4532\,mA$

$I_{3(S)} = \left(\frac{R_3}{R_2+R_3}\right) I_T = \left(\frac{330}{220+330}\right)(1{,}4532)$

$I_{3(S1)} = 0{,}8719\,mA$



$R_1 || R_2 = 166{,}22$

$R_3 + R_4 = 800\,\Omega$

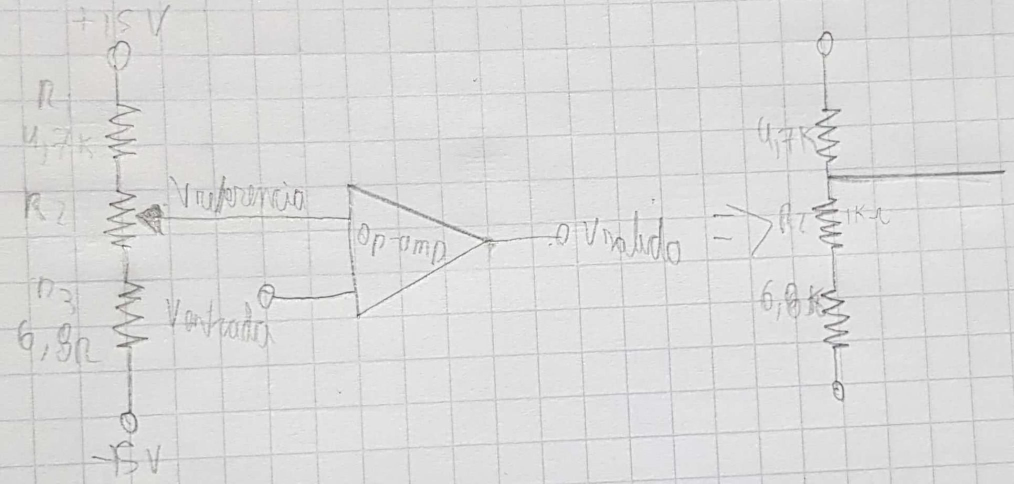
$I_3 = \left(\frac{R_{3+4}}{R_{1||2}+R_{3+4}}\right) I_T = \left(\frac{800}{800+166{,}22}\right) 100m \Rightarrow I_T = 0{,}8279\,mA$

$I_3 = I_{3(S1)} + I_{3(S2)}$

$I_3 = 0{,}8719 + 0{,}8279$

$I_3 = 1{,}6\,mA$

11) En la figura se muestra un circuito comparador. El $V_{entrada}$ se compara con el de referencia y se genera una salida negativa



$R_2 = 1K$

$R_2 = 4,7 + 1 + 6,8$

$R_2 = 12,5 K\Omega$

$V_{R_2} = \left(\frac{R_2}{R_T}\right) 15V \Rightarrow V_{R_2} = 1,2V$

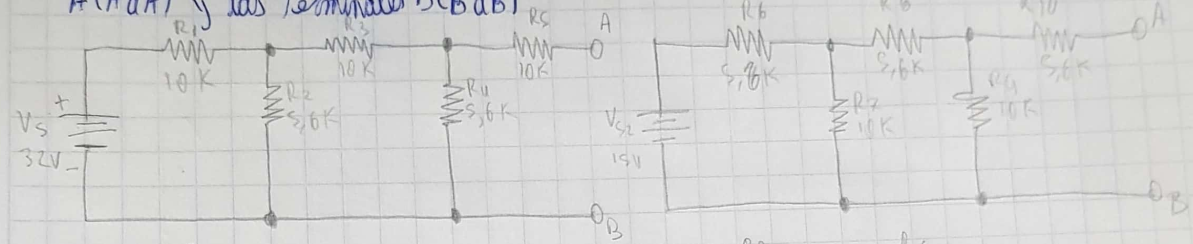
$V_{referencia}$ es $\pm$ 1,2 ancho cada ventana

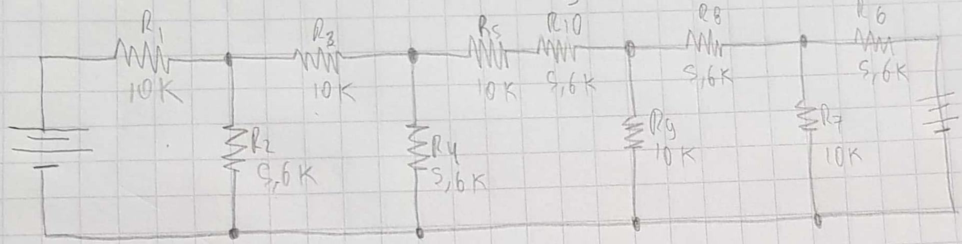
$V_{ancho\ ventana} = 2,52V$

$V_{max} = 3,72 V$

$V_{min} = 1,32 V$

15) Determine la corriente producida por cada una de las baterías cuando se conectan A (A a A) y las terminales B (B a B)





Con $V_{S_2} = 0$

$R_8 \| R_7 = \frac{5,6K(10K)}{5,6K+10K} = 3,59K\Omega$ // $R_{8\|7} + R_6 = 3,59K + 5,6K = 9,19K\Omega$ //

$R_{8\|7+6} \| R_9 = \frac{9,19K(10K)}{9,19K+10K} = 4,39K\Omega = R_A$ // $R_A + R_{10} + R_5 = 20,39K\Omega = R_B$ //

$R_B \| R_4 = \frac{20,39K(5,6K)}{20,39K+5,6K} = 4,39 = R_D$ $R_D + R_3 = 4,39 + 10 = 14,39K = R_F$

$R_F \| R_2 = \frac{14,39K(5,6K)}{14,39K+5,6K} = 4,03K\Omega \Rightarrow R_T = 4,03K\Omega + 10K\Omega = 14,03K\Omega$

$I_{S_1} = \frac{V_{S_1}}{R_{T(S_1)}} = \frac{32V}{14,03K\Omega} = 2,28mA$ //

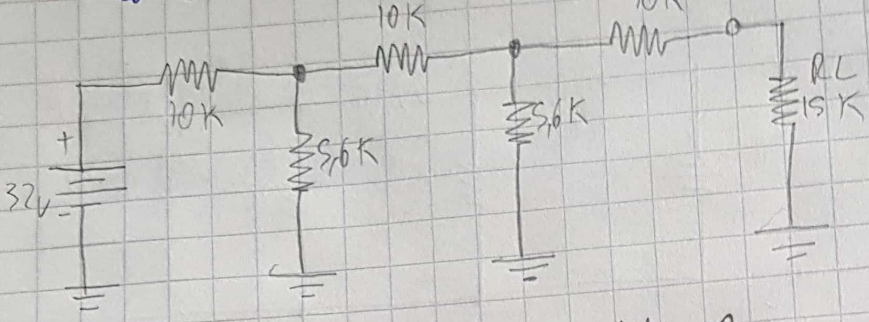
Con $V_{S_1} = 0$

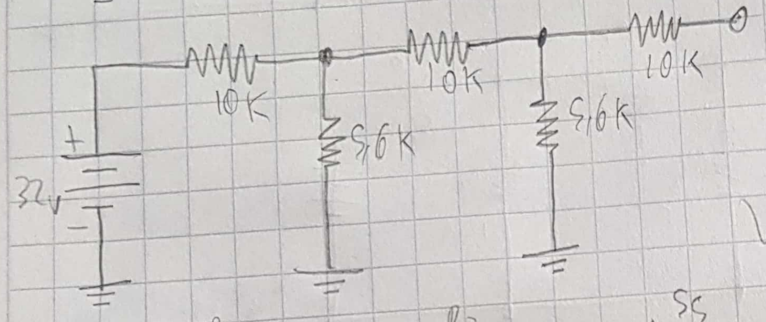
$R_T = (R_1 \| R_2) + R_3 \| R_4 + (R_5 + R_{10} \| R_9) + R_8 + (R_7 \| R_6)$

$R_T = 11,1K\Omega$

$I_{S_2} = \frac{V_{S_2}}{R_{T(S_2)}} = \frac{15V}{11,1K\Omega} = 1,35mA$ //

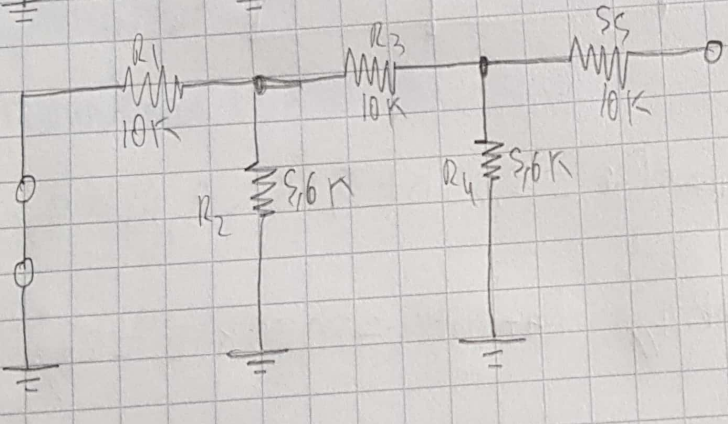
17) Con el teorema de Thevenin, determine la corriente a traves de la carga RL





$$V_{R_1} = \left(\frac{25}{25+20}\right)32V$$

$$VR_1 = 17{,}78V$$



$$R_1 \| R_2 = \frac{10K(5{,}6K)}{10K+5{,}6K} = 3{,}59K$$

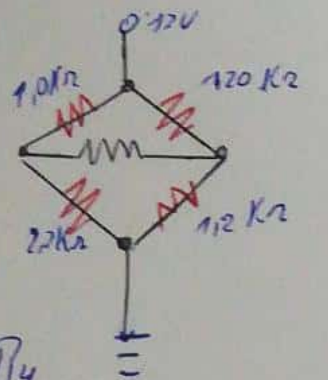
$$(R_1 \| R_2) + R_3 = 3{,}59K + 10K = 13{,}59K\Omega$$

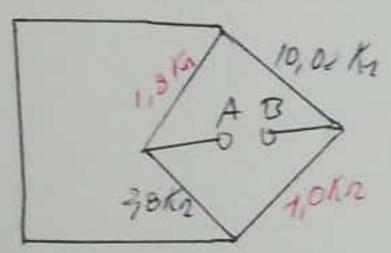
$$R_{(1\|2)+3} \| R_4 = \frac{13{,}59K(5{,}6K)}{13{,}59K+5{,}6K} = 3{,}96K\Omega$$

$$R_T = 3{,}96K + 10K = 13{,}96K\Omega$$

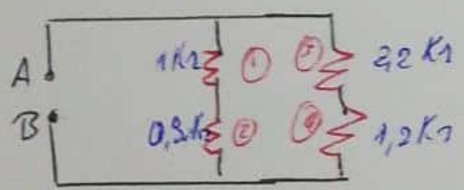
$$I_{R_1} = \frac{17{,}78}{13{,}96} = 116\mu A$$

(27)-





Reordenado:



$$R_N = R_1 + R_2 / R_3 + R_4$$

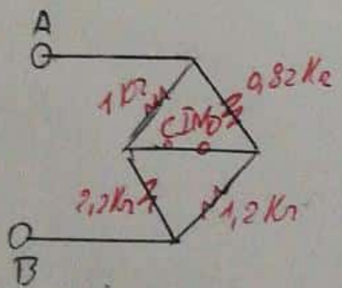
$$R_N = \frac{(R_1 + R_2)(R_3 + R_4)}{(R_1+R_2)+(R_3+R_4)}$$

$$R_N = \frac{(1+0,82)(2,2+1,2)}{1+0,82+2,2+1,2}$$

$$R_N = \frac{(1,82)(3,14)}{5,22}$$

$$R_N = 1,195\ K\Omega$$

Intensidad de Norton:

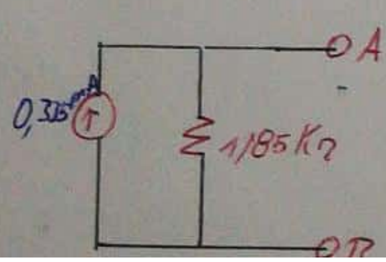


$$I_{AC} = \frac{1,195}{(2,2+1)}(5,22)$$

$$I_{AC} = 1,933\,mA$$

$$I_{AD} = \frac{1,83}{(0,82+1,2)}(5,22)$$

$$I_{AD} = 3,062\,mA$$

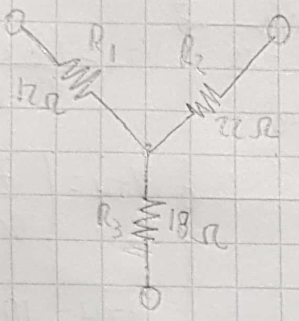


$$I_N = \frac{3,062}{10K\Omega} = 0,0306\,mA$$

Conversión Y a Δ

35) Convierte cada red Y a red Δ

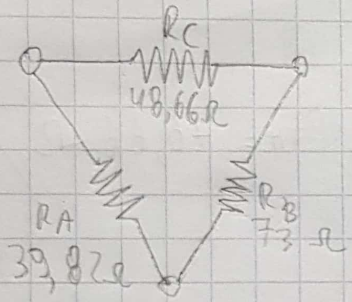
a)



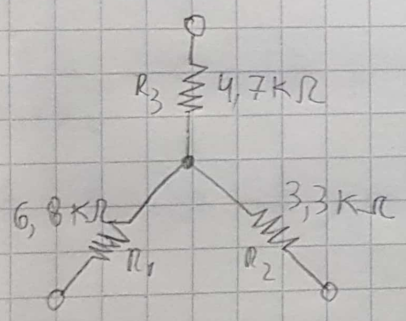
$$R_A = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_2} = \frac{(12)(22)+(12)(18)+(22)(18)}{22} = 39,82\ \Omega$$

$$R_B = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_1} = \frac{(12)(22)+(12)(18)+(22)(18)}{12} = 73\ \Omega$$

$$R_C = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_3} = \frac{(12)(22)+(12)(18)+(22)(18)}{18} = 48,66\ \Omega$$



b)

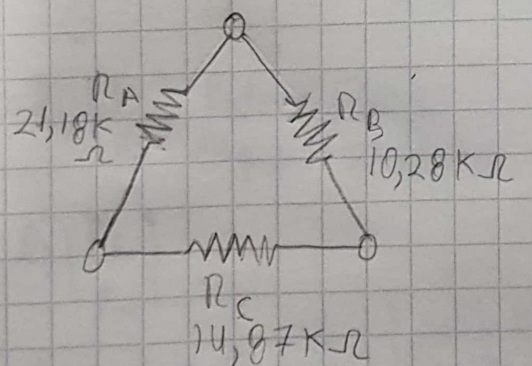


$$R_A = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_2} = \frac{(6,8K)(3,3K)+(6,8K)(4,7K)+(3,3K)(4,7K)}{3,3K} = 21,18K\Omega$$

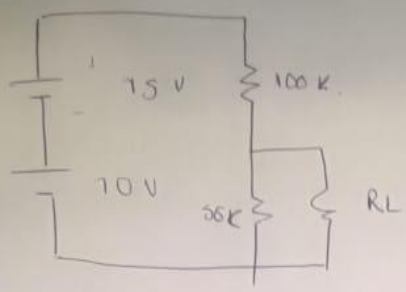
$$R_B = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_1} = \frac{(6,8K)(3,3K)+(6,3K)(4,7K)+(3,3K)(4,7K)}{6,8K} = 10,28K\Omega$$

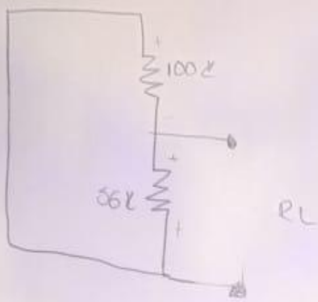
$$R_C = \frac{R_1R_2 + R_1R_3 + R_2R_3}{R_3} = \frac{(6,8K)(3,3K)+(6,9K)(4,7K)+(3,3K)(4,7K)}{4,7K}$$

$$= 14,87K\Omega$$



(c)





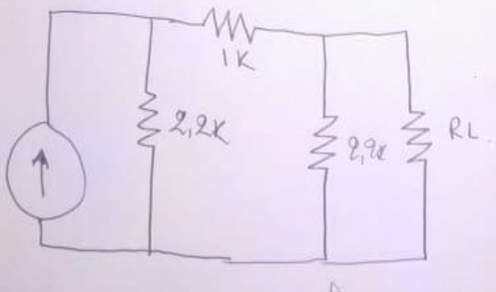
$R_1 \| R_2$

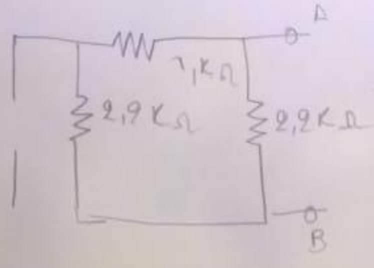
$$R_1 + R_2 = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

$$R_1 + R_2 = \frac{1}{\frac{1}{100K} + \frac{1}{56K}}$$

$$\boxed{R_1 + R_2 = 35,9\ K}$$

(d)





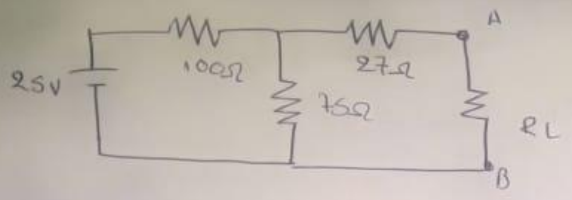
$$R_1 + R_2 = 3,2\ K$$

$$R_1 + R_2 + R_3 = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

$$R_1 + R_2 + R_3 = \frac{1}{\frac{1}{3,2K} + \frac{1}{2,2K}}$$

$$\boxed{R_1 + R_2 + R_3 = 1,3\ K\Omega}$$

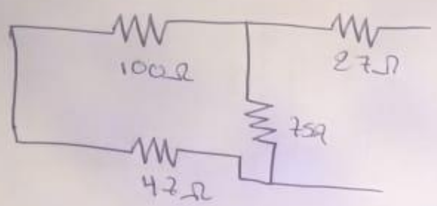
23. Para cada uno de los circuitos determine el equivalente de Norton.



$R_1 + R_2 = 147\,\Omega$

$R_1 + R_2 + R_3 = \dfrac{1}{\dfrac{1}{147} + \dfrac{1}{75}}$

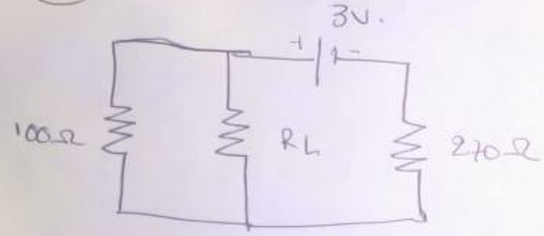
$= 49{,}66$



$R_N = 49{,}66 + 27$

$\boxed{R_N = 76{,}66}$

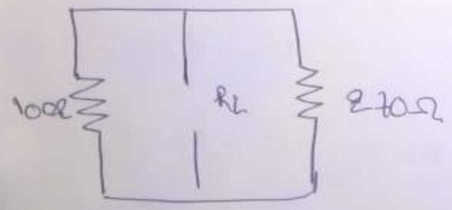
5



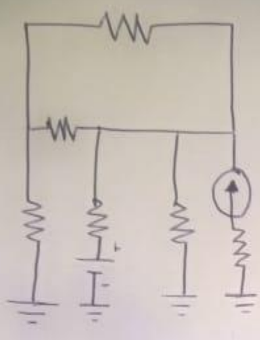
$R_1 // R_3$

$R_1 + R_3 = \dfrac{1}{\dfrac{1}{100} + \dfrac{1}{270}}$

$\boxed{= 72{,}97\,\Omega}$



(25) Con el teorema de norton, determine V en R_5.



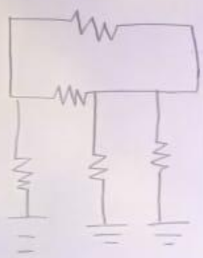
$R_N = 1{,}95\ k\Omega$

$I\ 10mA$

$I_N = I_T \cdot \frac{R_1}{R_1 + R_2}$

$I_N = 10mA \cdot \frac{3{,}3K}{3{,}3K + 3{,}3K}$

$\boxed{I_N = 5mA}$



$V = I \cdot R$

$V = 5mA \cdot (3{,}3K)$

$\boxed{V = 17V}$