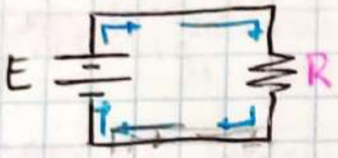
CONCEPTOS DE CIRCUITOS ELECTRICOS

Ley de Ohm $V = RI$ La tensión entre los extremos de materiales conductores es directamente proporcional a la corriente que fluye a través del material.

// tensión ó voltaje

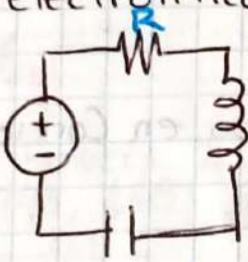
Un resistor es aquel que se opone al paso de la corriente.



I → Sale de la terminal positiva.

10^{-6}	micro	μ	10^{6}	mega	M
10^{-3}	mili	m	10^{3}	Kilo	K

Resistor electrolítico y cerámico



Resistencia R —WW— Ω V/A $R = \frac{V}{I}$

Carga positiva: (Protón) 1.602×10^{-19} C
Carga negativa: (Electrón) -1.602×10^{-19} C

Ley de Ohm: Establece que la tensión entre los extremos de materiales conductores es directamente proporcional a la corriente que fluye a través del material: $\boxed{V = Ri}$ R= Resistencia eléctrica.

- Voltaje (tensión)
- Corriente: se define corriente en un punto específico, que fluye en una dirección especificada, como la velocidad instantanea a la cual la carga positiva pasa por ese punto en la dirección especificada.

$\boxed{i = \frac{dq}{dt}}$

C/s

°La unidad de corriente es el ampere

ELEMENTOS RESISTIVOS

—WW— Resistencia: Dificultad u oposición que presenta un cuerpo al paso de una corriente eléctrica para circular a través de él Ω

Resistencia - Potencia Absorbida

Por ley de Ohm ↓

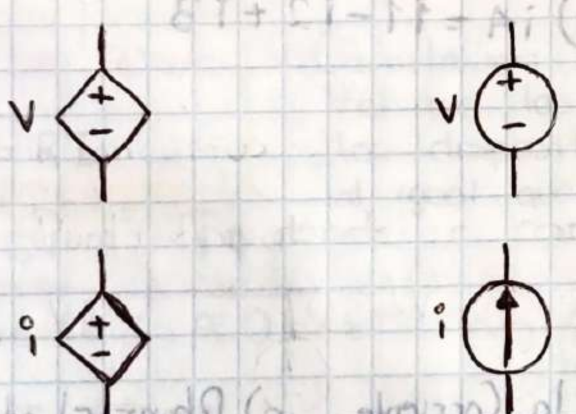
La formula de potencia es: $\boxed{P = Vi}$ $P = i^2 R$ $P = V^2/R$

Capacitor: (Pasivo) tiene la capacidad de almacenar y devolver energía. El almacenamiento es en el campo eléctrica (F) (Farad)

Inductor: (Pasivo) tiene la capacidad de almacenar energía durante periodos y la devuelve en otros. Potencia prom = 0 Henry (H)

*TIPOS DE FUENTES.

Dependientes Independientes



Fte. de Voltaje de CD.

Fuente de Corriente de CD.

Nodo: Punto en el cual dos o más elementos tienen una conexión común. Punto en donde se conectan una o más ramas.

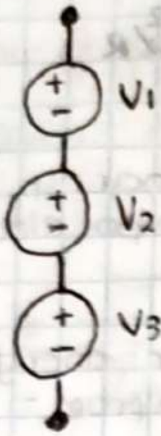
Trayectoria: Cuando no pasas por un nodo mas de una vez.

Trayectoria cerrada o lazo: Punto en donde dos o más elementos tienen una conexión en común.

Rama: Trayectoria simple en una red (Número de elementos.

Malla: Trayectoria cerrada dentro de un circuito de tal forma que si la corriente sale de un nodo, esta regresa al mismo al terminar el recorrido sin pasar dos veces por un mismo nodo.

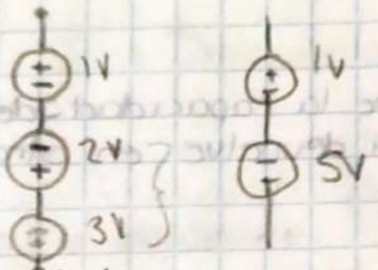
Fuentes ind. en serie.



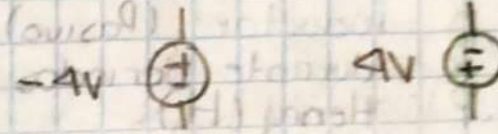
Las fuentes de voltaje V_1, V_2 y V_3 están conectados en serie.

$V_4 = V_1 + V_2 + V_3$

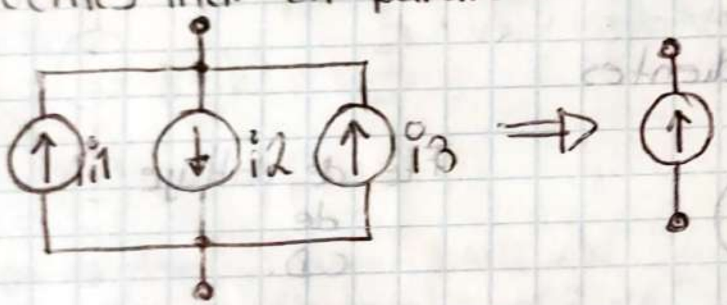
Ej:



$+1V - 2V - 3V = -4V$



Fuentes ind. en paralelo

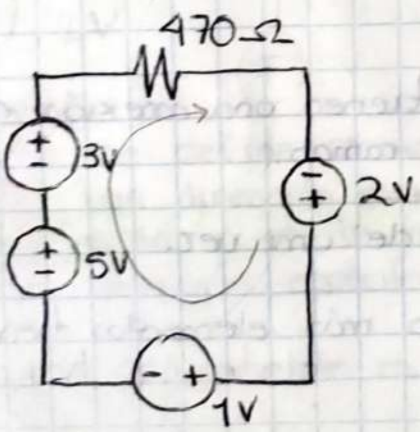


$i_4 = i_1 - i_2 + i_3$

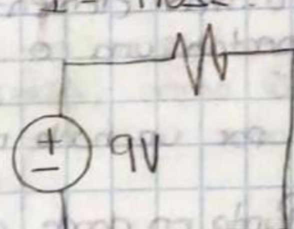
Fuentes independientes.

En el sig. cto:

a) Suma las fuentes b) Obtener la Corriente c) Dibujar el cto simplificado



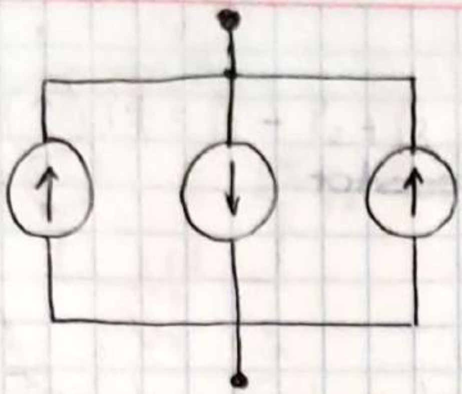
$I = \frac{9V}{470\Omega} = 0.019$ Amp



$-2V + 1V - 5V - 3V = -9V$

ó 9V

$-2 + 1 - 5 - 3$



$i_1 = 10A$
$i_2 = 3A$
$i_3 = 7A$

$10A - 3A + 7A = \underline{14A}$

El voltaje en paralelo es el mismo
La corriente en serie es la misma

Circuito en Serie: Configuración de conexión en que las terminales de los dispositivos se conectan secuencialmente.
El voltaje se divide.

LEY DE OHM

$$V = RI$$

Circuito en Paralelo: Conexión del dispositivo tal que las terminales de entrada de todos los dispositivos conectados coinciden entre si al igual que sus terminales de salida.

Serie

$$I_T = I_1 = I_2 = I_3 = I_4$$

$$R_T = R_1 + R_2 + R_3 + R_4$$

$$V_i = V_1 + V_2 + V_3 + V_4$$

Paralelo

$$V_T = V_1 = V_2 = V_3 = V_4$$

$$R_T = \frac{R_1 R_2}{R_1 + R_2} \text{ (2 Resist.) ó } R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots}$$

$$I_T = I_1 + I_2 + I_3 + I_4.$$

$$i = \frac{P}{V}$$

$$P = Vi$$

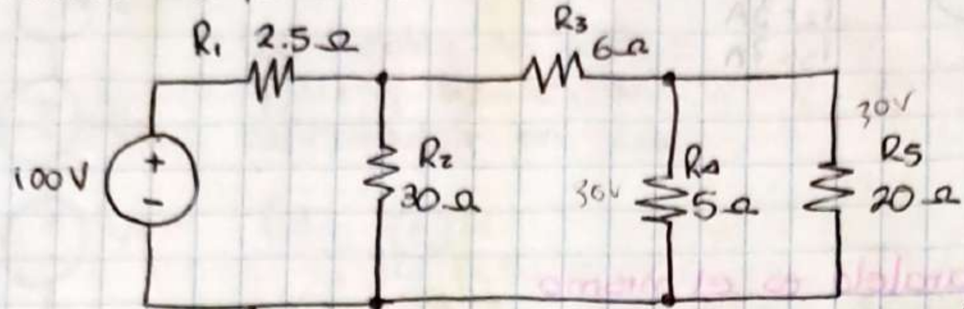
$$i_1 = \frac{27.75\,nW}{1.5\,mV} = 18.5$$

$$I_2 = \frac{-3\,\mu W}{1.5\,mV}$$

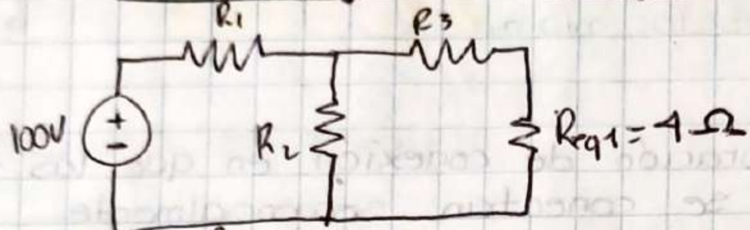
$$I_3 = \frac{1.20\,\mu W}{1.5\,mV}$$

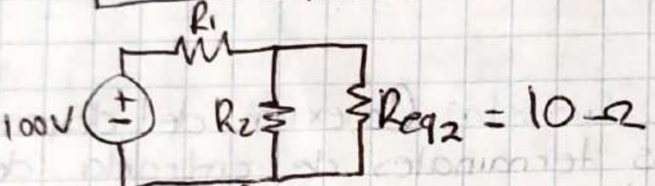
Circuitos en serie y en Paralelo.

Encuentre la potencia absorbida en cada resistor.

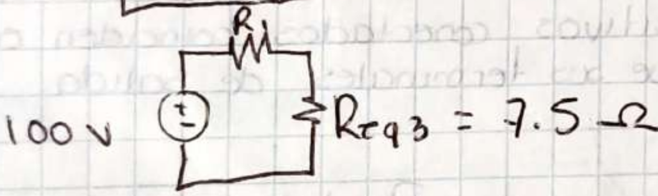


$$\frac{5 \cdot 20}{5+20} = 4$$





$V_{eq2} = 75V$



$$I_T = \frac{V_T}{R_T} = \frac{100\ V}{10\ \Omega}$$

$I_T = 10\ A$

100W

$V_{eq3} = R_{eq3} I_{eq3} = \cancel{25}\ 75\ V$

$V = 7.5A(4\ \Omega)$

30V

$\boxed{P = i^2 R}$ $\boxed{P = Vi}$ $P = \frac{V^2}{R}$

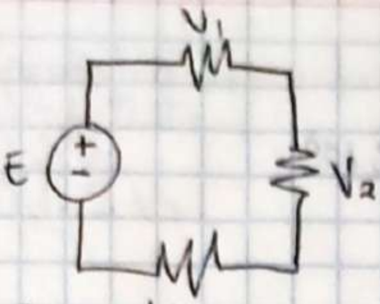
$P_{R_1} = 10^2(2.5) = 250\ W$

$P_{R_2} = \frac{(75)^2}{30} = 187.5\ W$

$P_{R_3} = (7.5)^2(6) = 337.5\ W$

$P_{R_4} = \frac{V^2}{R} = \frac{30^2}{5} = 180\ W$

$P_{R_5} = \frac{30^2}{20} = 45\ W$



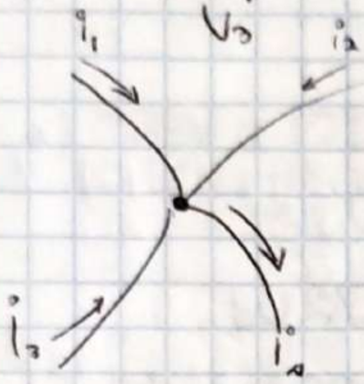
$E + V_1 + V_2 + V_3 = 0$

$P = Vi$

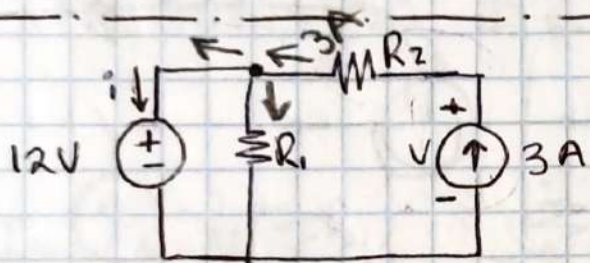
$P = i^2 R$

$P = \frac{V^2}{R}$

$V = iR$



$i_1 + i_2 + i_3 = i_4$



$P = Vi$
$24 = Vi$
$12V$

$i = 2A$

$R_2 = 3\Omega$

12Ω

a) Suponer $R_1 = 6\Omega$ y $R_2 = 3\Omega$
Encontrar la corriente i y el voltaje V

$V_3 = 9V$ En serie R_2 y ↑

$\frac{12}{6} = 2A$

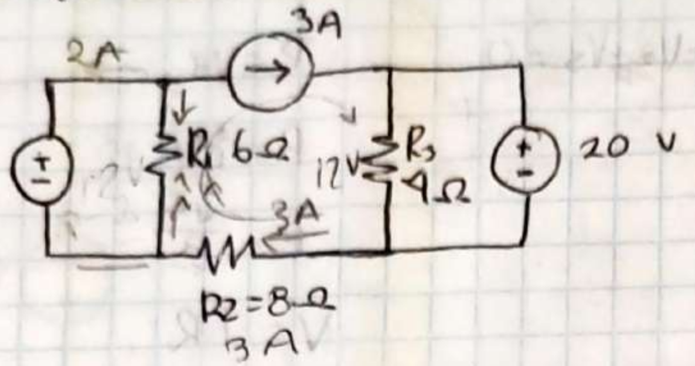
$i = 1A$

b) Suponer que $i = 1.5A$ y $V = 2V$. Determine R_1 y R_2

$R_1 = 8\Omega$ $R_2 = 6\Omega$

c) Suponer que la fuente de voltaje suministra 24W y la fuente de corriente suministra 9W de potencia, determine corriente i, voltaje V y R_1, R_2

Calcular potencia en resistores



24, 72, 100

$v_{R_1} = 6i$

$I = 12/6 = 2A$

$V = RI$

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

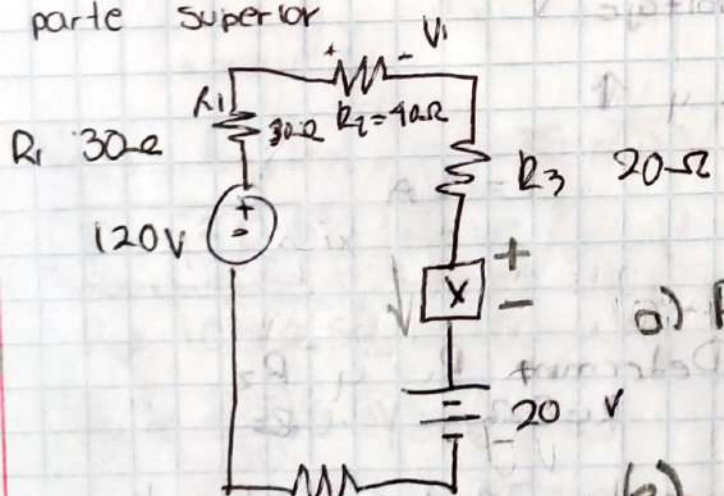
$I_3 = \frac{20}{4}$

$P_1 = V_1 I_1 = (12v)(2A) = 24W$

$P_2 = R i^2 = (8\,\Omega)(3A)^2 = 72W$

$P_3 = V_3 I_3 = (20V)(5A) = 100\,w$

Calcular potencia del elemento X con referencia positiva en la parte superior



a) $R = 100\,\Omega$

b) FVI de 40 V

FVD con $20\,i_x$

FVD con 60 v

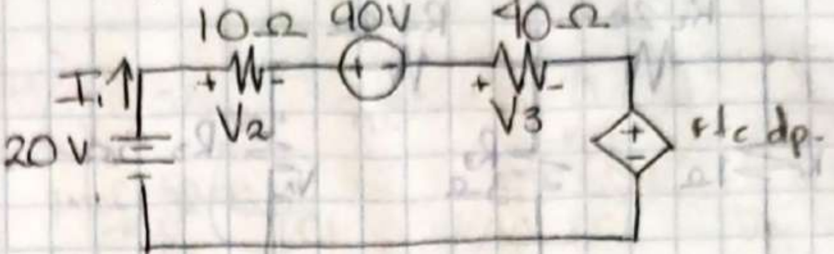
a) $P = R i^2 = (100\Omega)(0.5)^2$

$= 25\,w$

b)

Encuentre I_1 si la fuente dependiente de voltaje tiene valor de:

a) $-1.5\, I_1$
b) $2\, V_2$
c) $1.5\, V_3$



a) $-20V + 10I_1 + 90V + 40I_1 - 15I_1 = 0$

$50I_1 + 15I_1 = -90 + 20$

$+35I_1 = -70$

$I_1 = -70/35$

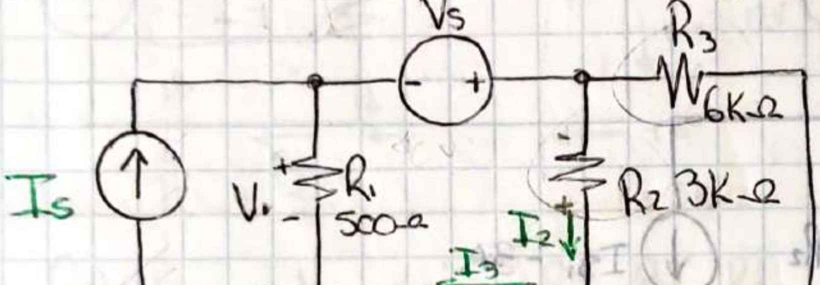
b) $-20V + 10I_1 + 90 + 40I_1 + 2(10I_1) = 0$

$70I_1 = -70 \quad I_1 = -1$

c) $-20V + 10I + 90 + 40I + 1.5(40I)$

$110I = -70$

$I = -0.63$ amp



$$R_{eq} = \frac{6 \cdot 3}{6+3} = \frac{18}{9} = 2\ K\Omega = 2\,000\ \Omega$$

Para el circuito

a) Considere $V_s = 40\ V$ e $I_s = 0A$, determine V_1
b) Considere $V_s = 0V$ e $I_s = 3mA$, determine I_2 e I_3

a) $40 + 2000i + 500i = 0$

$2500i = -40$

$i = -0.016$ amp

$V_1 = R_1 I_1 = (500)(0.016a) = 8V$

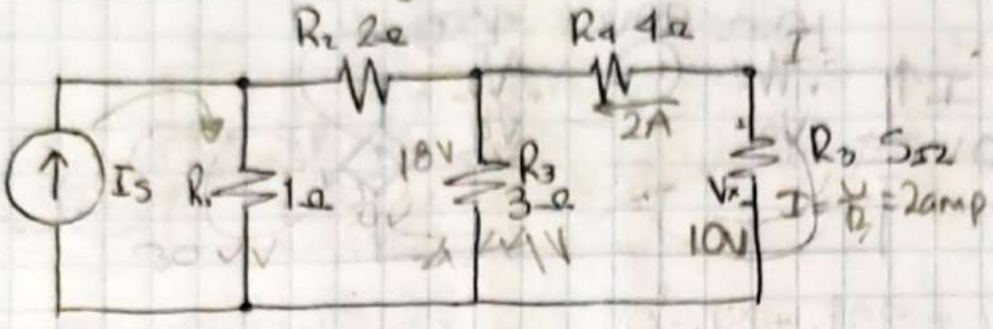
$V = Ri = 400\Omega \cdot 3mA$

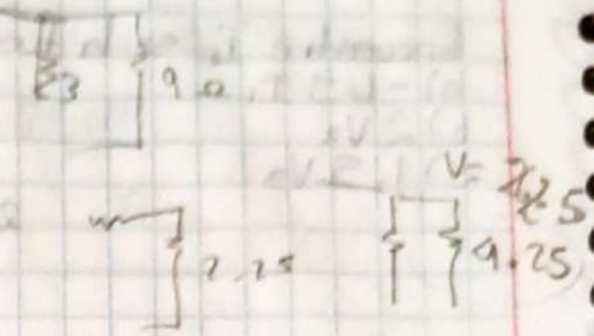
$1.2\ V$

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

2500

Con base en el siguiente circuito:





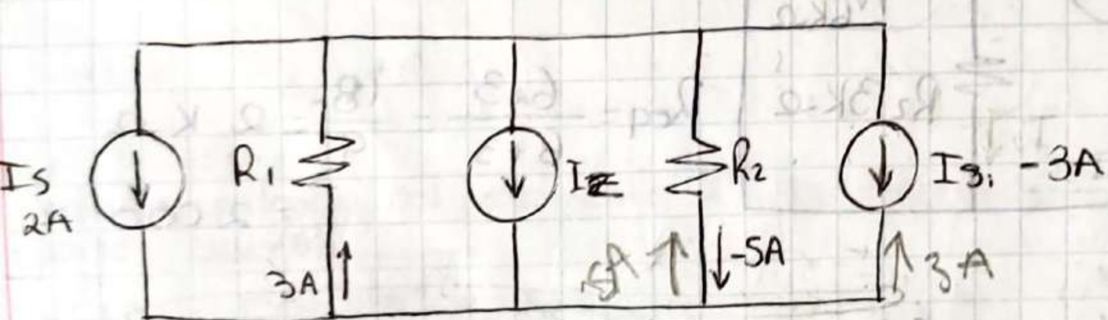
a) Encuentre Is con $V_x = 10V$

26 amp. :)

b) Encuentre Vx con $I_s = 50\,A$

$V_x = R_x I_x = (23amp)(5\Omega)$

$\approx 119 \approx \underline{12V}$



a) Determine Iz

$2A - 3A + I_z - 5A - 3A = 0$

$I_z - 9A = 0$

$\underline{I_z = 9A}$

b) Si $R_1 = 1\Omega$, determine R_2

$V = RI = (1)(-3A) - (-3V)$

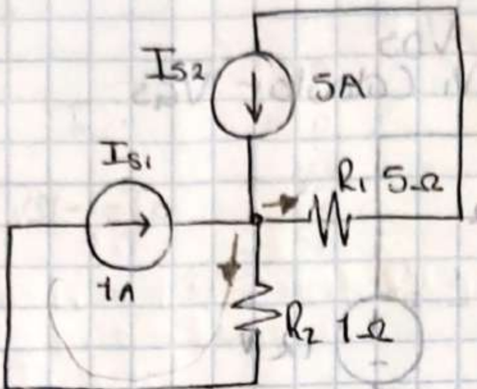
$R = \frac{V}{I} = \frac{(-3V)}{-5A} = \underline{0.6\,\Omega}$

Calcular potencia en R_1 y R_2

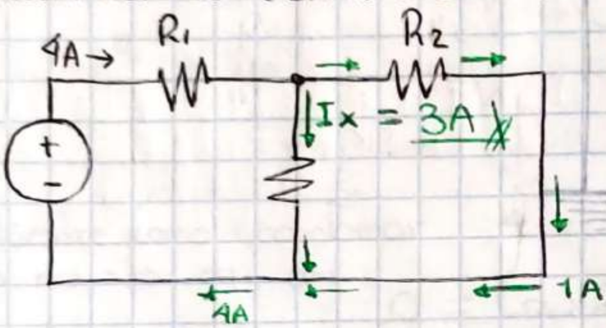
$P = I^2 R$

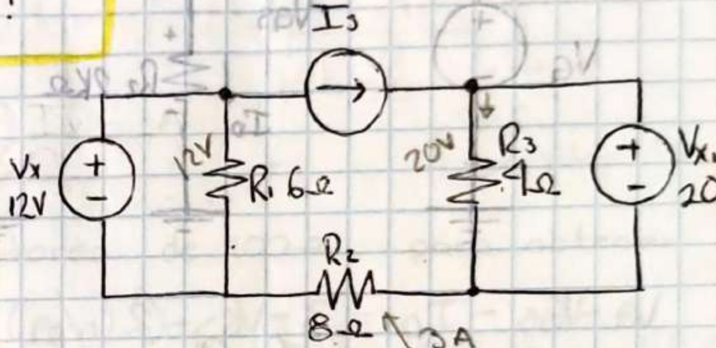
$P_2 = (1)^2(1) = \underline{1 W}$

$P_1 = (5)^2(5) = \underline{125 W}$



Encontra la corriente en Ix:





Calcular potencia en R_1, R_2, R_3

$P_{R2} = I^2 R = (3A)^2 (8) = \underline{72 W}$

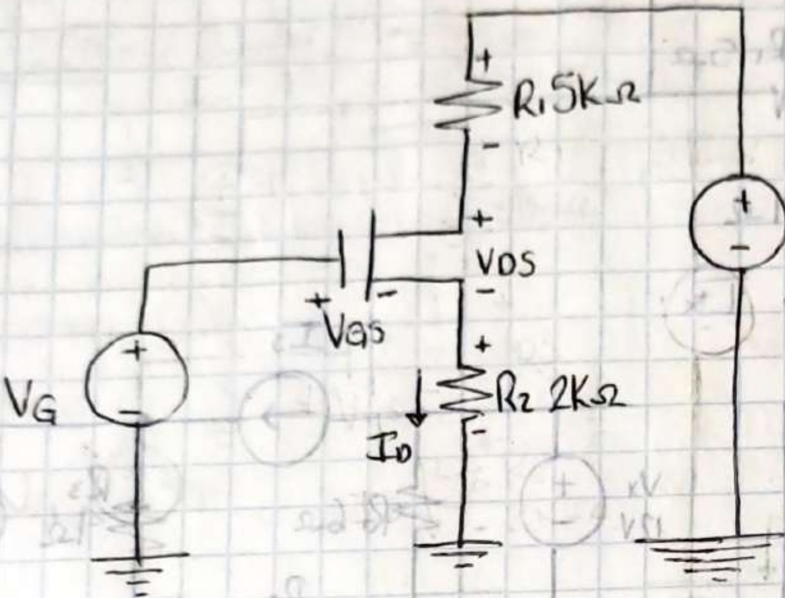
$P_{R1} = \frac{V^2}{R} = \frac{(12)^2}{6} = \frac{144}{6} = \underline{24 W}$

$P_{R3} = \frac{V^2}{R} = \frac{20^2}{4} = \frac{400}{4} = \underline{100 W}$

Del cto. transistorizado obtener:

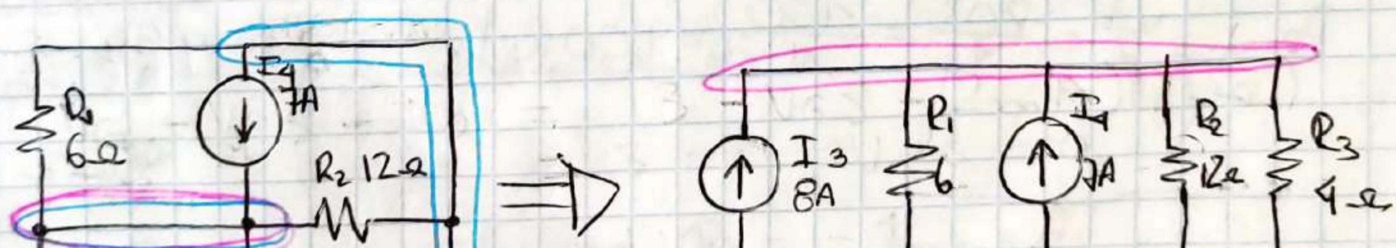
a) Si $I_D = 1.5\,mA$, calcular V_{DS}

b) Si $I_D = 2\,mA$ y $V_G = 3V$, Calcular V_{GS}.



$$V_G - V_{GS} - I_D = 3 - V_{GS} - (2\,mA)(2K\Omega) = 0$$
$$= 3 - 4 - V_{GS} = 0$$
$$V_{GS} = -1$$

Calcular la Potencia en todos los elementos.



$$8 + \frac{V}{6} + 7 + \frac{V}{12} + \frac{V}{4} = 0$$

$$V\left(\frac{1}{6} + \frac{1}{12} + \frac{1}{4}\right) = -15$$

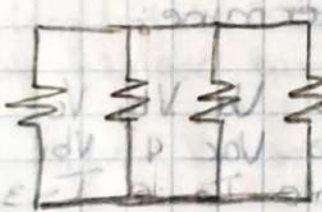
$V = (-15)(22)$

$V = -330$

$P_3 = V_3 I_3 = -330\,(8A) = -2640\ W$

Muestre como combinar 4 resistores de 100 Ω para obtener un resistor eq. de:

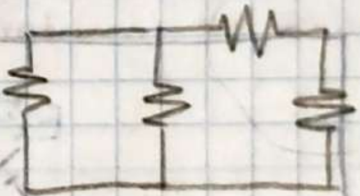
a) Req. = 25 Ω



$\frac{1}{100}+\frac{1}{100}+\frac{1}{100}+\frac{1}{100}$

$= \frac{1}{\frac{4}{100}} = \frac{1}{0.04} = \underline{25}$

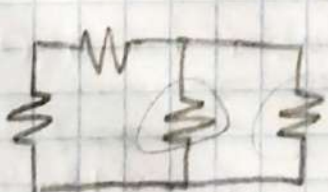
b) Req = 40 Ω



$\frac{(200)(100)}{300} = \frac{(66.66)(100)}{100+66.66}$

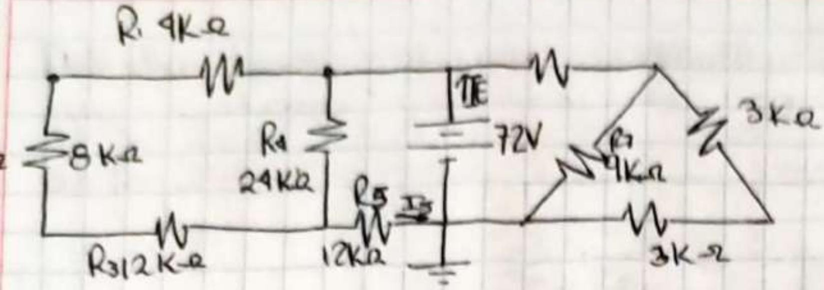
$= \underline{40\ \Omega}$

c) Req. = 60 Ω



$50 + 100 = 150$

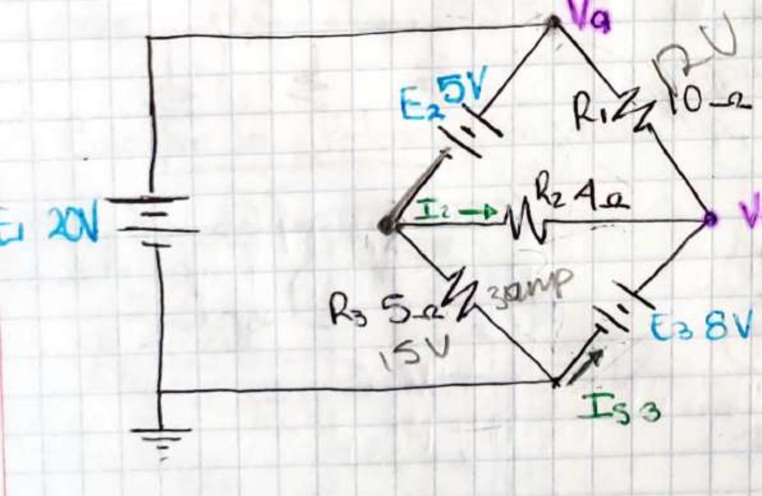
$\frac{(150)(100)}{250} = 60\Omega$



7.36 (F1c)

$\frac{72}{24}$ $I_5 = 3mA$
$I_T = 4.36$

Pte de Wnstn (Para Condicionar Señales.)

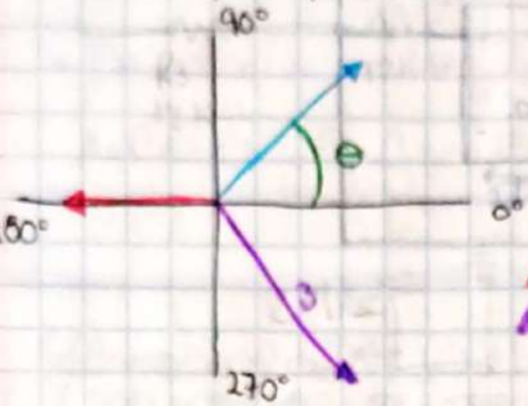


Determine:

a) Voltajes Va, Vb, Vc
b) Voltajes Vac y Vbc
c) Corriente I2 e Is3

FASORES.

Un fasor es un tipo de vector; se emplea para representar funciones, del tiempo que varian en forma senoidal



Magnitud (longitud de la flecha, medida de una cant

El ángulo θ (Con respecto a 0°); representa la posición angular.

Magnitud = 1, ángulo de fase (θ) = 180°
Magnitud = 3, ángulo de fase (θ) = -45° (ó 315°)

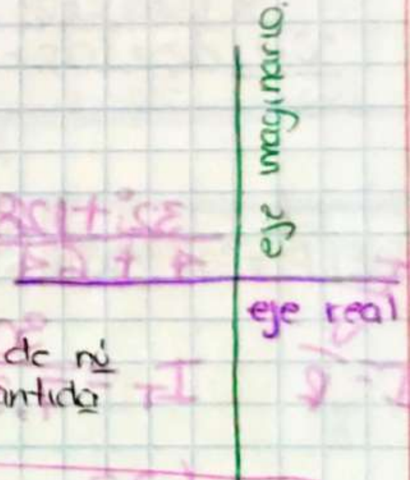
Un ciclo completo de una onda seno puede ser representado por la rotación de 360° de un fasor. El valor instantaneo de la onda seno en cualquier punto es igual a la distancia vertical desde la punta del fasor hasta el eje horizontal.
La longitud del fasor es igual al valor pico de la onda seno (puntos de 90° y 270°). El ángulo del fasor medido a partir de 0° es el punto angular correspondiente de la onda seno.

La longitud de fasor es el valor pico del voltaje sinosoidal, V_p. Por lo tanto el lado opuesto del triángulo, (valor instantaneo) se expresa:

$$v = V_p \operatorname{sen} \theta$$

NUMEROS COMPLEJOS

En Cts. se utiliza el prefijo $\pm j$
Complejo: Combinación de un imaginario y un complejo.

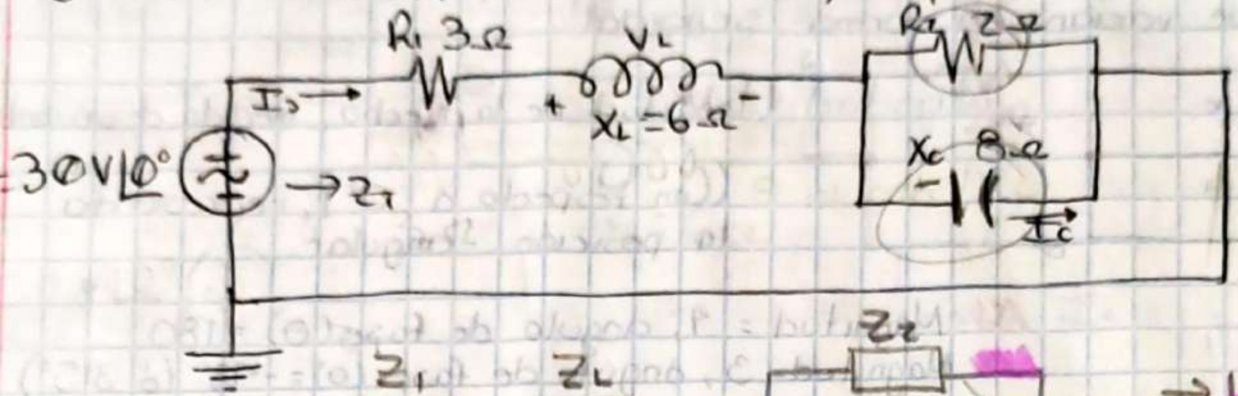


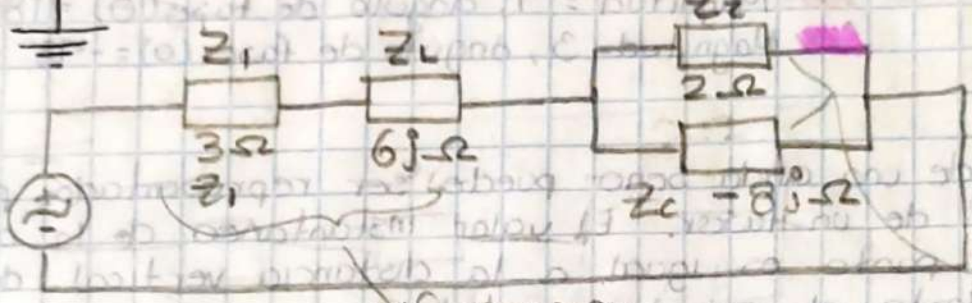
Las formas rectangulares y polar son dos formas de números complejos que se utilizan para representar cantidades fasoriales.

$8+3j$, $6-7j$, $-3+9j$, $-5-10j$ — Rectangular $A + Bj$

$8.5\angle 20.55$, $9.21\angle -49°$, $25\angle 110°$, $-60\angle 110°$ — Polar $C\angle \pm\theta$

a) Determine la impedancia total (Z_T)
b) Determine la corriente I_C, I_S, V_L



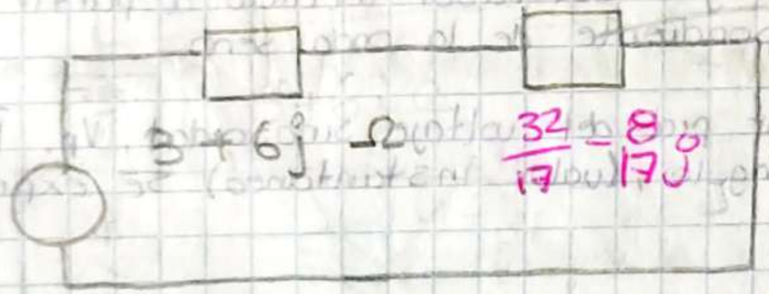


→ Lo pasamos a sist. de bloques

Sumamos

Sumamos

$$\frac{-16j}{2-8j}$$



Hay que multiplicar por su conjugado

$$\left(\frac{-16j}{2-8j}\right)\left(\frac{2+8j}{2+8j}\right)$$

$$\frac{32j+128}{4+64} = \frac{32}{17} - \frac{8}{17}j \qquad Z_T = \frac{83}{17} + \frac{94}{17}j$$

I eje y

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

$$I_T = \frac{30V\angle 0°}{7.37\angle 48.55} \approx 4.06\angle -48.55 \approx 2.69 - 3.04j$$

$$V_{Z_2 Z_C} = \left(\frac{32}{17} - \frac{18}{17}j\right)(2.69 + 3.04j) = -316.81 - 575.$$

$$\boxed{I_{Z_C} = 71.85 - 39.6j}$$

Forma Rectangular

$A + Bj$

- De polar a rectangular

$A = C\cos\theta \quad B = C\,\text{sen}\,\theta$

Forma Polar

$C \angle \pm\theta$

- De rectangular a polar

$C = \sqrt{A^2 + B^2} \quad \theta = \tan^{-1}\left(\frac{\pm B}{A}\right)$

Adición

$(8+5j)+(2+j) = 10 + 6j$
$(20-10j)+(12+6j) = (32 - 4j)$

Sustracción

$(3+4j)-(1+2j) = 2 + 2j$
$(15+15j)-(10-8j) = (5 + 23j)$

Multiplicación

$(5+3j)(2-4j) = 10 - 20j + 6j + 12$
$= 22 - 14j$

$(10\angle 45^\circ)(5\angle 20^\circ)$
$= (10 \cdot 5)\angle(45+20) = 50\angle 65^\circ$

División

$\frac{10+5j}{2+4j} = \frac{(10+5j)(2-4j)}{(2+4j)(2-4j)} = \frac{20-40j+10j-20j^2}{4-16j^2}$

$= \frac{20+20-30j}{4+16} = \frac{40-30j}{20} = 2 - 1.5j$

$\frac{100\angle 50^\circ}{25\angle 20^\circ} = \left(\frac{100}{25}\right)\angle 50^\circ - 20^\circ = 4\angle 30^\circ$

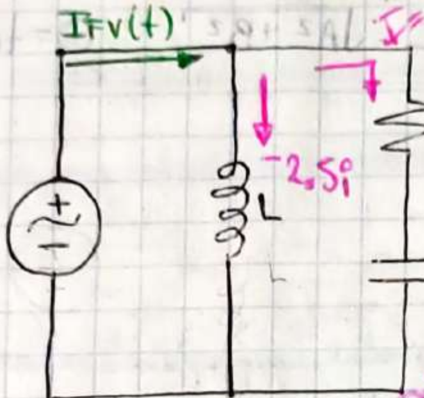
Ley de Kirchhoff de Voltaje: La suma algebraica de todos los voltajes en una trayectoria cerrada única es cero:

Ley de Kirchhoff de corriente: La suma de las corrientes que entran a un nodo es igual a la suma de las corrientes que salen de dicho nodo.

Encuentre el valor de L donde

$E(t) = 100\ sen(500\ t)V$
$I_{FV} = 2.5\ sen(500\ t)A$
Considere $K = 1$

$2.5 + 2.5j$



$\Rightarrow$ $E(t) = 100\ sen(500t)$

$E(t) = 100(1)\angle 0° = 100\angle 0°$

$$Z_C = \frac{1}{j\omega C}$$

Donde $\omega = 500$
$C = 100 \times 10^{-6}$

$$Z_C = \frac{1}{(500)(100\times10^{-6})} = \frac{1}{0.05} = 20\,\Omega$$

Amplitud sen(frecuencia(t) + angulo)
$\rightarrow$ $\boxed{A\ sen(\omega t + \alpha)}$

Para pasar a su forma polar:

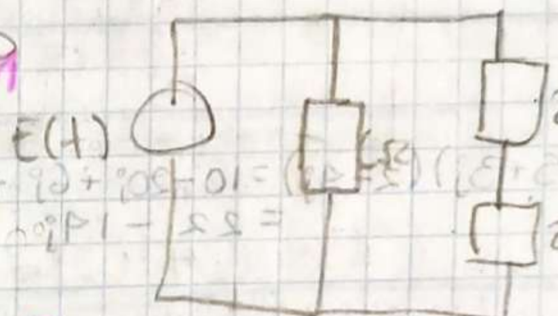
$\boxed{AK\angle\alpha}$

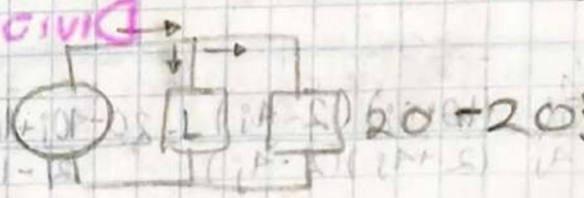
Si no hay consideraciones $K = \frac{1}{\sqrt{2}}$

Ahora: $Z_C = \frac{1}{j\omega C}\ \Omega$

& $Z_L = j\omega L\ \Omega$

$\Rightarrow$



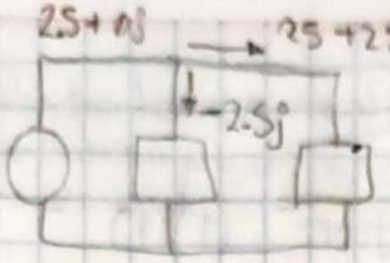


$V = RI$
$I_2 = \frac{V_2}{R_2} = \frac{100\angle 0°}{20-20j} = \frac{100\angle 0°}{28.28\angle -45°} = \underset{Pol}{3.53\angle 45°} = \underset{Rec}{2.49 + 2.49j}$

$I_{FV} = 2.5\ sen(500t)A = 2.5(1)\angle 0° = \underset{Pol}{2.5\angle 0°} = \underset{Rec}{2.5 + 0j}$

$(2.5 + 0j) - (2.5 + 2.5j) = 0 - 2.5j$

~~A cos(ωt) ⟹ A sen(ωt + 90°)~~ $\cos(t) = sen(t + 90°)$



$V_L = I_L Z_L \qquad V_L = I_L(jwL)$

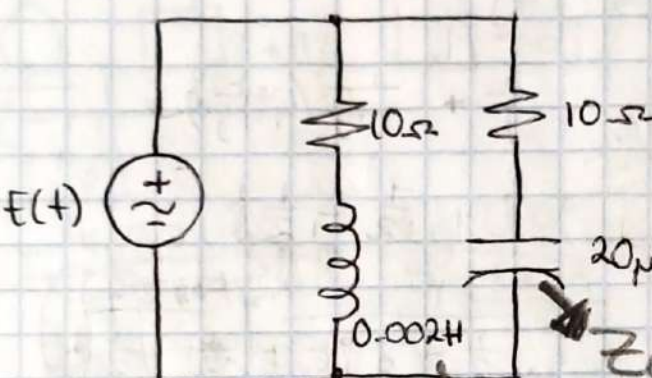
$\Rightarrow 100\angle 0^\circ = -2.5j(500jL)$

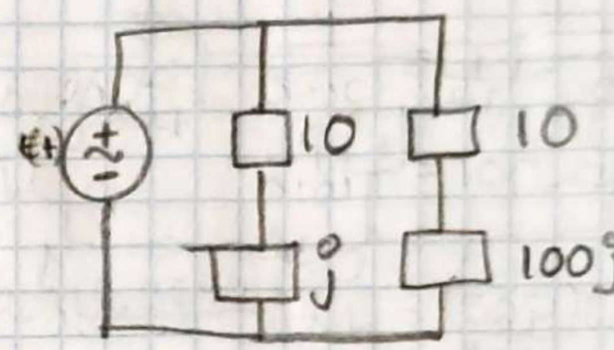
$100\angle 0^\circ = 1250L$

$L = \frac{100\angle 0}{1250} = \underline{0.08}$

Calcule la corriente en cada rama si $E(t) = 100\,sen(500t)V$

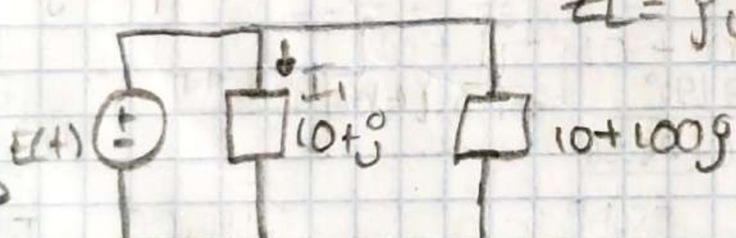
$E(t) = 100\left(\frac{1}{\sqrt{2}}\right)\angle 0^\circ = 70.71\angle 0^\circ$





$Z_C = \frac{1}{jwC} \Rightarrow \frac{1}{(500)(20\times10^{-6})j} = 100$

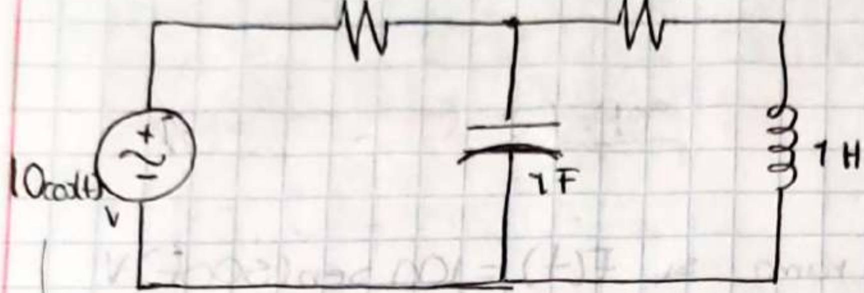
$Z_L = jwL \Rightarrow (500)(0.002)j = 1 = j$



$\Rightarrow V = RI \qquad I_1 = \frac{70.71}{10+j} \approx \underline{7 - 0.7j}$

$I = \frac{V}{R} \qquad I_2 = \frac{70.71}{10+100j} = \underline{0.07 - 0.7j}$

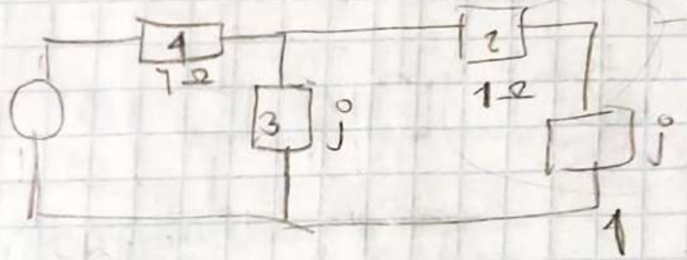
Calcular corriente que circula en la bobina.



$$Z_C = \frac{1}{jwC} = \frac{1}{(1)(1)} = 1 - j$$

$$Z_L = jwC = (1)(1) = 1j$$

$$E(t) = 10\cos(t) = 10\,sen(t+90°) = 10\left(\frac{1}{\sqrt{2}}\right)\angle 90° = 7.07\angle 90°$$



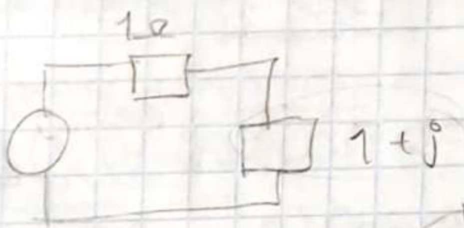
$$1 + j$$

$$\frac{1}{\frac{1}{j} + \frac{1}{1+j}}\left(\frac{1-j}{1-j}\right) = \left(\frac{1-j}{1-j^2}\right)$$

$$j + \frac{1}{2} - \frac{1}{2}j$$

$$\frac{1}{\frac{1}{2} + \frac{1}{2}j}\left(\frac{\frac{1}{2} - \frac{1}{2}j}{\frac{1}{2} - \frac{1}{2}j}\right)$$

$$= \frac{\frac{1}{2} + \frac{1}{2}j}{\frac{1}{4} + \frac{1}{4}} = 1 + j$$



$2.236\angle 26.56$

$V = RI$

$$I = \frac{7.07\angle 90°}{2.2360\angle 26.56} = 3.1618\angle 63.44$$

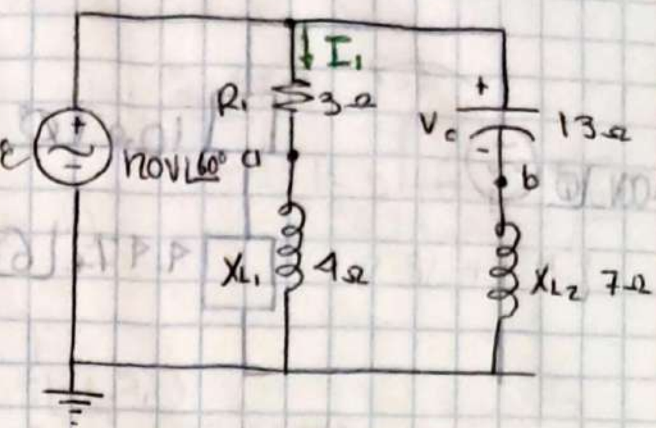
$$V = (1+j)(3.1618\angle 63.44) = (1.4142\angle 45°)(3.1618\angle 63.44)$$
$$= 4.47\angle 108.44$$

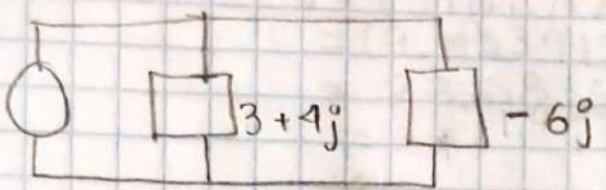
$$I_{1,2} = \frac{V}{R} = \frac{4.47\angle 108.44}{1+j} = \frac{4.47\angle 108.44}{1.4142\angle 45} = 3.16\angle 63.44$$

... admitancia está dado en simens (s) y es la inversa de la impedancia.

$$\boxed{S = \frac{1}{Z}}$$

⇒ Del siguiente circuito
a) Determine corriente I_1
c) Calcule el valor V_c y V_{ab}





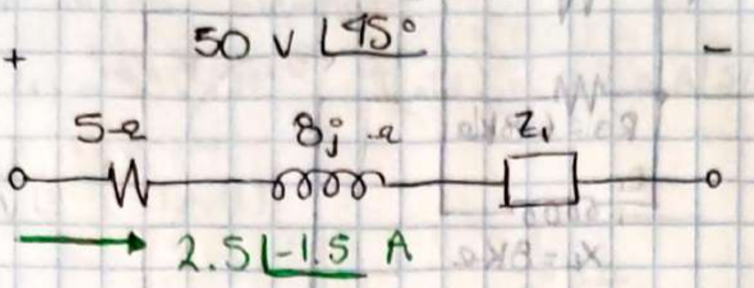
120V∠60°

$V = RI$

$$I_1 = \frac{120\angle 60°}{3+4j} = \frac{120\angle 60°}{5\angle 53.13} = 24\angle 6.8698$$

0.0238272

Calcular la impedancia Z_i



$V = RI \qquad V = (5+8j)(2.5\angle{-1.5})$

$= (9.4339\angle 57.99)(2.5\angle{-1.5})$

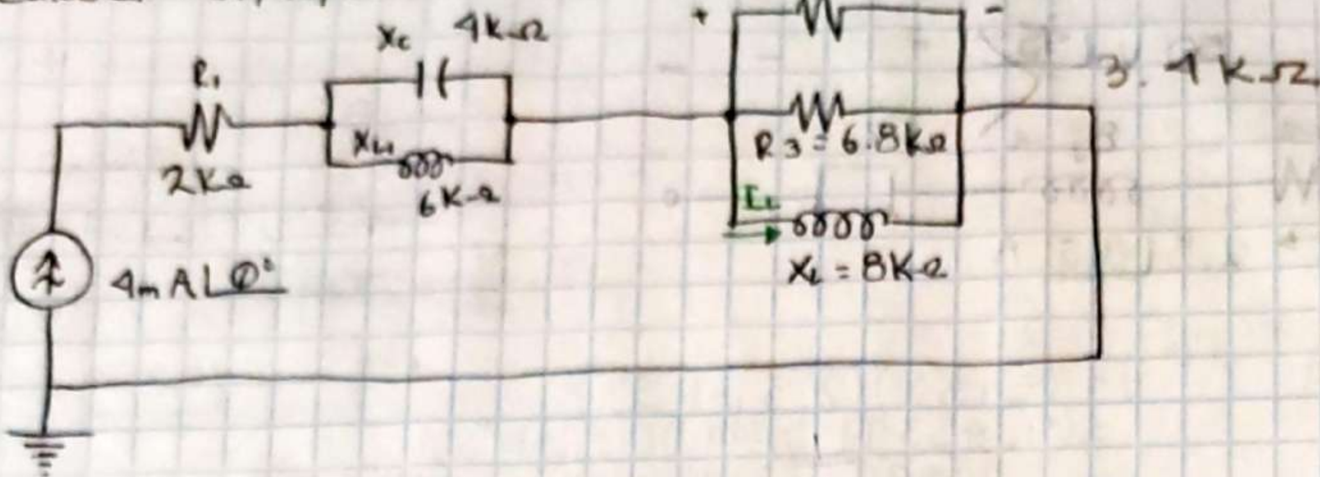
$= 23.58\angle 56.49 = 13.0181 + 19.6607j$

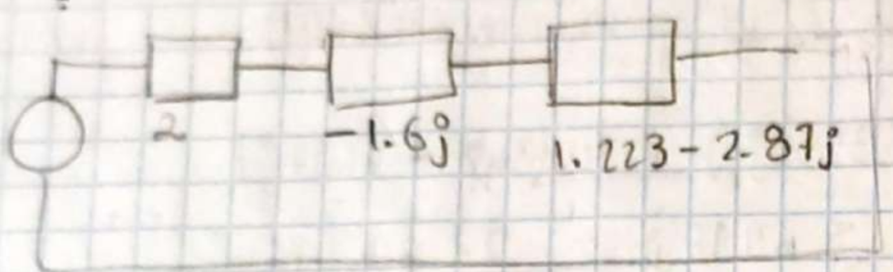
$50v\angle 45° = (35.3553 + 35.3553j) - (13.0181 + 19.6607j)$

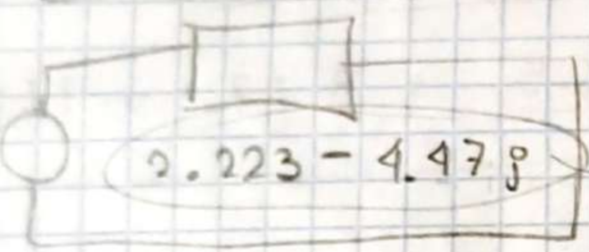
$V_{Zi} = 22.3372 + 15.6946j = 27.29\angle 35°$

$$z_i = \frac{27.29\angle 35°}{2.5\angle{-1.5}} = 10.916\angle 36.5 = 8.77 + 6.49j$$

Calcular Z_T, V_2, I_L







$$I = \frac{V}{R} = \frac{4\,mA\angle 0°}{4.99\angle -63.55} = 0.8\angle 63.55$$

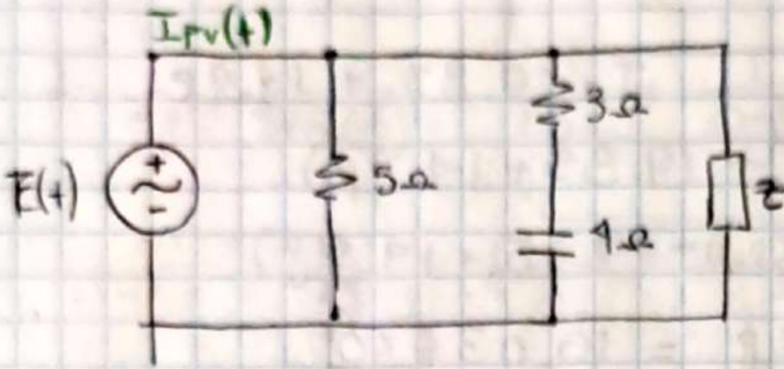
$$V = RI = (1.223 - 2.87j)(0.8\angle 63.55) = (3.11\angle -66.91)(0.8\angle 63.55)$$
$$= 2.48\angle -3.36$$

$$V_2 = 2.48\angle -3.36 = 2.47 - 0.1j$$

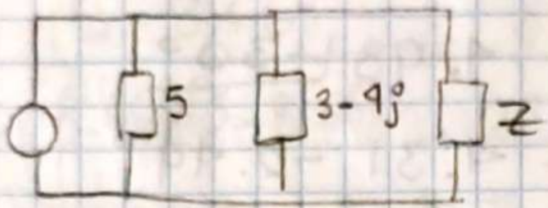
$$I_L = \frac{V}{R} = \frac{2.48\angle -3.36}{8\angle 90°} = 0.31\angle -93.36 = -0.01 - 0.3j$$

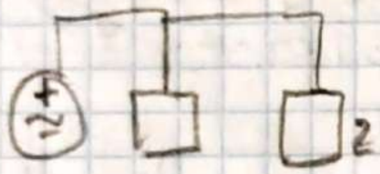
Del siguiente circuito determine el valor de Z y la naturaleza de dicho elemento.

$E(t) = 50V \angle 30^\circ$ $\quad$ $I_{Tv}(t) = 27.9\ A \angle 57.8^\circ$



$I_1 = \dfrac{V}{Z_1} = \dfrac{50V \angle 30^\circ}{\quad}$





R1 $I_1 = \frac{V}{R} = \frac{50V \angle 30^\circ}{5} = 10V \angle 30^\circ = 8.66 + 5j$

$I_2 = \frac{50V \angle 30^\circ}{3-4j} = \frac{50V \angle 30^\circ}{5 \angle -53.13} = 10V \angle 83.13$

$= 1.19 + 9.9j$

$I_4 = 9.85 + 14.9j$

$(27.94 \angle 57.8^\circ) - (9.85 + 14.9j)$

$= (14.86 + 23.6) - (9.85 + 14.9j)$

$I_3 = 5.01 + 8.7j = 10.03 \angle 60^\circ$

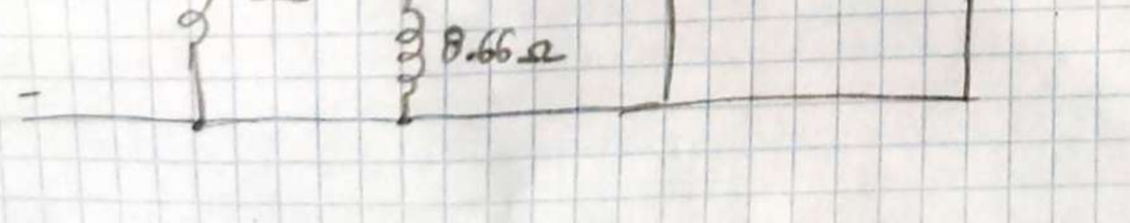
$Z = \frac{V}{I_3} = \frac{50V \angle 30^\circ}{10.03 \angle 60^\circ} = 4.98 \angle -30^\circ$

$= 4.31 - 2.49j$

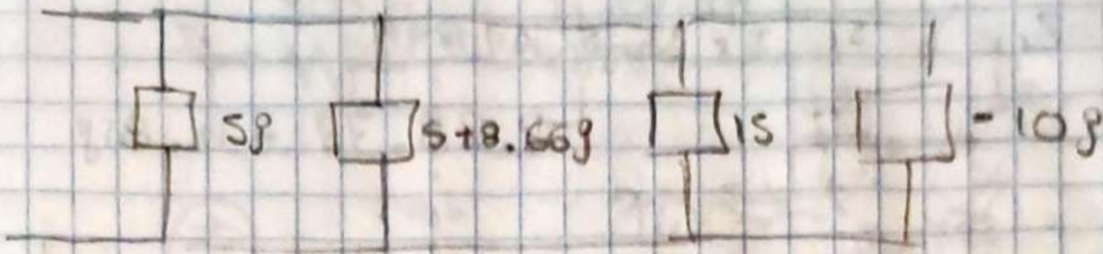
Para el sig. cto

a) Calcular impedancia equivalente Zeq. y la admitancia equivalente Yeq

b) Intensidad de corriente total I que absorbe el cto es 33 A $\angle -13^\circ$. Obtener intensidad de corriente por la rama I_3 y la tensión V.



a)



$$\frac{1}{\frac{1}{5j}+\frac{1}{5+8.66j}+\frac{1}{15}+\frac{1}{0-10j}}$$

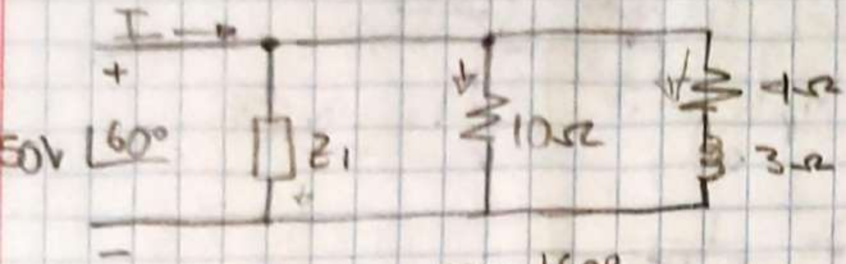
$$\frac{1}{(0.04+0.2j)+(0.05-0.08)+(0.06)}$$

$$\frac{(5-8.66j)}{(5+8.66j)(5-8.66j)} = 25+74.9956 = 99.9956 = 0.05-0.08j$$

$$\underline{100j}$$

Determinar Z_1, Y_1 si $I = 31.5\,A\angle 24^\circ$

$\hookrightarrow 28.77 + 12.81j$



$$I_2 = \frac{V}{Z_2} = \frac{50V\angle 60^\circ}{10} = 5V\angle 60^\circ = 2.5 + 4.33j$$

$$I_3 = \frac{V}{Z_3} = \frac{50V\angle 60^\circ}{4+3j} = \frac{50V\angle 60^\circ}{5\angle 36.86^\circ} = 10\angle 23.14^\circ$$

$$= 9.19 + 3.92j$$

$$I_4 = 11.69 + 8.25j$$

$$I_T = I_4 + I_1 \qquad I_T - I_4 = I_1 = (28.77 + 12.81j) - (9.19 + 3.92j)$$

$$= 19.58 + 8.89j =$$

$$= 21.5\angle 24.41^\circ$$

$$Z = \frac{V}{I_1} = \frac{50V\angle 60^\circ}{21.5\angle 24.4} = 2.32\angle 35.6^\circ$$

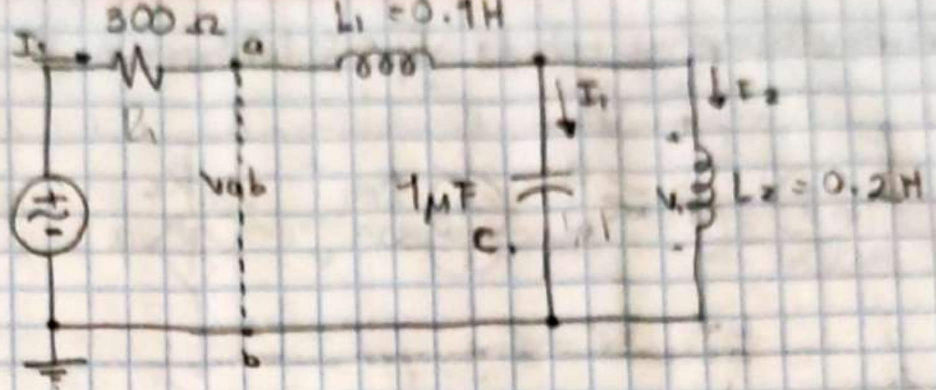
$$= 1.88 + 1.35j \qquad 2 + 2j$$

$$Y = \frac{1}{Z}$$

$$Y = \left(\frac{1}{1.88 + 1.35j}\right)\left(\frac{1.88 - 1.35}{1.88 - 1.35j}\right) = \frac{1.88 - 1.35j}{3.5 + 1.82 = 5.}$$

$$= 0.35 - 0.25j$$

Determine Z_T, I_S, I_1, I_2, V_1 y V_{ab}



$e = \sqrt{2}(50)\,\text{sen}\,\underbrace{2\pi\,1000}_{\omega}\,t + 0$

$\alpha = 0$

$V_{ab} = V_a - V_b$

V

$V_{de}\ R_1 + V$

AKL

$\sqrt{2}(50)\left(\frac{1}{\sqrt{2}}\right)$

$50\,\underline{\lfloor 0^\circ}$

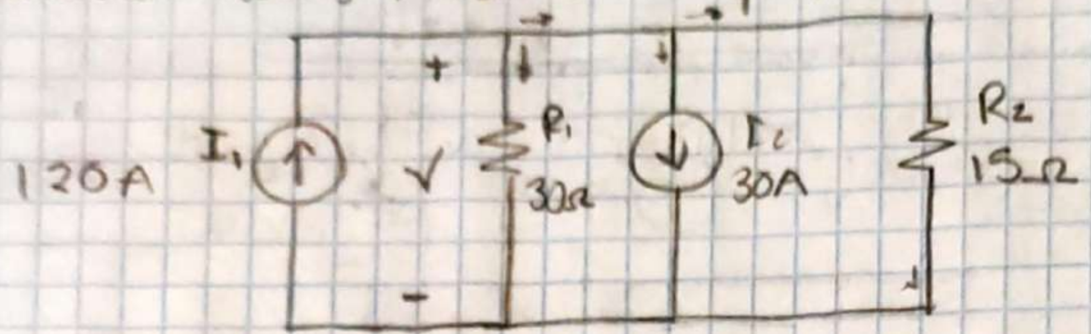
$Z_{L2} = j\,2\pi(1000)(0.2)$

$= 1256.63\,j$

$Z_C = \dfrac{1}{j(2\pi)(1000)(1\times10^{-6})} = 159.15\,j$

la corriente

Calcular voltaje, corriente y potencia en R_1 y R_2



$$120 = \frac{V}{30} + 30 + \frac{V}{15}$$

$$V\left(\frac{1}{30} + \frac{1}{15}\right) = 90$$

$$V(0.1) = 90$$

$$V = \underline{900}$$

$$V_1 = R_1 (I_1)$$

$$I_1 = \frac{V_1}{R_1} = \frac{900}{30} = \underline{30\ A}$$

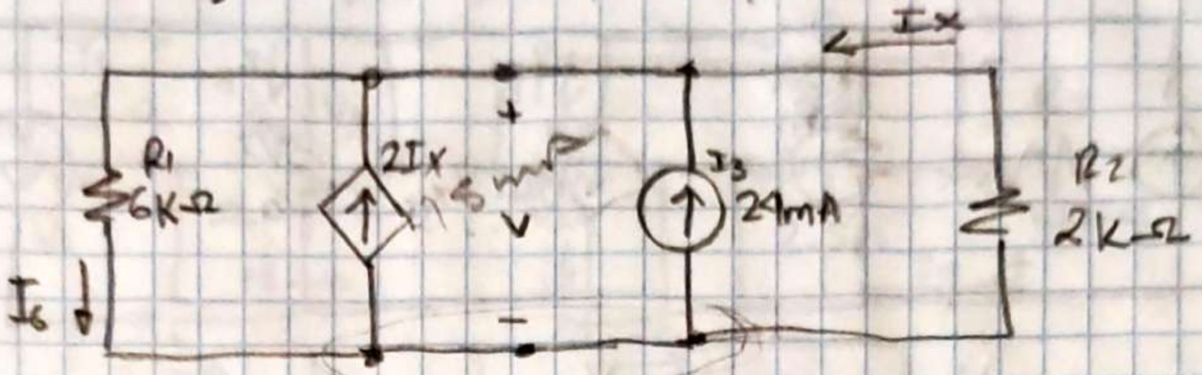
$$I_2 = \frac{V_1}{R_1} = \frac{900}{15} = 60\ A$$

$P = Vi$

$$P_1 = (900)(30) = 27\,000\ W = 27\ kW$$

$$P_2 = (900)(60) = 60\,000\ W = 60\ kW$$

Determina V, corrientes Ix, I6 y la potencia en la f.te dep.



$V = IR$

$Ix = -\frac{V}{R_2}$

$I_6 = \frac{V}{R_1}$

$I_6 = (2Ix + I_3 + (-Ix))$

$\frac{V}{6K\Omega} = -2\left(\frac{V}{2K\Omega}\right) + 24mA + \frac{V}{2K\Omega}$

$V\left(\frac{1}{6000} - \frac{2}{2000} + \frac{1}{2000}\right) = 20\times10^{-3}A$

$V(-1.66\times10^{-3}) = 20\times10^{-3}A$

14.4V

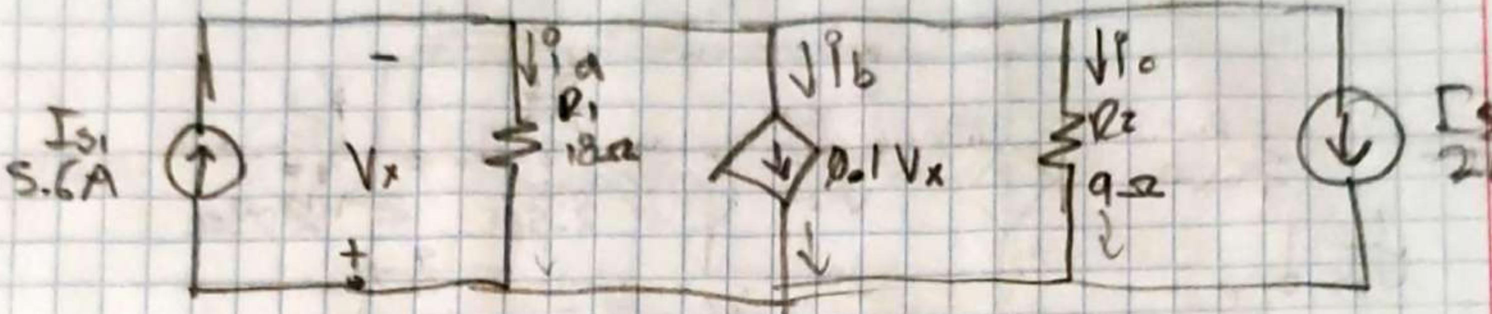
$V = -12V$

$I = \frac{V}{R}$ $\quad Ix = \frac{12V}{2000\Omega} = 6\times10^{-3}A$
mA

$I_6 = \frac{-15V}{6000} = -2.5\,mA$ 15 mA

$P = Vi = (-15V)(15mA) =$

Determine V_x y las corrientes i_a, i_b e i_c



$$5.6A = \frac{V}{18} + 0.1V + \frac{V}{9\Omega} + 2A$$

$$3.6A = V\left(\frac{1}{18} + 0.1 + \frac{1}{9}\right)$$

$$V(0.26) = 3.6A$$

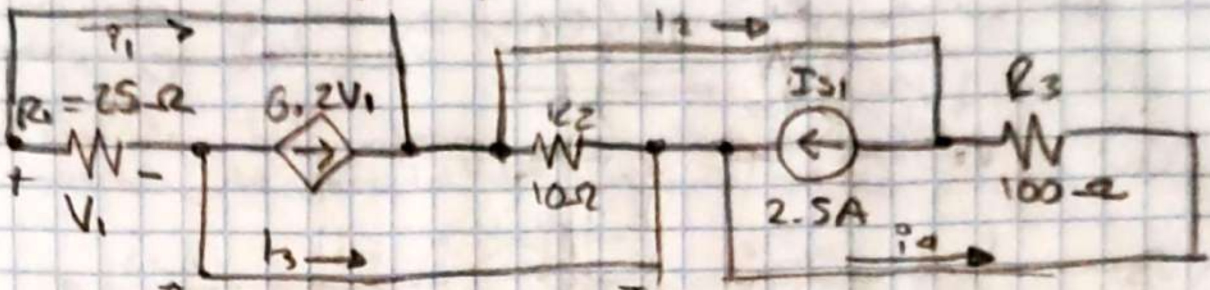
$$V = 13.5V$$

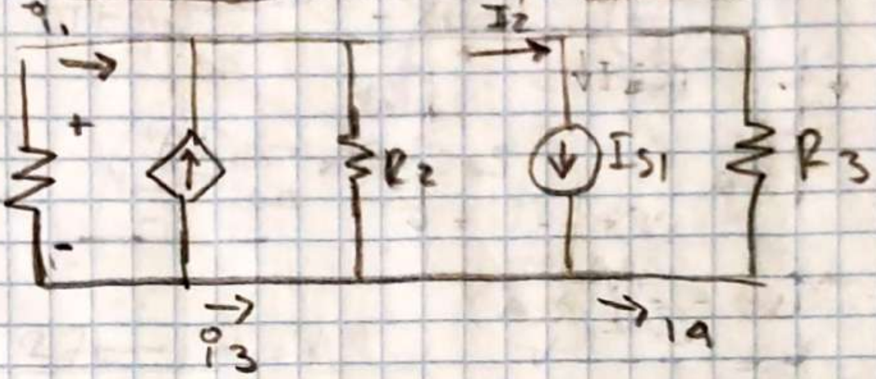
$$I_a = \frac{V}{R} = \frac{13.5}{18} = 0.75$$

$$I_b = 0.1V_x = (0.1)(13.5) = 1.35$$

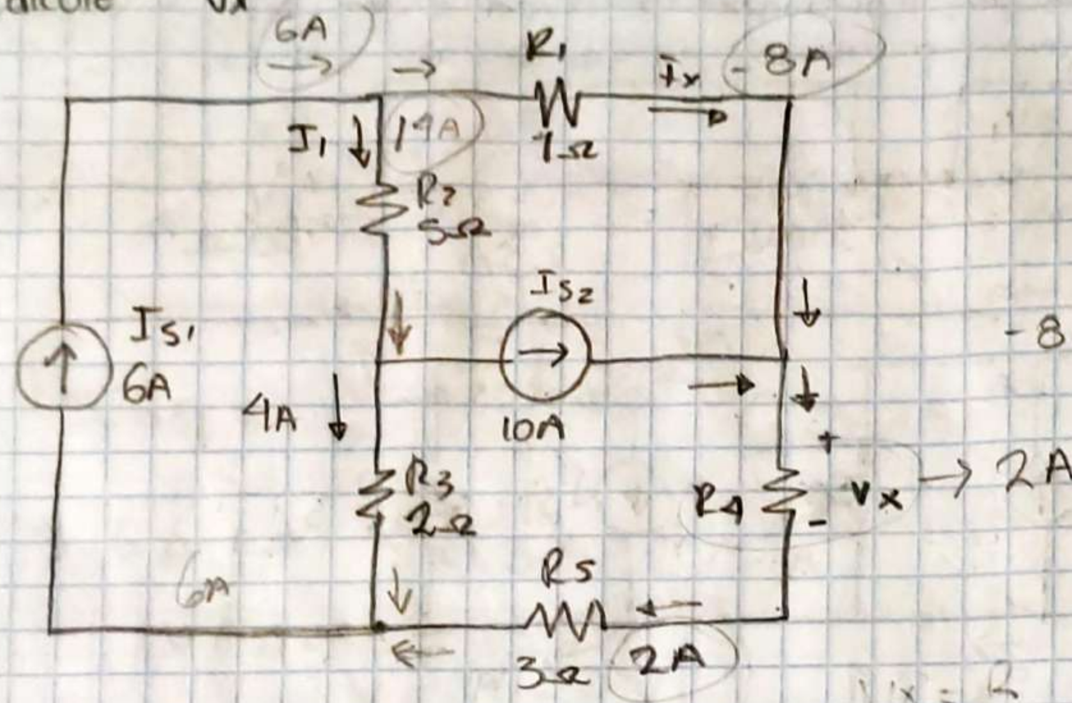
$$I_c = \frac{V}{R} = \frac{13.5}{}$$

Calcular el Voltaje V_1, I_1 I_2 I_3 e I_4





Calcule V_x



$-8A + 10 = 2A$

$V_x = R$

$6A = 14 + I_x$

$6A - 14 = -8A$

$5i_2$ = Voltaje

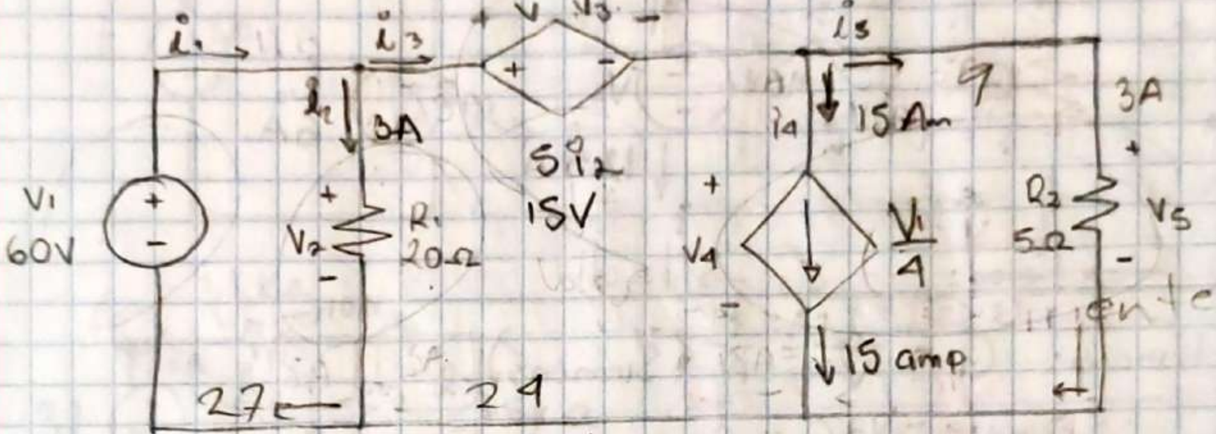
$\frac{V_1}{4}$ = Corriente

$V = RI$

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

a) Utilizar leyes de Kirchhoff y de Ohm en un procedimiento paso por paso para evaluar todas las corrientes y voltajes

b) Calcular la potencia que absorbe c/u de los cinco elementos del circuito y mostrar que la suma es cero.



$i_2 = (60/20) = 3A$

$P_1 = 60\,(60/20) = 180$ W

$i_3 =$

$V_3 = 5i_2 = 5(3A) = \underline{15V}$

45

$15 / 5 = 3A$

$P = Vi$

$P_{V_1} = (60V)(18A) = 1080$ W

$P_{R_1} = 180$ W

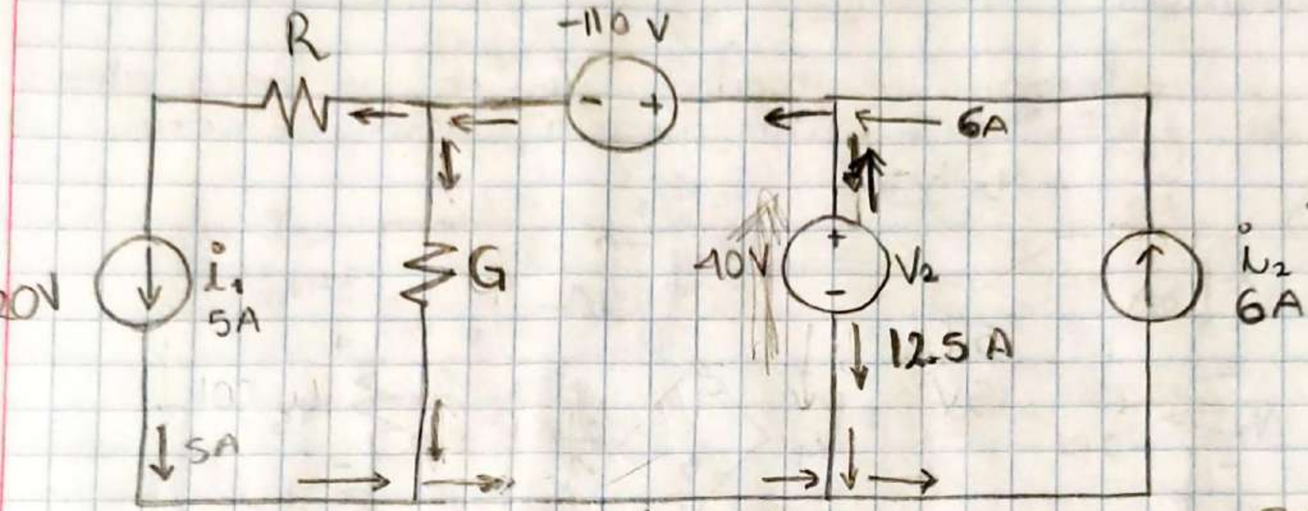
$P_{V_4} = (15V)(12A) = 180$ W

$P_{R_2} = (15V)(3A) = 45$ W

19

9

Encuentre R y G si la flc de 5A está suministrando 100 W y la flc de 40 V proporciona 500 W.



Conductancia: $G = \frac{i}{V} = \frac{1}{R}$ (Siemens)

$$P = Vi = V^2 G = \frac{i}{G}$$

$$V_1 = \frac{P}{i} = \frac{100\,W}{5A} = 20\,V$$

$$i = \frac{P}{V} = \frac{500\,W}{40\,V} = 12.5\,A$$

$P = Vi$

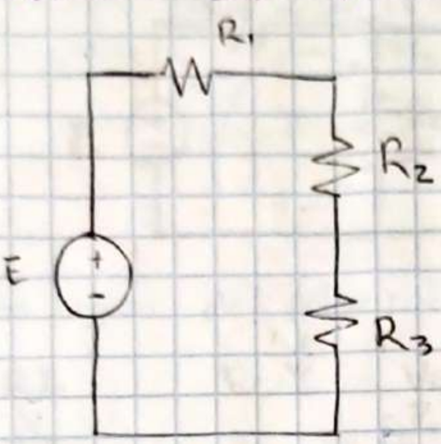
$500 = 40V$

20V

Unidad II

(1) División de voltaje, división de corriente, mallas, nodos.)

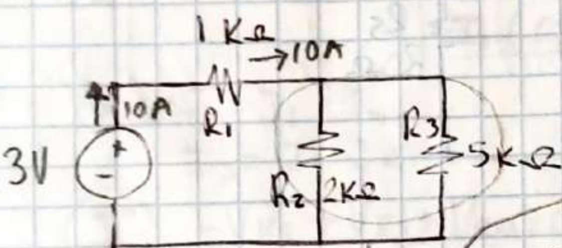
Divisor de voltaje



$$V_{R_1} = E\,\frac{R_1}{R_1+R_2+R_3}$$

$$V_{R_2} = E\,\frac{R_2}{R_1+R_2+R_3}$$

$$V_{R3} = E\,\frac{R_3}{R_1+R_2+R_3}$$



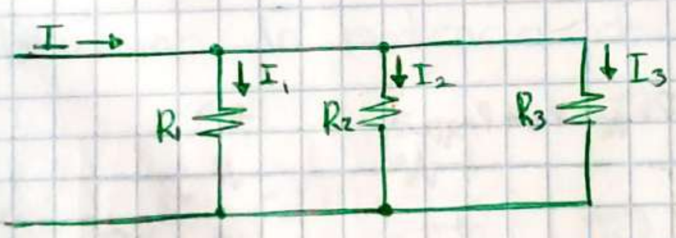
$$V_{R_1} = 3\,\frac{1K\Omega}{1K\Omega+2K\Omega} = 1V$$

$$V_{R_2} = 3\,\frac{2K\Omega}{1K\Omega+2K\Omega} = 2V$$

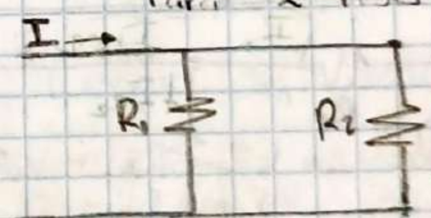
D

$$V_{R1} = E\,\frac{R_1}{R_1+R_4} \qquad V_{R5} = E\,\frac{R_5}{R_2+R_5}$$

Divisor de corriente



Para 2 resistencias:

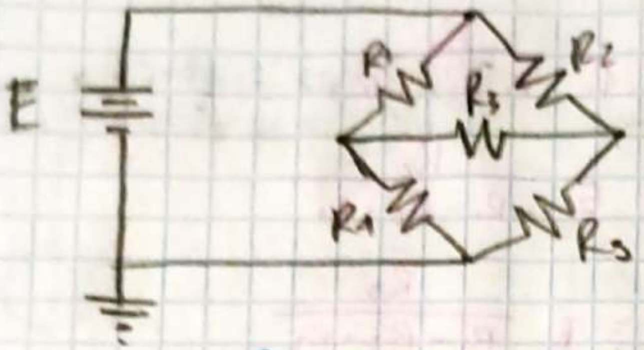


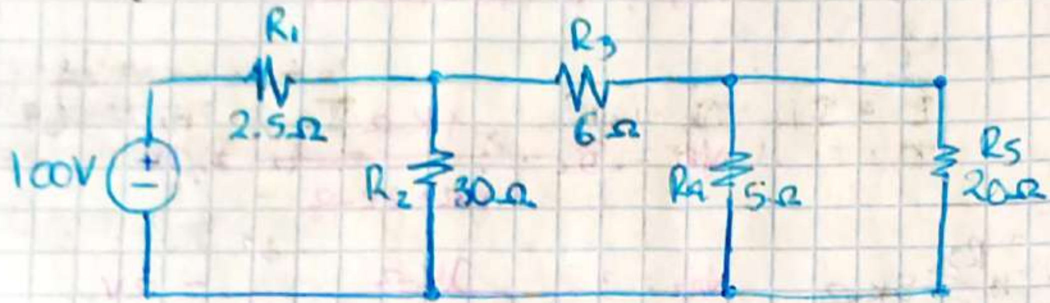
$$I_{R_1} = I\,\frac{R_2}{R_1+R_2}$$

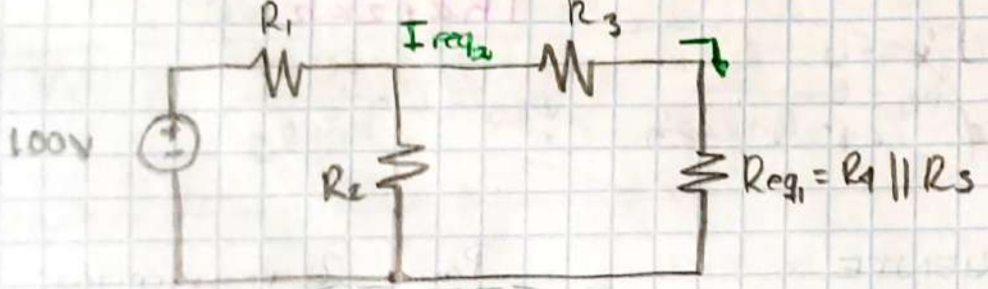
$$I_{R_2} = I\,\frac{R_1}{R_1+R_2}$$

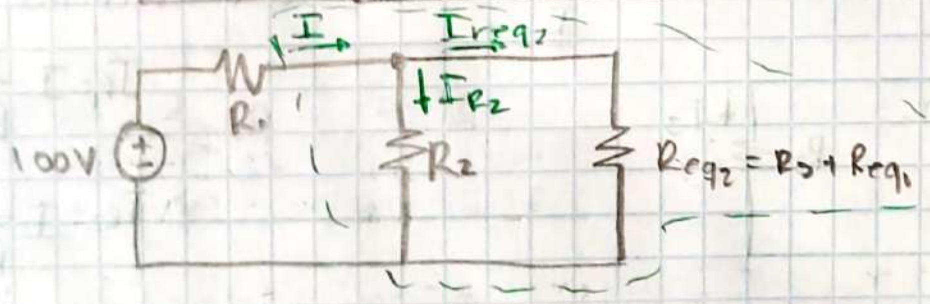
De manera general

$$I_{R_x} = I\,\frac{\frac{1}{R_x}}{\frac{1}{R_1}+\frac{1}{R_2}+\dots+\frac{1}{R_N}}$$



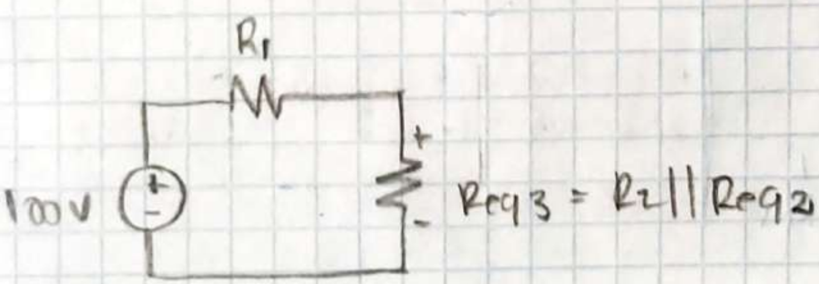






$$I_{R2} = I \frac{Req_2}{R_2 + Req_2}$$

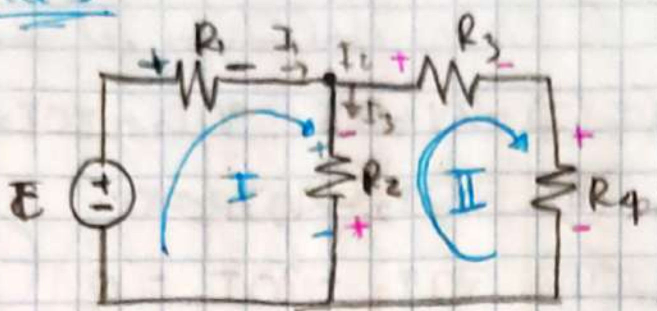
$$Ireq_2 = I \frac{R_2}{R_2 + Req_2}$$



$$V_{R1} = 100 \frac{R_1}{R_1 + Req_3}$$

$$V_{Req3} = 100 \frac{Req_3}{R_1 + Req_3}$$

Mallas



$\#$ Mallas = $\#$ Ecs.

Con signos de polarización.

$V = RI$

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

Ec I. $V_1 + V_2 + V_3 = 0$

$-E + V_{R_1} + V_{R_2} = 0$

$E = I_1 R_1 + (I_1 - I_2) R_2$

$I_1 (R_1 + R_2) - I_2 R_2 = E$

Ec. II

$V_{R_2} + V_{R_3} + V_{R_4} = 0$

$(I_2 - I_1) R_2 + I_2 R_3 + I_2 R_4 = 0$

$-I_1 R_2 + I_2 (R_2 + R_3 + R_4) = 0$

$I_3 = I_1 - I_2$

(A) $I_1 = I_2 + I_3$

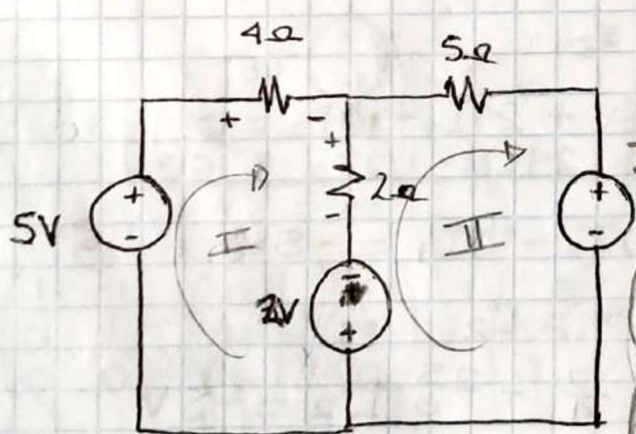
$I_3 = I_1 - I_2$

(II) $-V_{R_2} + V_{R_3} + V_{R_4} = 0$

$-(I_1 - I_2) R_2 + I_2 R_3 + I_2 R_4 = 0$

7/03/14

Determine la potencia de la fuente de 2V.



I) $-5V + 6I_1 - 2I_2 - 2V = 0$

$6I_1 - 2I_2 = 7V$

II) $2V + 7I_2 - 2I_1 + 1V = 0$

$-2I_1 + 7I_2 = -3V$

$$\left(\begin{array}{cc|c} 6 & -2 & 7 \\ -2 & 7 & -3 \end{array}\right) \sim \left(\begin{array}{cc|c} 1 & -1/3 & 7/6 \\ 0 & 19/3 & -2/3 \end{array}\right)$$

$$\left(\begin{array}{cc|c} 1 & 0 & 43/38 \\ 0 & 1 & -2/19 \end{array}\right) \begin{array}{l} \approx 1.13 \\ \approx -0.10 \end{array}$$

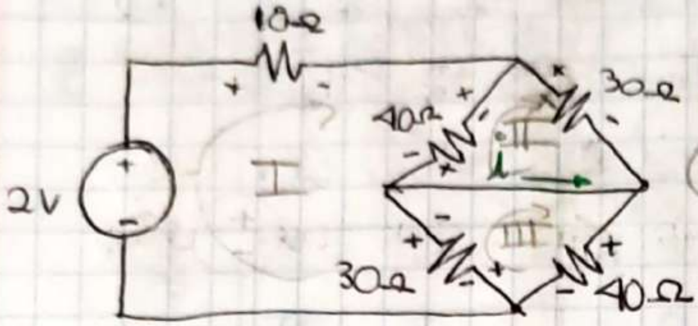
$P = VI$ $\quad I = I_1 - I_2$

$= 43/38 + 2/19 = 47/38 \approx 1.2368$

2.47

$P = VI = (2V)(1.2368\,A) = 2.47\,W$

Determine la corriente i



Ⓘ $-2V + 80I_1 - 40I_2 - 30I_3 = 0$

Ⓘⓘ $70I_2 - 40I_1 = 0$

Ⓘⓘⓘ $70I_3 - 30I_1 = 0$

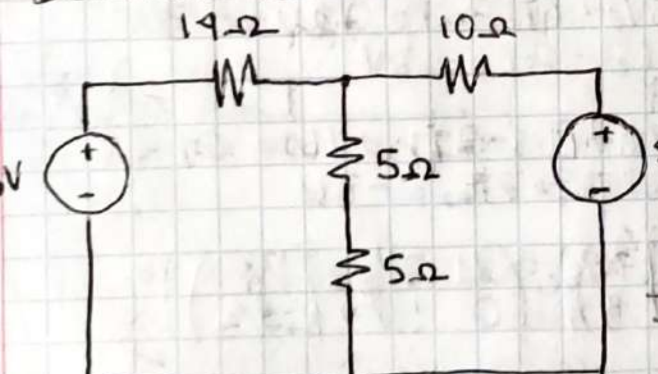
$$\left(\begin{array}{ccc|c} 80 & -40 & -30 & 2 \\ -40 & 70 & 0 & 0 \\ -30 & 0 & 70 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -1/2 & -3/8 & 1/40 \\ 0 & 50 & -15 & 1 \\ 0 & -15 & 235/4 & 3/4 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -1/2 & -3/8 & 1/40 \\ 0 & 1 & -3/10 & 1/50 \\ 0 & 0 & 217/4 & 21/20 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & -1/2 & 0 & 1/31 \\ 0 & 1 & 0 & 4/155 \\ 0 & 0 & 1 & 3/155 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & 7/155 \\ 0 & 1 & 0 & 4/155 \\ 0 & 0 & 1 & 3/155 \end{array}\right) \begin{array}{c} I_1 \\ I_2 \\ I_3 \end{array}$$

$$i = I_3 - I_2 = 3/155 - 4/155 = -1/155 \approx 6.45 \times 10^{-}$$

$$\underline{6.45\,mA}$$

Determine la corriente i_1 e i_2



Ⓘ $-6V + 24I_1 - 10I_2 = 0$

$24I_1 - 10I_2 = 6V$

Ⓘⓘ $20I_2 - 10I_1 = -5V$

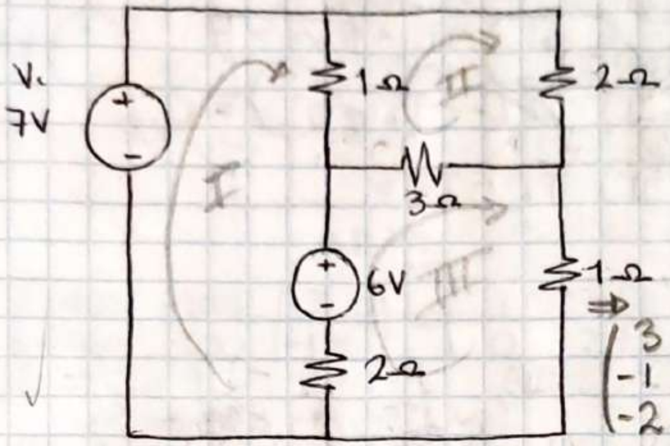
$I_1 = \frac{1}{4} + \frac{5}{12} I_2$

$20I_2 - \frac{10}{4} - \frac{25}{6} I_2 = -5V$

$\frac{95}{6} I_2 = -\frac{5}{2}$

$I_2 = -0.1578 \Rightarrow I_1 = \frac{1}{4} + \frac{5}{12}(-0.1578) = 0.1842$

Determine las corrientes



I) $-7V + 3I_1 - I_2 - 2I_3 + 6V = 0$

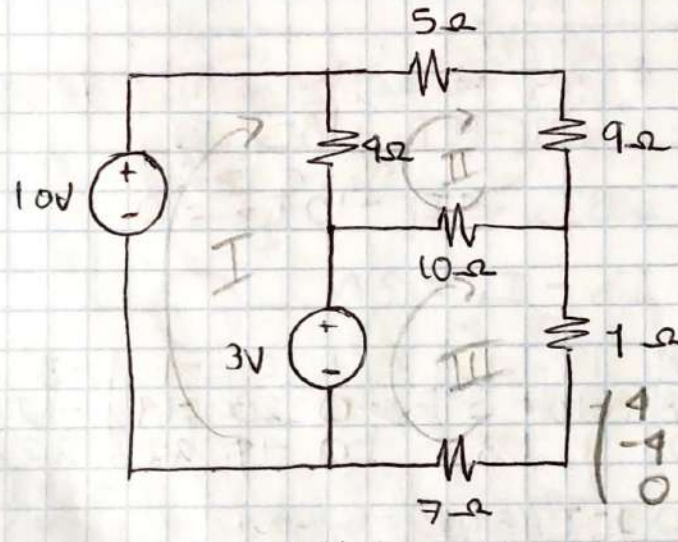
$3I_1 - I_2 - 2I_3 = 1$

II) $6I_2 - I_1 - 3I_3 = 0$

III) $6I_3 - 2I_1 - 3I_2 = 6$

$$\Rightarrow \left(\begin{array}{ccc|c} 3 & -1 & -2 & 1 \\ -1 & 6 & -3 & 0 \\ -2 & -3 & 6 & 6 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -6 & 3 & 0 \\ 0 & 17 & -11 & 1 \\ 0 & -15 & 12 & 6 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & -6 & 3 & 0 \\ 0 & 1 & -4/5 & -2/5 \\ 0 & 0 & 13/5 & 39/5 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -6 & 0 & -9 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right) \sim \begin{array}{c} \left(\begin{array}{ccc|c} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right) \end{array} \begin{array}{l} I_1 \\ I_2 \\ I_3 \end{array}$$



I) $-10V + 4I_1 - 4I_2 + 3V = 0$

$4I_1 - 4I_2 = 7$

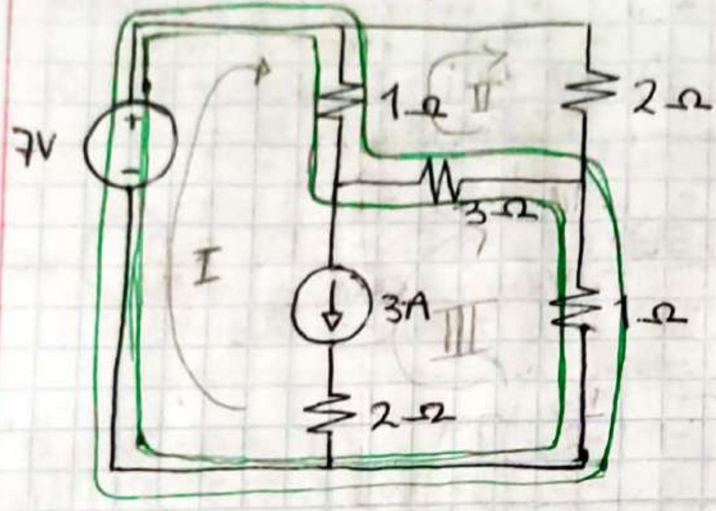
II) $28I_2 - 4I_1 - 10I_3 = 0$

III) $18I_3 - 10I_2 = 3$

$$\left(\begin{array}{ccc|c} 4 & -4 & 0 & 7 \\ -4 & 28 & -10 & 0 \\ 0 & -10 & 18 & 3 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -1 & 0 & 7/4 \\ 0 & 24 & -10 & 7 \\ 0 & -10 & 18 & 3 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & -1 & 0 & 7/4 \\ 0 & 1 & -5/12 & 7/24 \\ 0 & 0 & 83/6 & 71/12 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & 737/332 \\ 0 & 1 & 0 & 39/83 \\ 0 & 0 & 1 & 71/166 \end{array}\right) \begin{array}{l} \approx 2.2198 \text{ A} \\ \approx 0.4698 \text{ A} \\ \approx 0.4277 \text{ A} \end{array}$$

SuPer MALLAS



I) $-7V + I_1 - I_2 + 3I_3 - 3I_2 + I_3 = 0$

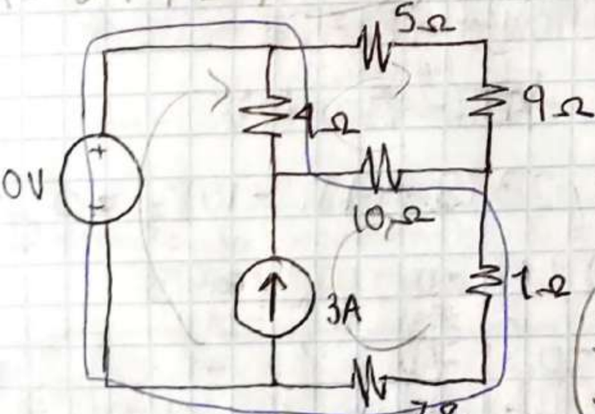
$I_1 - 4I_2 + 4I_3 = 7$

II) $6I_2 - I_1 - 3I_3 = 0$

III) $I_1 - I_3 =$

$$\left(\begin{array}{ccc|c} 1 & -4 & 4 & -7 \\ -1 & 6 & -3 & 0 \\ 1 & 0 & -1 & 7 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -4 & 4 & 7 \\ 0 & 2 & 1 & 7 \\ 0 & 4 & -5 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -4 & 4 & 7 \\ 0 & 1 & 1/2 & 7/2 \\ 0 & 0 & -7 & -14 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -4 & 0 & -1 \\ 0 & 1 & 0 & 5/2 \\ 0 & 0 & 1 & 2 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & 9 \\ 0 & 1 & 0 & 5/2 \\ 0 & 0 & 1 & 2 \end{array}\right) \begin{array}{c} 9 \\ 2.5 \\ 2 \end{array}$$



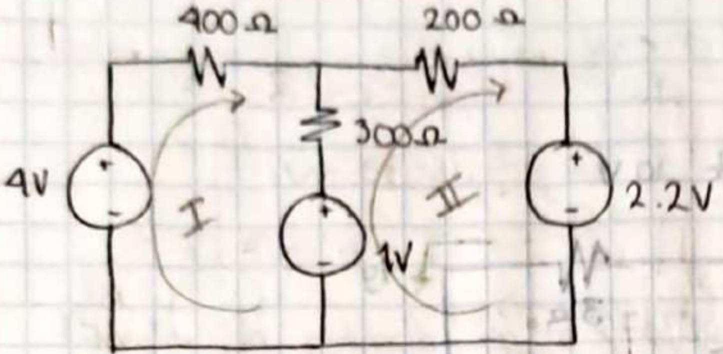
I) $4I_1 - 14I_2 + 18I_3 = 10$

II) $28I_2 - 4I_1 - 10I_3 = 0$

$I_3 - I_1 = 3A$

$$\left(\begin{array}{ccc|c} 4 & -14 & 18 & 10 \\ -4 & 28 & -10 & 0 \\ -1 & 0 & 1 & 3 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & -1 & -3 \\ 0 & 28 & -14 & -12 \\ 0 & -14 & 22 & 22 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & 0 & -1 & -3 \\ 0 & 1 & -1/2 & -3/7 \\ 0 & 0 & 15 & 16 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & -29/15 \\ 0 & 1 & 0 & 11/105 \\ 0 & 0 & 1 & 16/15 \end{array}\right) \begin{array}{l} \approx -1.93 \\ \approx 0.1047 \\ \approx 1.066 \end{array}$$



I) $-4 + 400I_1 - 300I_2 + 1V = 0$

$400I_1 - 300I_2 = 3$

II) $-1V + 500I_2 - 300I_1 + 2.2 = 0$

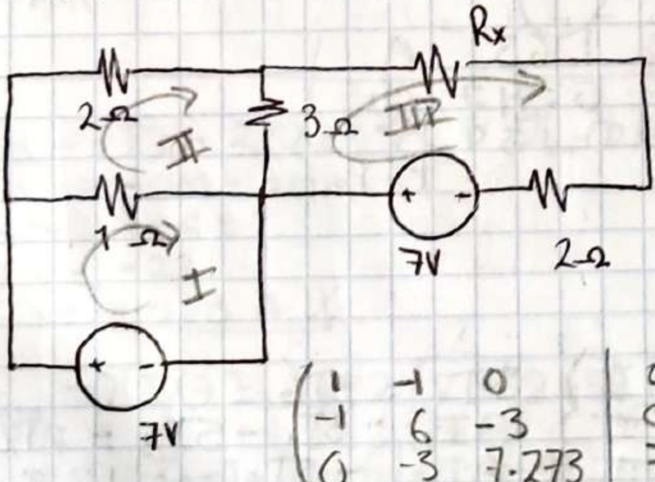
$-300I_1 + 500I_2 = -1.2$

$$\left(\begin{array}{cc|c} 400 & -300 & 3 \\ -300 & 500 & -1.2 \end{array}\right) \sim \left(\begin{array}{cc|c} 1 & -3/4 & 3/400 \\ 0 & 275 & 21/20 \end{array}\right) \sim \left(\begin{array}{cc|c} 1 & 0 & 57/5500 \\ 0 & 1 & 21/5500 \end{array}\right)$$

0.0103 A

3.8 mA

Determine R_x si $i_2 = 2.273$ A



I) $-7 + I_1 - I_2 = 0$

$I_1 - I_2 = 7$

II) $6I_2 - I_1 - 3I_3 = 0$

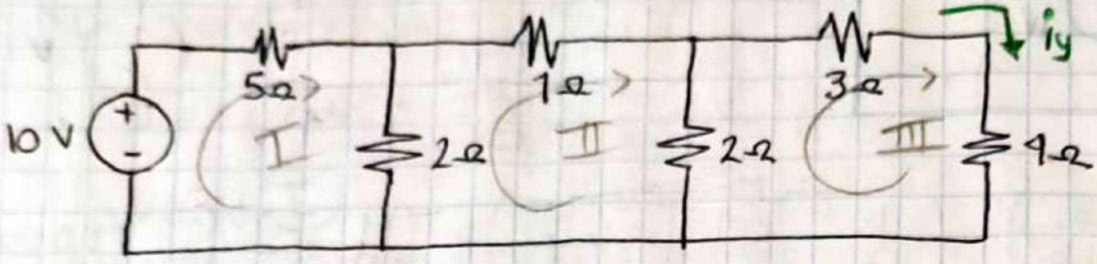
III) $7.273I_3 - 3I_2 = 7$

$$\left(\begin{array}{ccc|c} 1 & -1 & 0 & 0 \\ -1 & 6 & -3 & 0 \\ 0 & -3 & 7.273 & 7 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -1 & 0 & 0 \\ 0 & 5 & -3 & 0 \\ 0 & -3 & 7.273 & 7 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & -1 & 0 & 0 \\ 0 & 1 & -3/5 & 0 \\ 0 & 0 & 5.473 & 7 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & 0 & 0.7674 \\ 0 & 1 & 0 & 0.7674 \\ 0 & 0 & 1 & 1.2790 \end{array}\right)$$

Mallas

- Determine la corriente i_y
- Potencia suministrada por la fte de 10 V   16.33 W



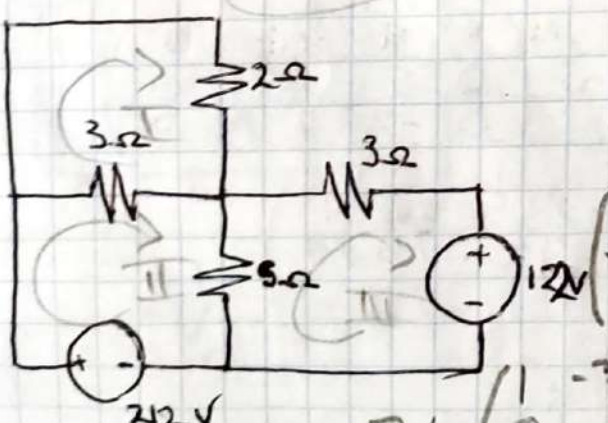
I) $-10V + 7I_1 - 2I_2 = 0$
$7I_1 - 2I_2 = 10$

II) $5I_2 - 2I_1 - 2I_3 = 0$
III) $9I_3 - 2I_2 = 0$

$$\left(\begin{array}{ccc|c} 7 & -2 & 0 & 10 \\ -2 & 5 & -2 & 0 \\ 0 & -2 & 9 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -2/7 & 0 & 10/7 \\ 0 & 31/7 & -2 & 20/7 \\ 0 & -2 & 9 & 0 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -2/7 & 0 & 10/7 \\ 0 & 1 & -9/2 & 0 \\ 0 & 0 & 251/14 & 20/7 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & 410/251 \\ 0 & 1 & 0 & 180/251 \\ 0 & 0 & 1 & 40/251 \end{array}\right) \begin{array}{l} \approx 1.63 \text{ A} \\ \approx 0.717 \text{ A} \\ \approx 0.159 \text{ A} \end{array}$$

Corriente en $R = 2\Omega$ y $R = 5\Omega$
26.48

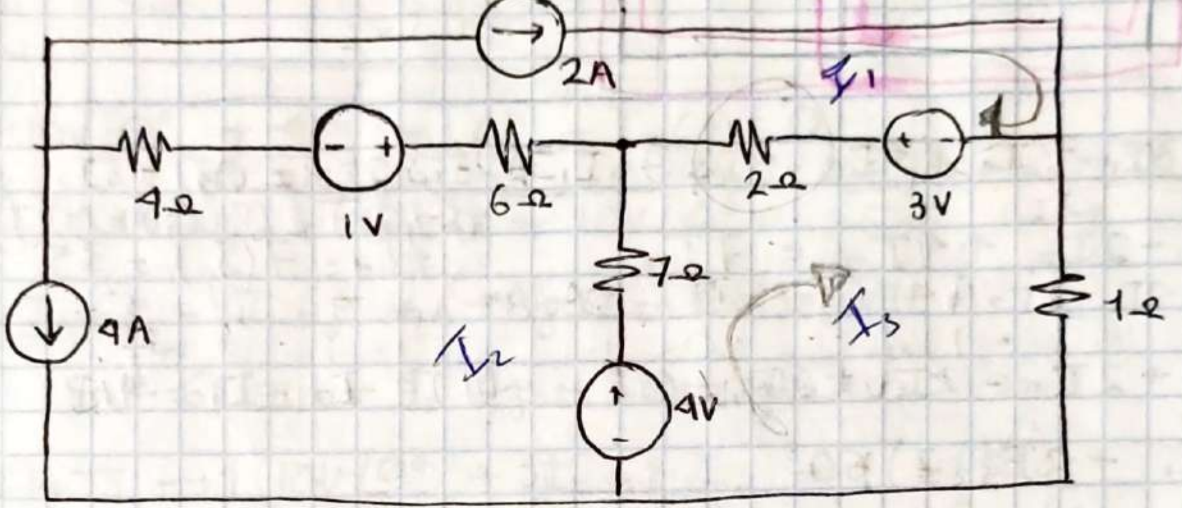


I) $5I_1 - 3I_2 = 0$
II) $8I_2 - 3I_1 - 5I_3 = 212$
III) $8I_3 - 5I_2 = -122$

$$\left(\begin{array}{ccc|c} 5 & -3 & 0 & 0 \\ -3 & 8 & -5 & 212 \\ 0 & -5 & 8 & -122 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & -3/5 & 0 & 0 \\ 0 & 31/5 & -5 & 21 \\ 0 & -5 & 8 & -12 \end{array}\right)$$

$$\sim \left(\begin{array}{ccc|c} 1 & -3/5 & 0 & 0 \\ 0 & 1 & -25/31 & 1060/31 \\ 0 & 0 & 123/31 & 938 \end{array}\right) \sim \left(\begin{array}{ccc} 1 & -3/5 & 0 \\ 0 & 1 & -25/ \\ 0 & 0 & 1 \end{array}\right)$$

Calcular la potencia en la fte de 2A.



$10I_3 - 7I_2 - 2I_1 = 1$ $I_1 = 2A$ $I_2 = -4A$

$10I_3 - 7(-4A) - 2(2A) = 1$

$10I_3 + 28 - 4 = 1$

$10I_3 = -23$

$I_3 = \underline{-2.3\ A}$

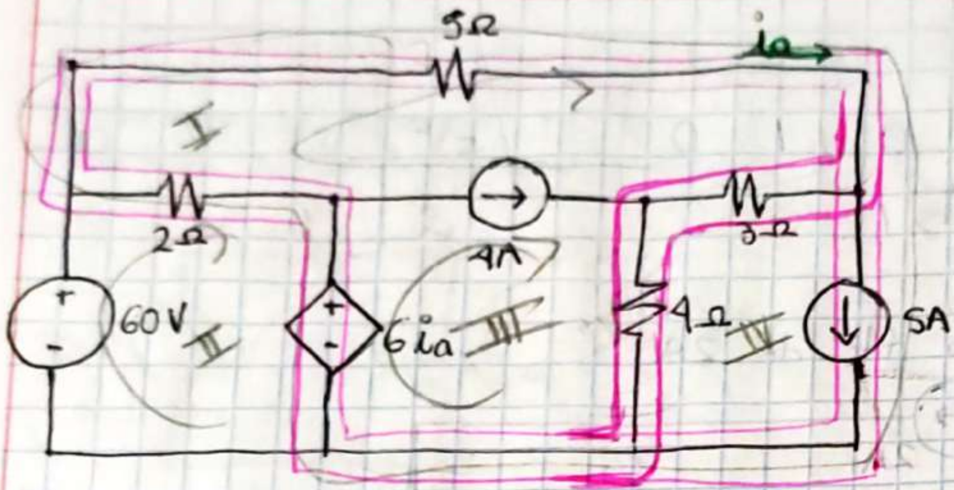
$V_{R2\Omega} = 2(I_1 - I_3) = 2[2-(-2.3)] = 2(4.3) = 8.6$

$V_{6\Omega} = 6(I_1 - I_2) = 6[2-(-4)] = 6(6) = 36$

$V_{R4} = 4(I_1 - I_2) = 4[2-(-4)] = 4(6) = 24$

$V_T = -3 + 8.6 + 36 + 24 + 1 = 66.6$

$P = VI = (66.6)(2) = \underline{133.2}$



Potencia en $R = 2\Omega$

Sea $i_a = i_1$

$I_4 = 5A$

I) $5I_1 + 3I_1 - 3I_4 + 4I_3 - 4I_4 - 6I_1 + 2I_1 - 2I_2 = 0$

$4I_1 - 2I_2 + 4I_3 = 7I_4$ $\qquad 7I_4 = 7(5) = 35$

$4I_1 - 2I_2 + 4I_3 = 35$

II) $-60 + 2I_2 - 2I_1 + 6I_1 = 0$ $\qquad$ III) $= I_3 - I_1 = 4A$

$4I_1 + 2I_2 = 60$

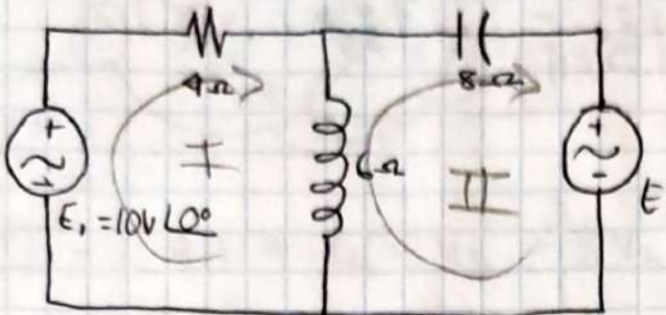
$$\left(\begin{array}{ccc|c} 4 & -2 & 4 & 35 \\ 4 & 2 & 0 & 60 \\ -1 & 0 & 1 & 4 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & -1 & -4 \\ 0 & 2 & 4 & 76 \\ 0 & -2 & 8 & 41 \end{array}\right) \sim \left(\begin{array}{ccc|c} 1 & 0 & -1 & -4 \\ 0 & 1 & 2 & 38 \\ 0 & 0 & 12 & 80 \end{array}\right)$$

$$\left(\begin{array}{ccc|c} 1 & 0 & & 2.66 \\ 0 & 1 & 0 & 24.66 \\ 0 & 0 & 1 & 6.66 \end{array}\right)$$

$(I_1 - I_2) = 2.66 - 24.66 =$

$6j$

Calcule la corriente a traves de R



I) $-10V\angle 0° + 4I_1 + I_1 6j - I_2 6j = 0$

$(4+6j)I_1 - I_2 6j = 10V\angle 0°$

II) $I_2 6j - I_1 6j + (-8j)I_2 + 40V\angle 60° = 0$

$-6j\, I_1 - I_2 2j = -40V\angle 60°$

de I) $\rightarrow I_1 = \dfrac{10V\angle 0°}{4+6j} + \dfrac{I_2 6j}{4+6j}$

$= \dfrac{10V\angle 0°}{7.21\angle 56.30} + \dfrac{I_2 6\angle 90°}{7.21\angle 56.30} = 1.38\angle -56.30 + 0.832\angle 33.7$

$= 0.76 - 1.14j + I_2\, 0.69 + 0.46j$

en II)

$-6j(0.76 - 1.14j + I_2(0.69 + 0.46j) - I_2 2j = -40V\angle 60°$

$(-4.56j + 6.84) + (-4.14j - 2.76)I_2 - I_2 2j = -40V\angle 60°$

$I_2(-2.76 - 4.14j - 2j) = -40V\angle 60° + (4.56j - 6.84)$

$I_2(-2.76 - 6.14j) = -40V\angle 60° + (-6.84 + 4.56j)$

$I_2 = \dfrac{-40V\angle 60° + (-6.84 + 4.56j)}{-2.76 - 6.14j}$

$= \dfrac{-40V\angle 60° + 8.22\angle 146.30}{6.73\angle -114.20} = -5.94\angle 174.2 + 1.22\angle 260.5$

$= 5.9 - 0.6j - 0.2 - 1.20j$

$I_2 = 5.7 - 1.8j$

$$I_2 = 5.7 - 1.8j$$

$$I_1 = (0.76 - 1.14j) + I_2(0.69 + 0.46j)$$
$$(0.76 - 1.14j) + (5.7 - 1.8j)(0.69 + 0.46j)$$
$$(0.76 - 1.14j) + (3.93 + 2.62j - 1.24j - 0.828)$$
$$(0.76 - 1.14j) + (3.1 + 1.38j)$$
$$(3.86 + 0.24j)$$

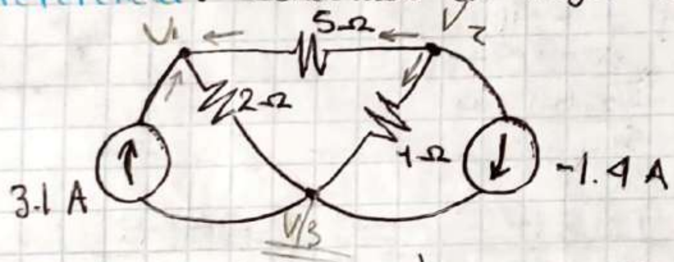
ANÁLISIS DE NODOS.

- Se aplican LCK con 2 o mas nodos para obtener las ecuaciones

Un circuito de 3 nodos tendrá 2 voltajes desconocidos y 2 ecuaciones
Un circuito de 10 nodos tendrá 9 voltajes desconocidos y 9 ecuaciones
Un circuito de N nodos tendra "N-1" voltajes y "N-1" ecuaciones

Nodo de referencia.- conectado al mayor número de ramas.

Ejemplo.



Para la dirección de la corriente una vez definida, la trabajaremos como: "El nodo del que sale menos el nodo al que llega"

I) $3.1 + I_{2\Omega} + I_{5\Omega}$

$$3.1 + \frac{V_3 - V_1}{2} + \frac{V_2 - V_1}{5}$$

$$\frac{1}{5}V_2 - V_1\left(\frac{1}{2} + \frac{1}{5}\right) = -3.1$$

$$-\frac{7}{10}V_1 + \frac{1}{5}V_2 = -3.1$$

II) $-1.4 + \frac{V_2 - V_3}{1} + \frac{V_2 - V_1}{5}$

$$\frac{6}{5}V_2 - \frac{1}{5}V_1 = 1.4$$

$$V_2 = \left(1.4 + \frac{1}{5}V_1\right)\frac{5}{6}$$
$$= 1.16 + \frac{1}{6}V_1$$

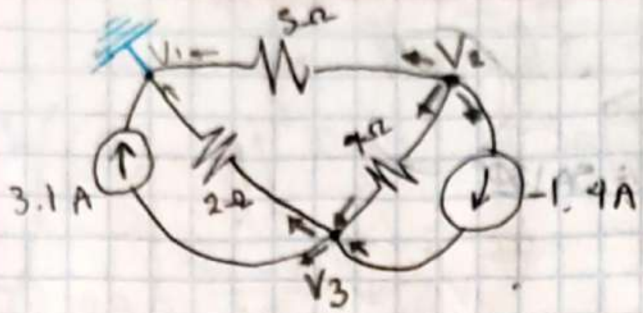
$$-\frac{7}{10}V_1 + \frac{1}{5}\left(1.16 + \frac{1}{6}V_1\right) = -3.1$$

$$-\frac{7}{10}V_1 + 0.232 + \frac{1}{30}V_1 = -3.1$$

$$-\frac{2}{3}V_1 = -3.332$$

$$V_1 = 4.99 \approx 5$$

$$\Rightarrow V_2 = 1.16 + \frac{1}{6}(5)$$
$$= 1.99 \approx 2$$



$V_1 =$	5	0	3
$V_2 =$	2	-3	0
$V_3 =$	0	-5	-2

I) $-1.4A + V_2 - V_3 + \frac{1}{5}V_2 = 0$

$\frac{6}{5}V_2 - V_3 = 1.4A$

II) $-1.4 + V_2 - V_3 = 3.1 + \frac{1}{2}V_3$

$V_2 - \frac{3}{2}V_3 = 4.5$

$V_2 = 4.5 + 3/2\, V_3$ ⟶ $V_2 = 4.5 + \frac{3}{2}(-5)$

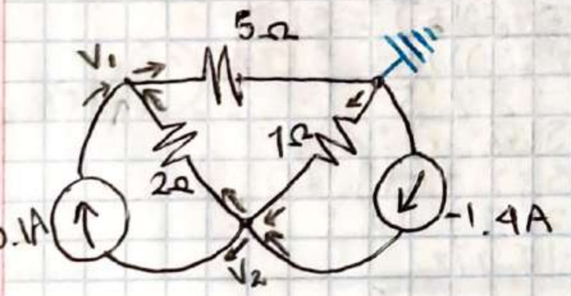
$= \underline{-3}$ //

$\frac{6}{5}(4.5 + \frac{3}{2}V_3) - V_3 = 1.4$

$5.4 + \frac{9}{5}V_3 - V_3 = 1.4$

$\frac{4}{5}V_3 = -4$

$\underline{V_3 = -5}$ /



I) $-1.4A - V_2 = \frac{V_2 - V_1}{2} + 3.1$

$-\frac{3}{2}V_2 + \frac{1}{2}V_1 = 4.5$ — ①

II) $3.1 + \frac{1}{2}V_2 - \frac{1}{2}V_1 = \frac{1}{5}V_1$

$\frac{7}{10}V_1 - \frac{1}{2}V_2 = 3.1$

① $V_1 = (4.5 + \frac{3}{2}V_2)2$

$V_1 = 9 + 3V_2$ — ②

$\frac{7}{10}(9 + 3V_2) - \frac{1}{2}V_2 = 3.1$

$\frac{63}{10} + \frac{21}{10}V_2 - \frac{1}{2}V_2 = 3.1$

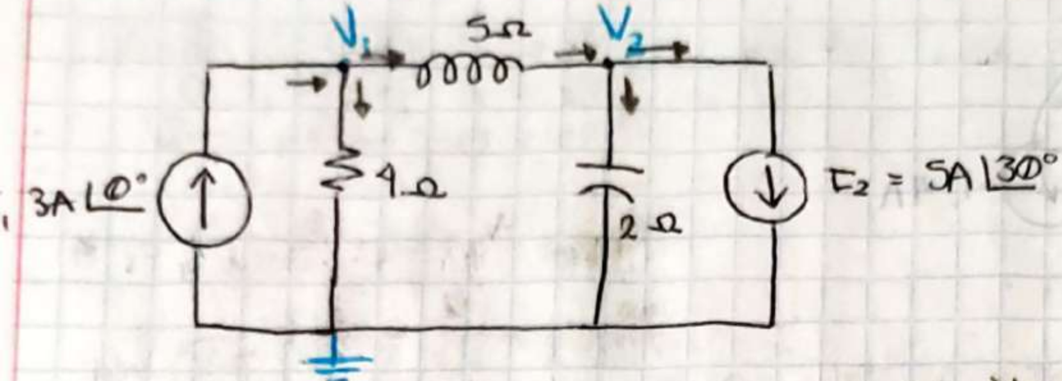
$\frac{8}{5}V_2 = -3.2$

$V_2 = -16/8$

$V_2 = \underline{-2}$ //

② $V_1 = 9 + 3(-2)$

$= 3$



I) $\frac{V_1 - V_2}{5j} + \frac{1}{4}V_1 = 3A\angle 0°$

$\left(\frac{1}{4+5j}\right)V_1 - \frac{1}{5j}V_2 = 3A\angle 0°$

$\left(\frac{4-5j}{41}\right)V_1 + \frac{5j}{25}V_2 = 3A\angle 0°$

$(0.0975 - 0.1219)V_1 + 0.2V_2 = 3A\angle 0°$

$V_2 = \frac{3\angle 0° - (0.0975 - 0.1219)V_1}{0.2}$

$V_2 = 15\angle 0° - (6.4875 - 0.6095j)V_1$

II) $\frac{V_1 - V_2}{5j} = 5A\angle 30° + \frac{V_2}{-2j}$

$\frac{1}{5j}V_1 + \frac{3}{10j}V_2 = 5A\angle 30°$

$-0.2V_1 - 3V_2 = 5A\angle 30°$

$\Rightarrow -0.2V_1 - 3(15\angle 0° - (0.4875 - 0.6095)V_1) = 5\angle 30°$

$-0.2V_1 - 45\angle 0° + (1.4625 - 1.8285)V_1 = 5\angle 30°$

$(1.2625 - 1.8285)V_1 = 5\angle 30° + 45\angle 0°$

$= (4.3301 + 2.5j) + (45 + 0j)$

$= 49.3301 + 2.5j$

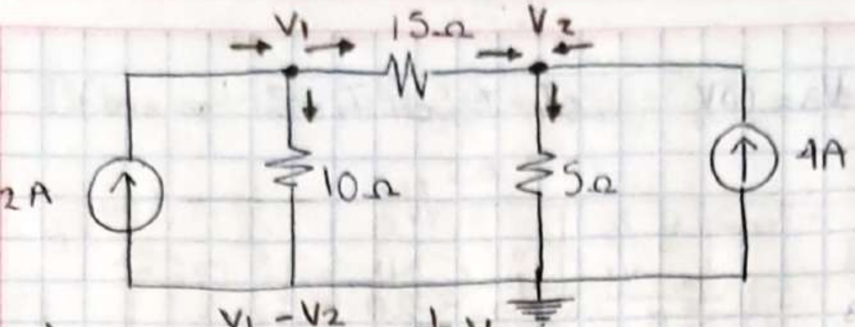
$V_1 = \frac{49.3934\angle 2.912}{2.2270\angle -55.3766}$

$V_1 = 22.2292\angle 58.2886$

$V_2 = (15 + 0j) - (0.4875 - 0.6095j)(11.6845 + 18.9105j)$

$= (15) - (5.69 + 9.21j - 7.12j + 11.52)$

$= -2.21 - 2.09j$



I) $2A = \frac{V_1 - V_2}{15} + \frac{1}{10}V_1$

$\frac{1}{6}V_1 - \frac{1}{15}V_2 = 2A$

$V_1 = 6\left(2 + \frac{1}{15}V_2\right)$
$= 12 + \frac{6}{15}V_2$

II) $4.A + \frac{1}{15}V_1 - \frac{1}{15}V_2 = \frac{1}{5}V_2$

$\frac{4}{15}V_2 - \frac{1}{15}V_1 = 4$

$\frac{4}{15}V_2 - \frac{1}{15}\left(12 + \frac{6}{15}V_2\right) = 4$

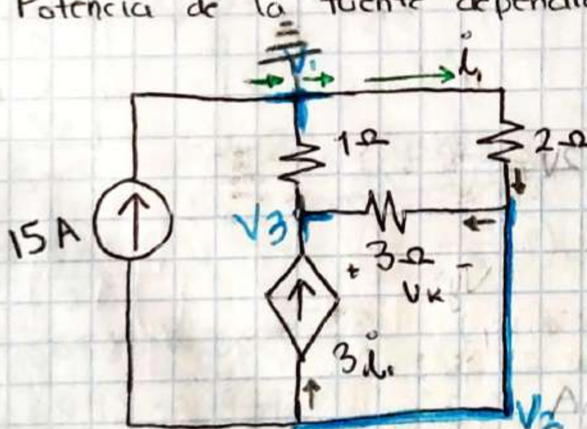
$\frac{4}{15}V_2 - \frac{12}{15} - \frac{2}{75}V_2 = 4$

$\frac{6}{25}V_2 = 4.8$

$V_2 = 120/6$
$= \underline{20}$ //

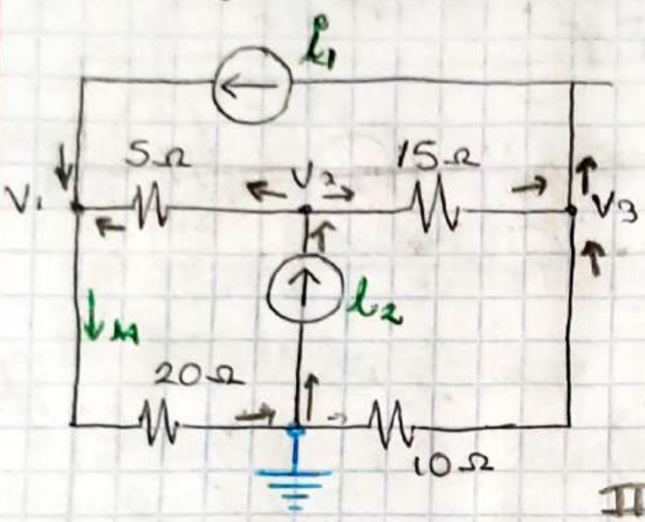
$V_1 = 12 + \frac{6}{15}(20)$
$= 12 + 8$
$= \underline{20}$ //

Potencia de la fuente dependiente.



I) $-\frac{1}{2}V_2 = \frac{V_2 - V_3}{3} + 3i_1$

*Sean $V_1 = 4V$, $V_2 = 15V$ $V_3 = 18V$ $I_1 = ?$ e $I_2 = ?$



-2, 2 y 2

I) $\frac{V_2 - V_1}{5} + i_1 = \frac{V_1}{20}$

$3 - \frac{4}{5} + i_1 - \frac{1}{5} = 0$

$\underline{i_1 = -2}$

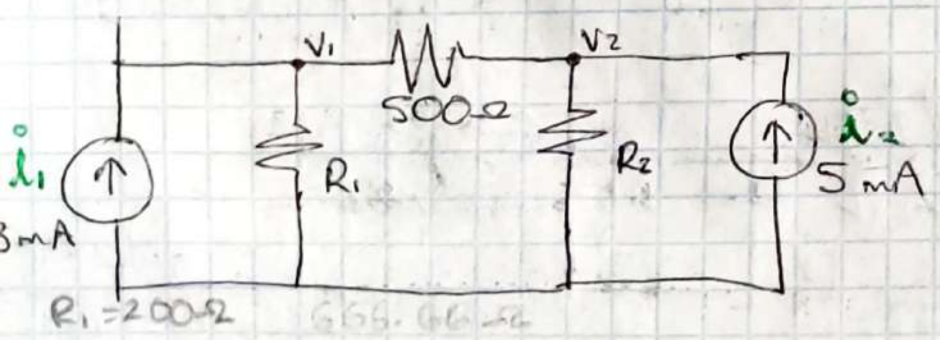
II) $i_2 = \frac{V_2 - V_3}{15} + \frac{V_2 - V_1}{5}$

$= \frac{15 - 18}{15} + \frac{15 - 4}{5}$

$= \frac{-3}{15} + \frac{11}{5} = \underline{2}$

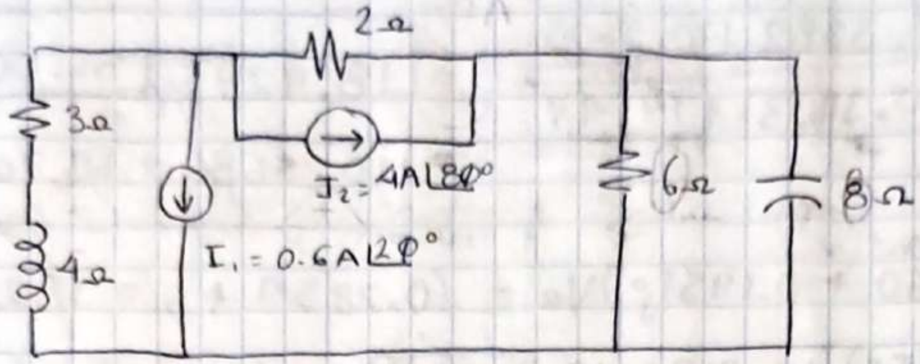
Determine la P_1 y P_2 $V_y = 1V$ y $V_2 = 2V$

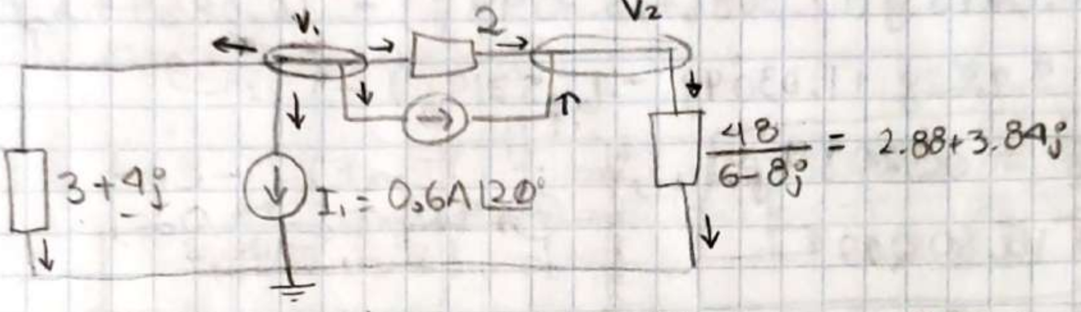
Determinar V en R_3



$R_1 = 200\Omega$ 666.66 Ω

Determine los Voltajes nodales para la red.





$$\left(\frac{48}{6-8j}\right)\left(\frac{6+8j}{6+8j}\right) = \frac{288+384j}{36+64} = 2.88+3.84j$$

$$\frac{V_1}{3+4j} + 0.6\angle 20 + 4A\angle 80° + \frac{V_1-V_2}{2} = 0$$

$$\frac{V_1(3-4j)}{25}$$

$0.5638+0.2052j$

$0.6945+3.9392j$

$$\frac{\frac{1}{2}V_2}{0.62-0.16j}$$

$$\frac{\frac{1}{2}(0.62+0.16)V_2}{0.41}$$

$$\left(\frac{31}{50} - \frac{4}{25}j\right)V_1 + (1.2583 + 4.1444j) - \frac{1}{2}V_2 = 0$$

$$V_1 = \frac{\frac{1}{2}V_2 - 4.3312\angle 73.1109}{0.6403\angle -14.4702}$$

I) $V_1 = (0.7560+0.1951)V_2 - (6.7643\angle 87.5811)$

II) $\frac{V_1-V_2}{2} + 0.6\angle 20 = 2.88+3.84j$

$$\frac{1}{2}\left[(0.756+0.1951)V_2 - (0.2854+6.7582j)\right] + (0.5638+0.2052j) = 2.88+3.84j$$

$$(0.378+0.09755)V_2 - (0.1427+3.3791j) + (0.5638+0.252) = 2.88+3.84j$$

$$(0.378 + 0.09755j)V_2 = 2.4589 + 6.9671j$$

$$V_2 = \frac{7.3882 \angle 70.5605}{0.3903 \angle 14.47} = \boxed{\begin{aligned} &18.9295 \angle 56.0605 \\ &= 10.5686 + 15.7094j \end{aligned}}$$

$$V_1 = \frac{1}{2}(0.7560 + 0.1951j)V_2 - (0.2854 + 6.7582)$$

$$= (0.378 + 0.09755j)(10.5686 + 15.7094j) - (0.2854 + 6.7582)$$

$$= (3.9949 + 5.9362j + 1.0309j - 1.5319j) -$$

$$\boxed{\begin{aligned} &= 2.1276 + 0.2089j \\ &= 2.1378 \angle 5.60 \end{aligned}}$$

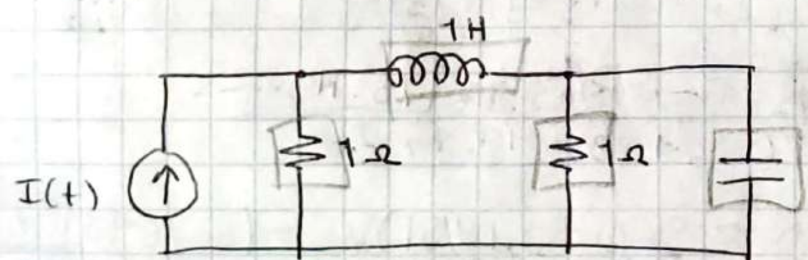
$$0.9455 - 5.6345j$$

$$2.0780 + 1.7935j$$

$$Z_L = j\omega L$$

$$Z_C = \frac{1}{j\omega C}$$

Calcule el voltaje en el capacitor



$\frac{10}{\sqrt{2}}$

$I(t) = 10 \text{ sen} t$

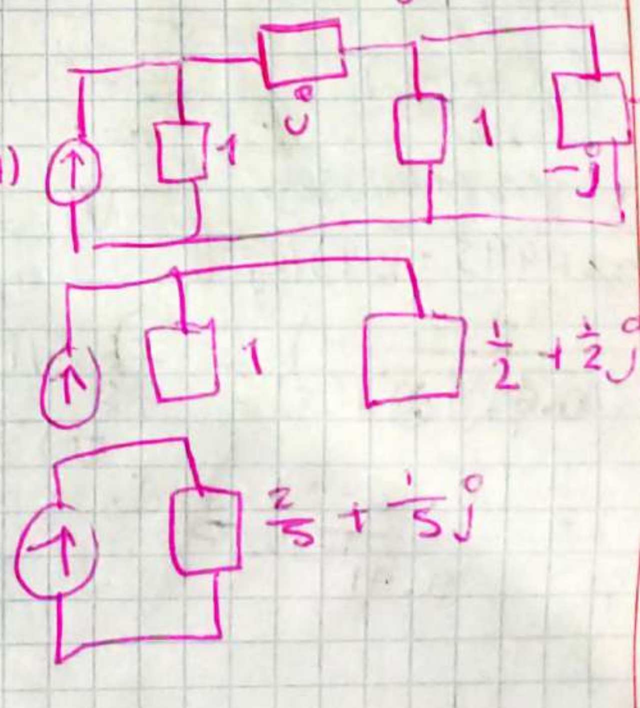
$A \text{ sen}(\omega t + \alpha)$

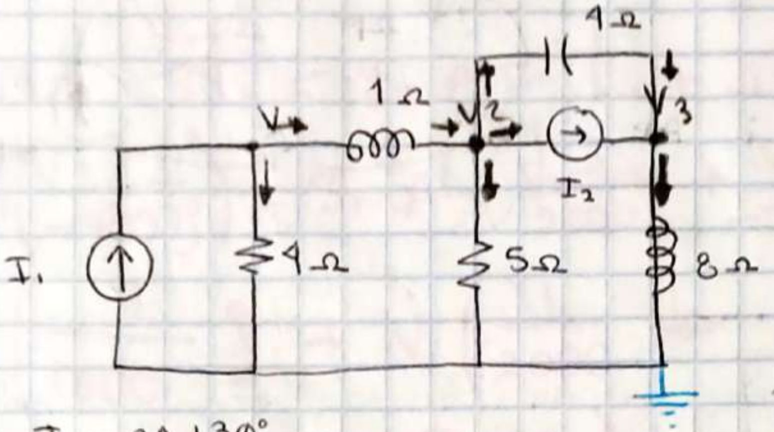
$4.47 \angle 26$ $k = \frac{1}{\sqrt{2}}$

$A k \angle \alpha$

$$\boxed{\frac{10}{\sqrt{2}} \angle 0°}$$

$$7.07 + 0j$$





$I_1 = 2A \angle 30°$
$I_2 = 3A \angle 150°$

I) $2A\angle 30 = \frac{V_1}{4} + \frac{V_1 - V_2}{j}$

$\boxed{\Rightarrow 2A\angle 30 = \left(\frac{1}{4} - j\right)V_1 + jV_2}$

II) $-jV_1 + jV_2 = \frac{1}{5}V_2 + 3A\angle 150 + \frac{V_2}{-}$

$-jV_1 + \cancel{jV_2} - \frac{1}{5}V_2 - \cancel{jV_2} + jV_3 = 3A$

$\boxed{= -jV_1 - \frac{1}{5}V_2 + jV_3 = 3A\angle 150}$

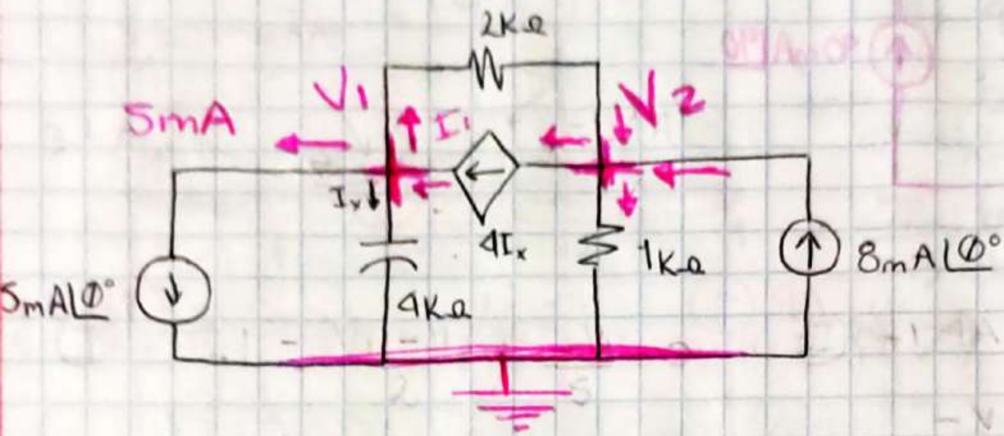
III) $\frac{V_2 - V_3}{-j} + 3A\angle 150 = \frac{V_3}{8j}$

$\Rightarrow jV_2 - jV_3 - \left(\frac{-8j\,V_3}{64}\right) = -3A\angle 150$

$\boxed{= jV_2 - \frac{7}{8}jV_3 = -(3A\angle 150)}$

V_1	V_2	V_3	I
0.25 - j	j		1.7320 + j
-j	-0.2		-2.598 + 1.5j

Nodos: Determine el voltaje en $R = 1k\Omega$



N1: $4I_x = 5mA + I_1 + I_x$

$$4\left(\frac{1}{-4000j}\right) = 5mA + \frac{V_1 - V_2}{2000} + \frac{V_1}{-4000j}$$

$$V_1\left(\frac{1}{1000}j\right) + V_1\left(-\frac{1}{2000} - \frac{1}{-4000j}\right) + V_2\left(\frac{1}{2000}\right) = 5mA$$

$$V_1\left(-\frac{1}{2000} + \frac{3}{4000}j\right) + V_2\left(\frac{1}{2000}\right) = 5mA$$

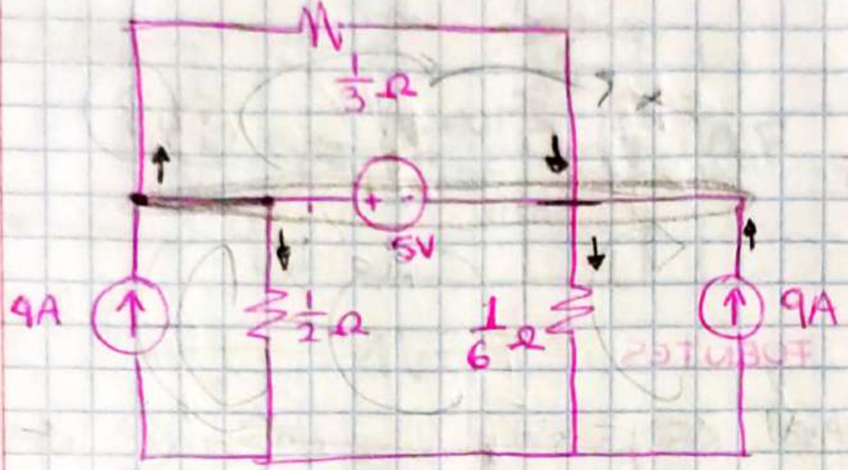
N2: $\frac{V_1 - V_2}{2000} + 8mA = \frac{V_2}{1000} + 4I_x$

$$V_1\left(\frac{1}{2000}\right) - V_2\left(\frac{1}{2000}\right) - V_2\left(\frac{1}{1000}\right) - 4\left(\frac{V_1}{-4000j}\right) = -8mA$$

$$-V_2\left(\frac{3}{2000}\right)$$

$$V_1\left(\frac{1}{2000} - \frac{1}{1000}j\right) - V_2\left(\frac{3}{2000}\right) = -8mA$$

Nodos. Calcula el voltaje en cada fte. de corriente.



I) $4A + 9A + \cancel{I_{\frac{1}{3}}} = I_{\frac{1}{2}} + I_{\frac{1}{6}} + \cancel{I}$

$13 = V_1/\frac{1}{2} + V_2/\frac{1}{6}$

$13 = 2V_1 + 6V_2$

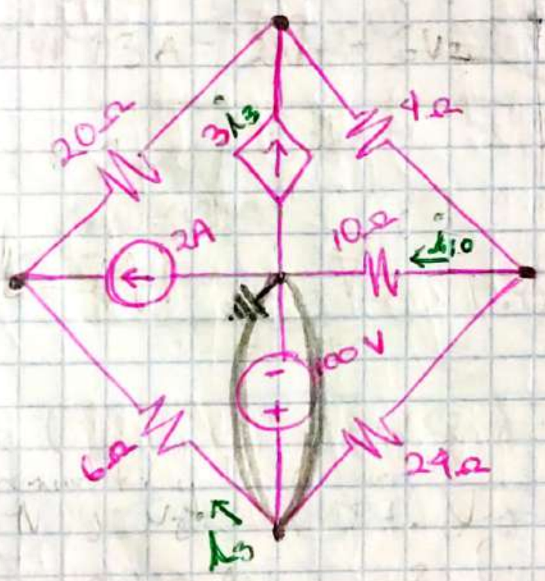
II $V_1 - V_2 = 5$

$\Rightarrow V_1 = 5 + V_2$

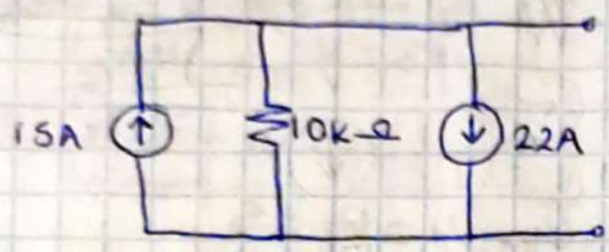
en I) $13 = 2(5 + V_2) + 6V_2$

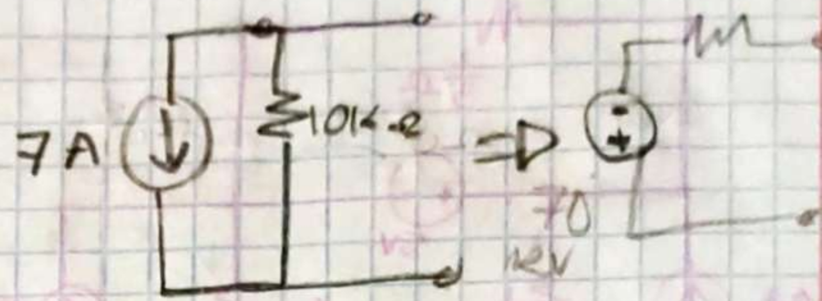
$13 = 10 + 2V_2 + 6V_2$

$3 = 8V_2$

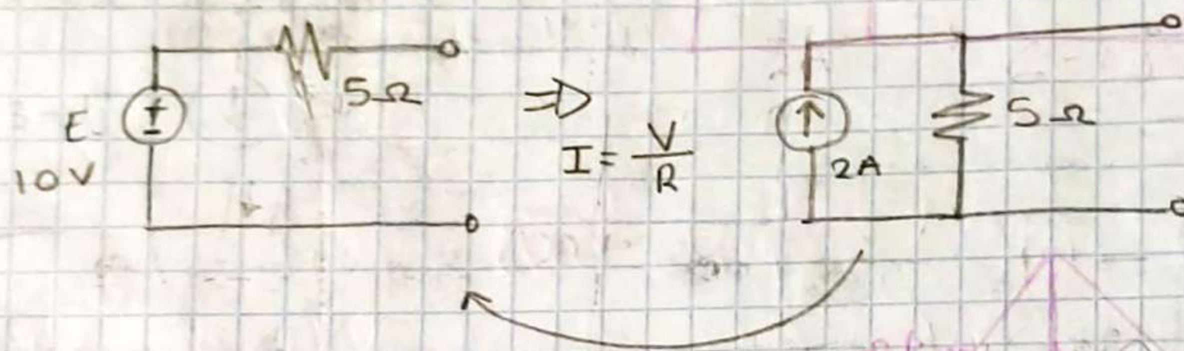


Convertir una sola fuente de voltaje independiente en serie con resistencia





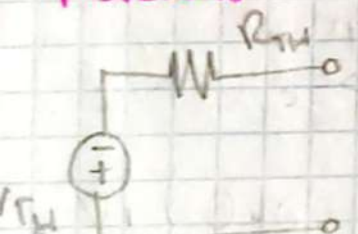
* TRANSFORMACIONES DE FUENTES



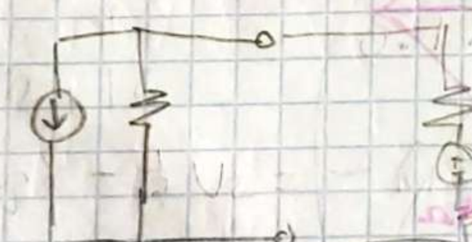
$I = \frac{V}{R}$

$V = IR$

THEVENIN



NORTON

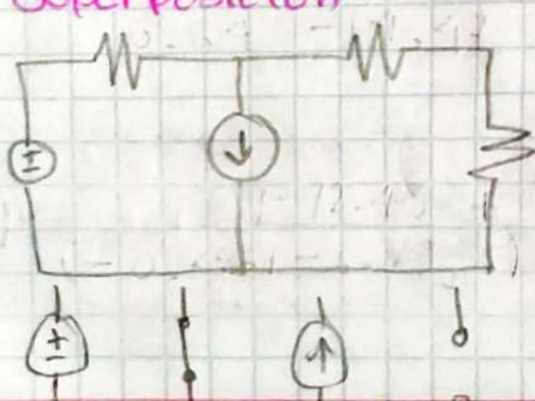


$V = IR$

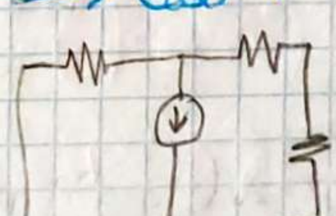
$V_{TH} = I_{SC} R_{TH}$

$V_{TH} - R_{TH}$

Superposición

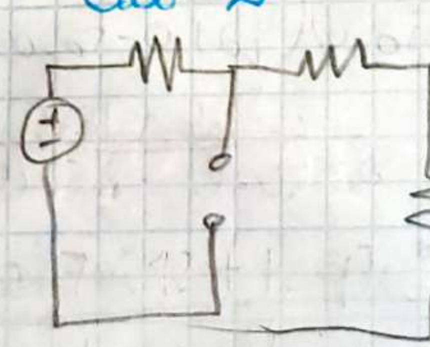


⟹ Caso 1



$V_{R2.1}$

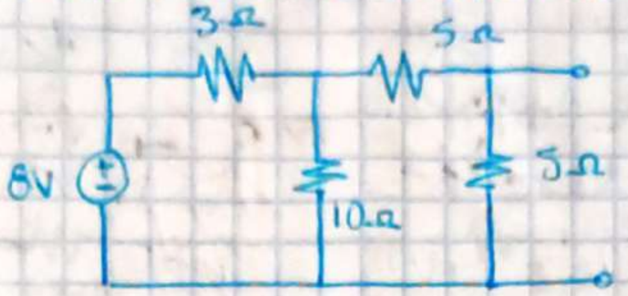
Caso 2

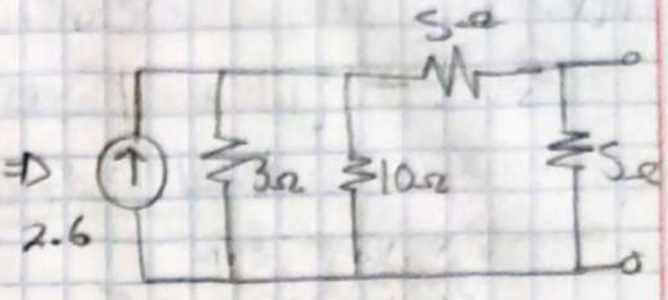


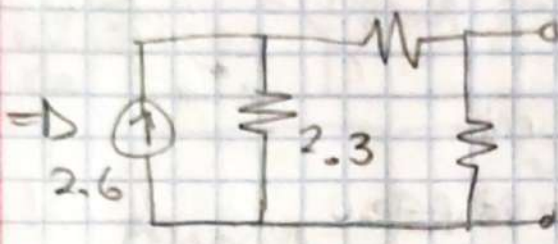
$V_{R2.2}$

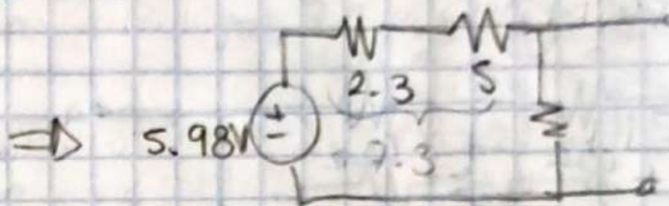
$\Rightarrow V_{R} = V_{R2.1} + V_{R2.2}$

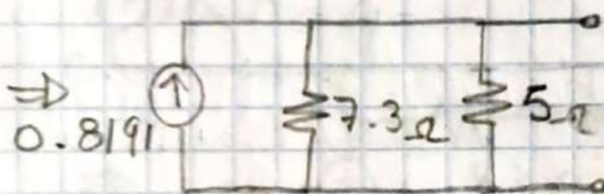
Convertir en una sola fuente de corriente independiente en paralelo con una resistencia

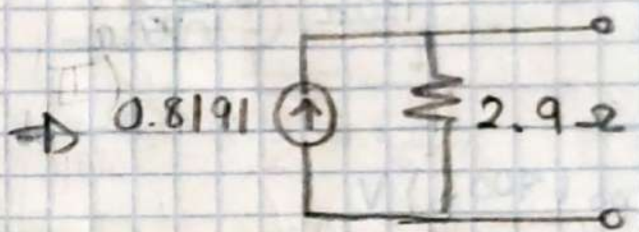


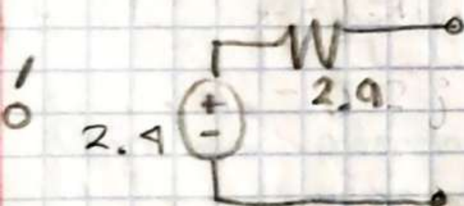


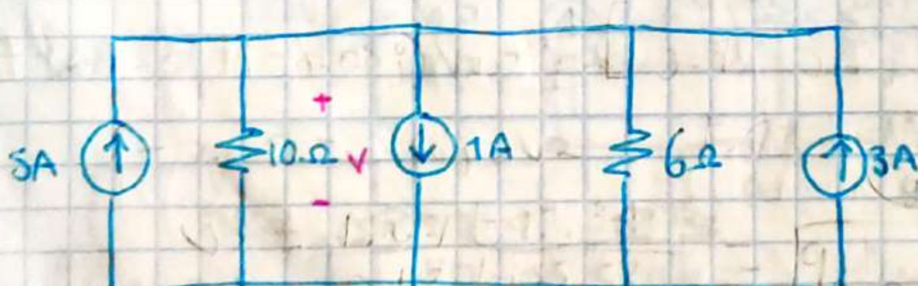




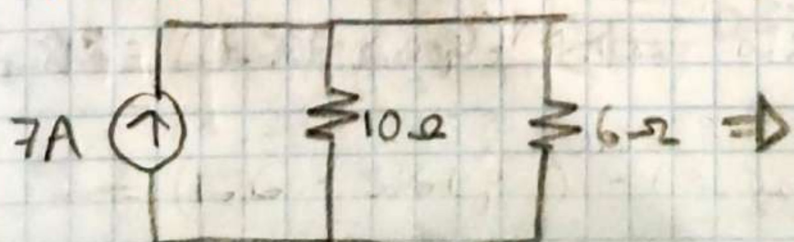


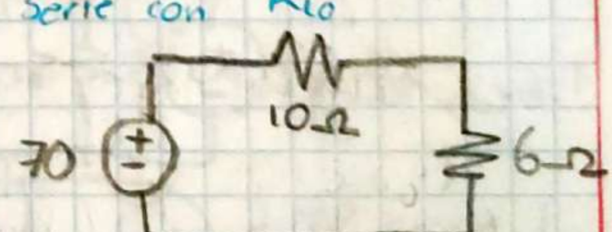






a) Simplificar a una fuente de voltaje en serie con R_{eq}





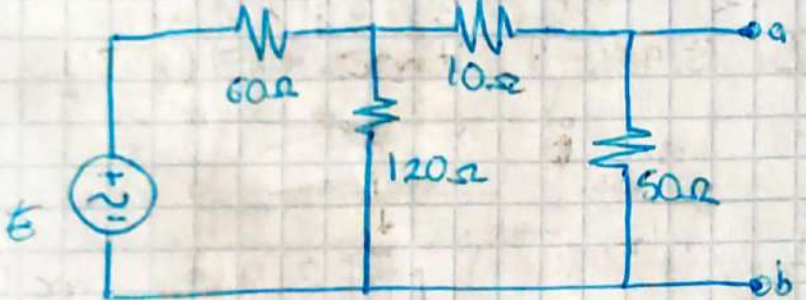
b) Calcular V

c) ¿Por qué R_o no se debe considerar?

2.25V

R   12V   6Ω 10Ω

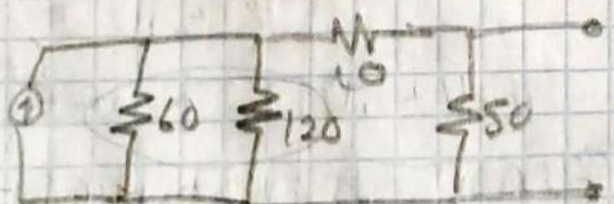
NOR



$E = 120\cos(400t)$ V

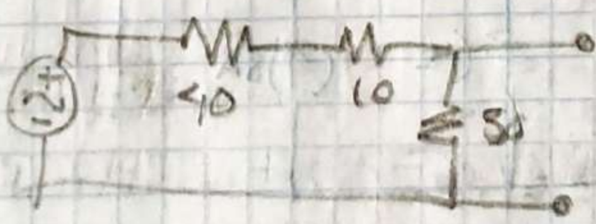
Simplificar a la izquierda de los puntos a y b.

2cos400t



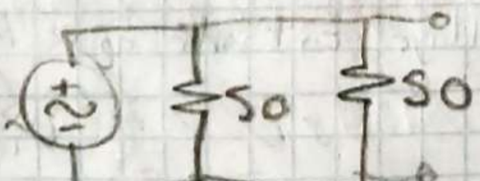
40

80 cos 400 t



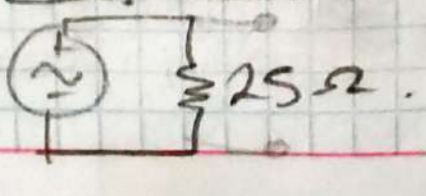
50

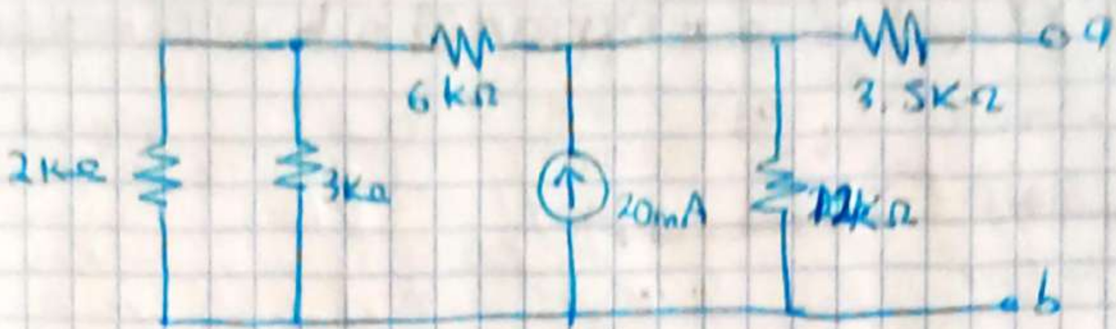
1.6cos 400t

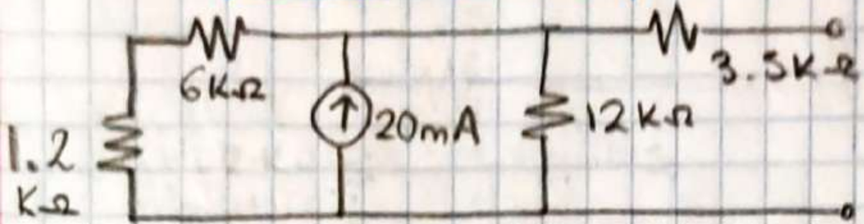


$\Rightarrow$ 1.6cos400t , 25Ω

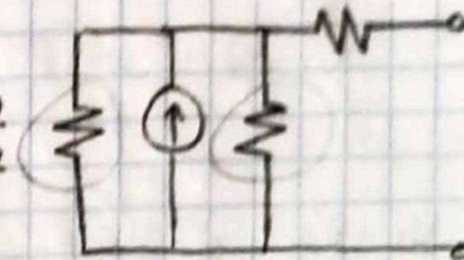
1.6 cos 400 t

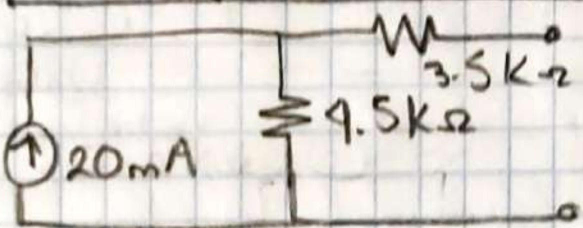




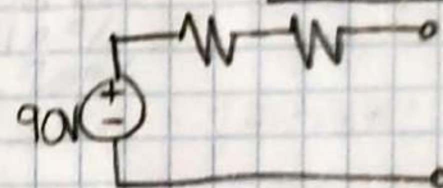


⇒ 7.2 kΩ

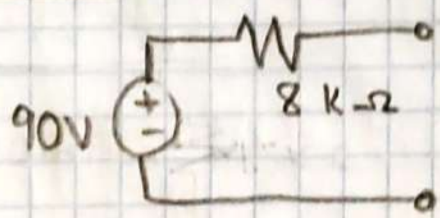




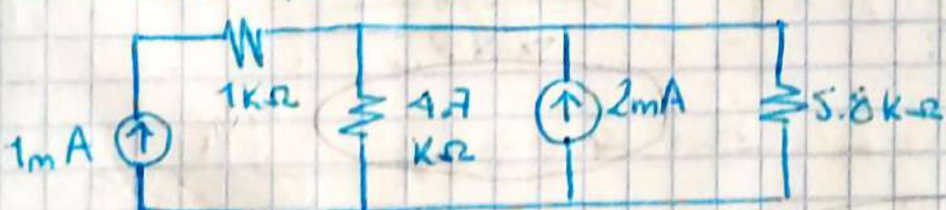
⇒ 90V

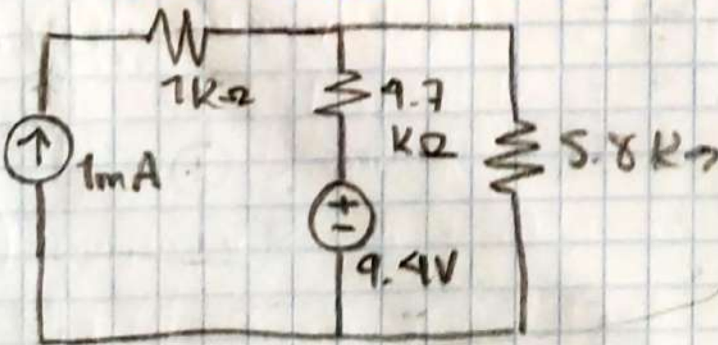


⇒



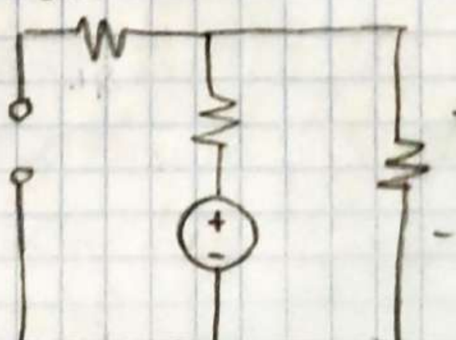
Determinar potencia disipada en R5.8 1kΩ





Sup V=

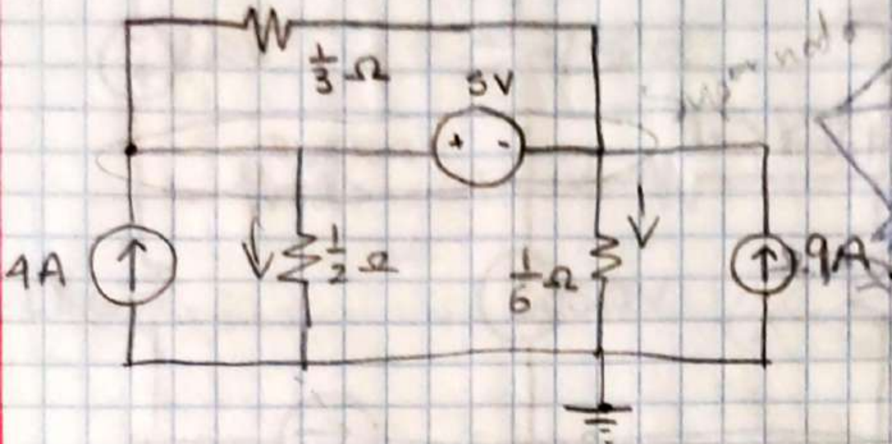
Caso 1



5.7 ±

1.6K 5.7 Ω

Nodos. Calcular voltaje en cada fuente de corriente



Supernodo todas las q' entran

SN $\quad 4A + 9A + \cancel{I_{\frac{1}{3}}} = I_{\frac{1}{2}} + I_{\frac{1}{6}} + \cancel{I_{\frac{1}{3}}}$

$4A + 9A = 2V_1 + 6V_2$

$V = RI$

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

EdV $\quad V_1 - V_2 = 5 \longrightarrow$

$13 = 2V_1 + 6V_2$

$V_1 = 5 + V_2 \longrightarrow \quad V_1 = 5.375$

$13 = 10 + 2V_2 + 6V_2$

$3 = 8V_2$

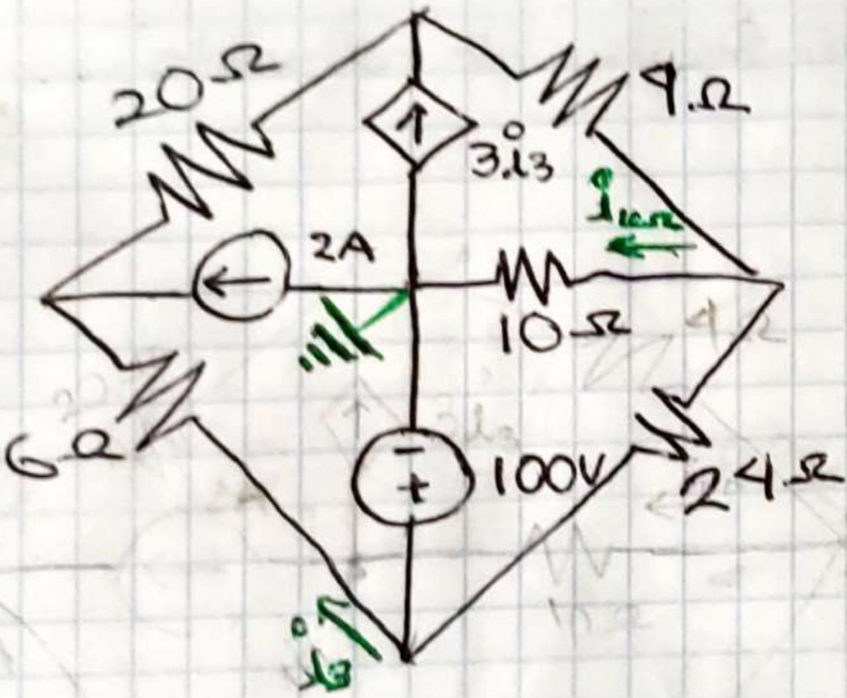
$V_2 = 0.375$

V_1 99.27

56.86

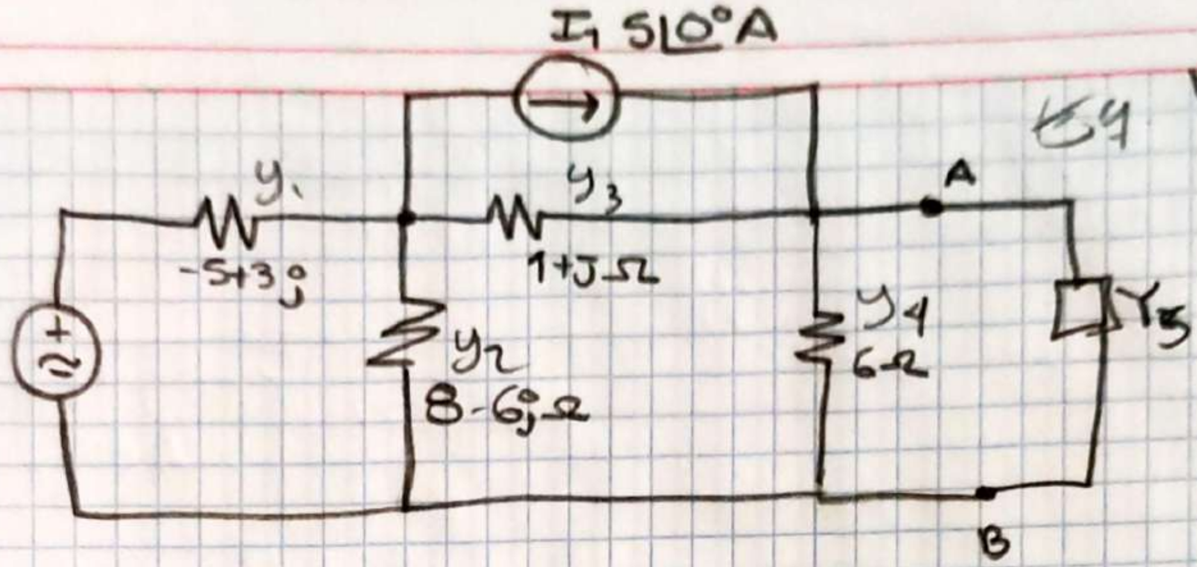
V_2 46.93 A 3LGTS 3770L

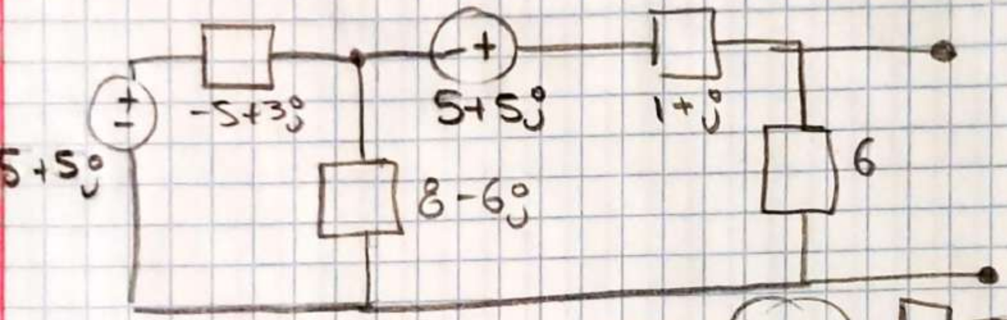
358004/04/00364918

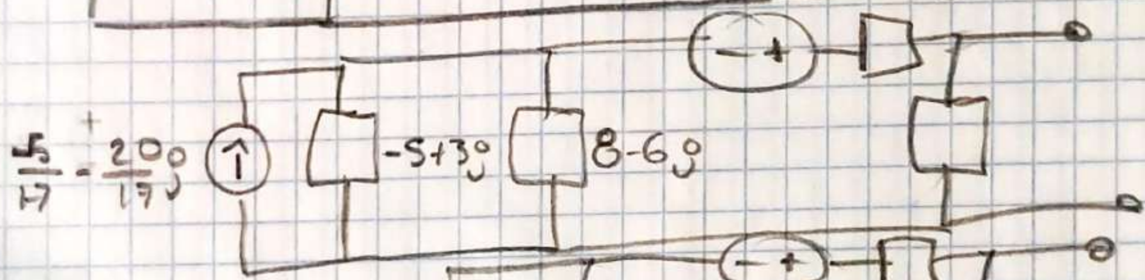


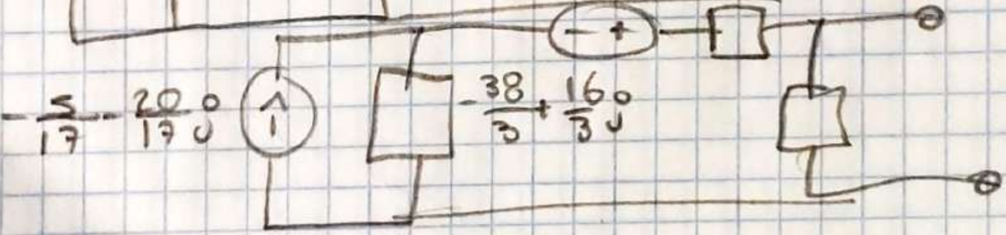
Norton

E4

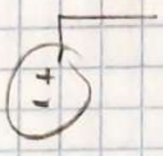








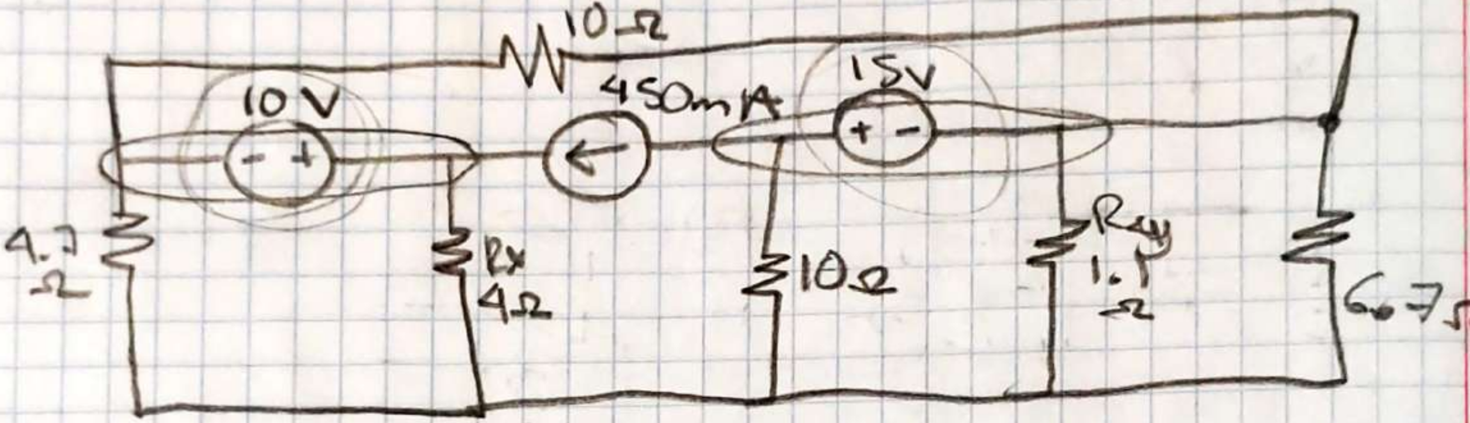
$1 + \frac{410}{30}j$



a) I en R_y

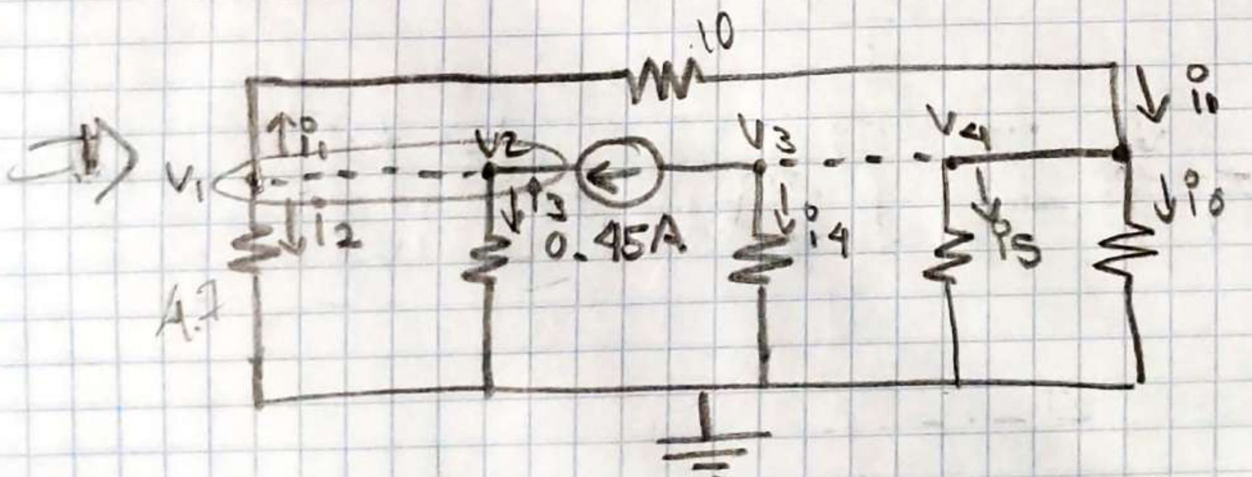
b) Pot en R_x

c) V en la fte de I



ANALISIS DE NODOS

* SUPERNODOS (FTES DE VOLT. IND O DEP EN MEDIO DE DOS NODOS)



LCK:

$i_2 + i_1 + i_3 = 0.45A$

$$\boxed{\frac{V_1 - V_4}{10} + \frac{V_1}{4.7} + \frac{V_2}{4} = 0.45A} \text{ — } (1)$$

$V_1 = -3.38V$

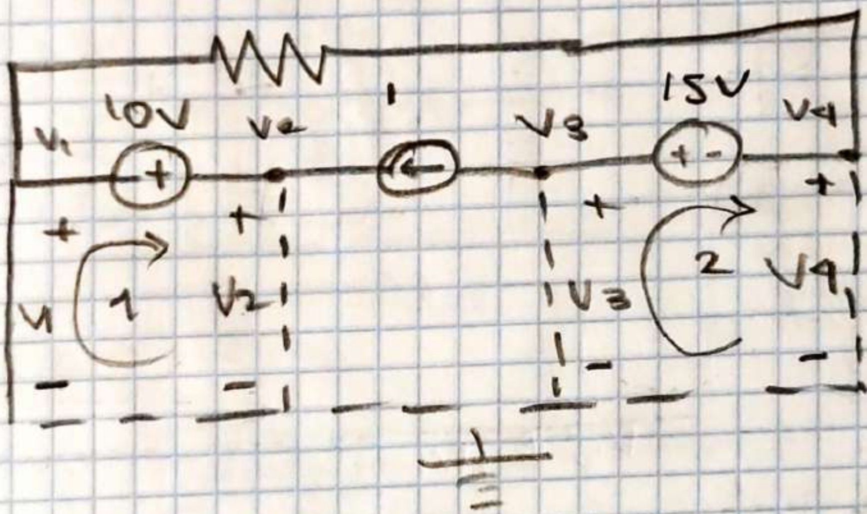
$V_2 = 6.62V \quad V_3 = 13.53$

$V_4 = -1.47V$

$i_4 + i_5 + i_6 + 0.45A = i_1$

$$\frac{v_4}{10} + \frac{v_4}{1.1} + \frac{v_4}{6.7} + 0.45 = \frac{v_4 - v_1}{10} \rightarrow (2)$$

LVK



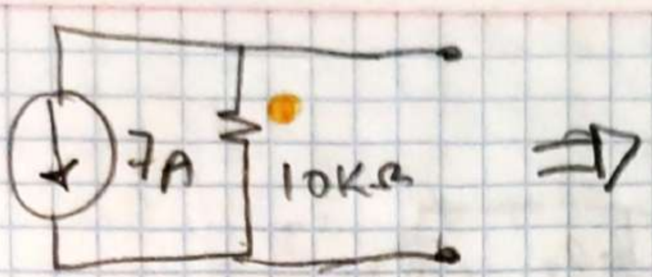
$-V_1 - 10V + V_2 = 0$

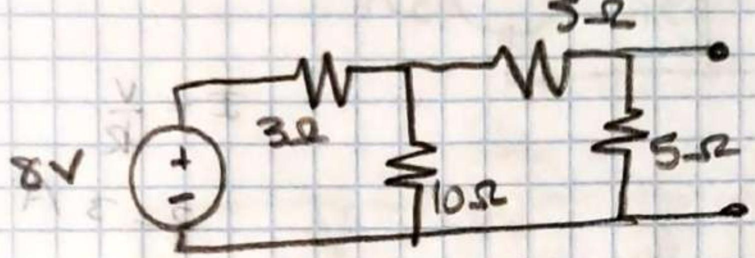
$V_2 - V_1 = 10$ — (3)

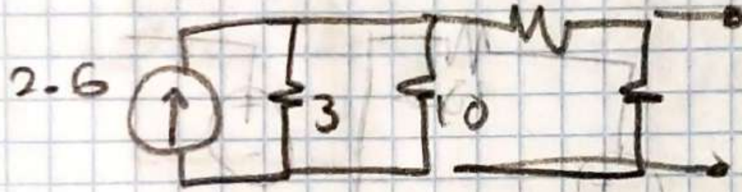
$-V_3 + 15V + V_4 = 0$

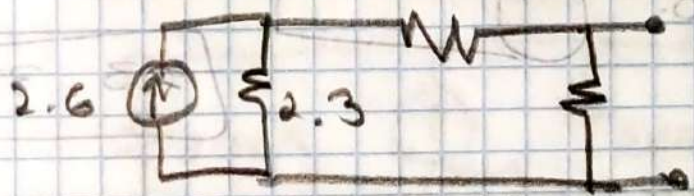
$V_4 - V_3 = -15$ — (4)

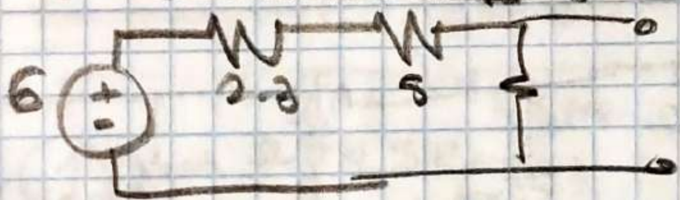
$I_{Ry} = -1.34\,A$

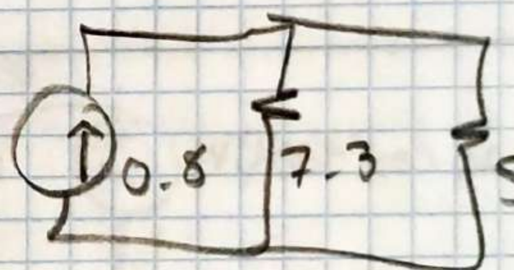

7A
10KΩ

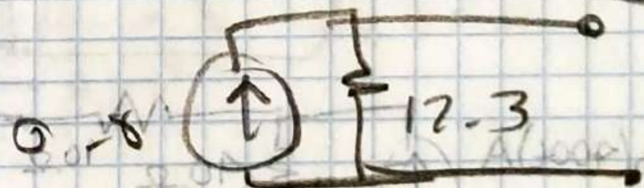

5Ω
8V
3Ω
10Ω
5Ω


2.6
3
10

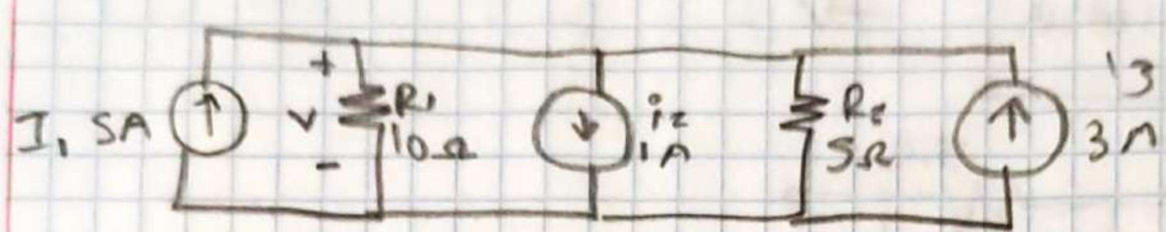

2.6
2.3


6
2.3
8


0.8
7.3
5

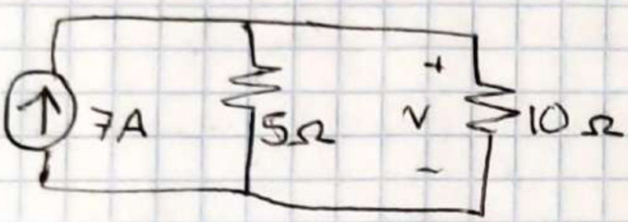

0.8
12.3

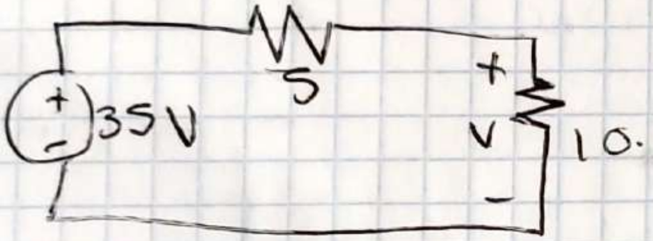
a) V en serie con R1
b) Calcular V

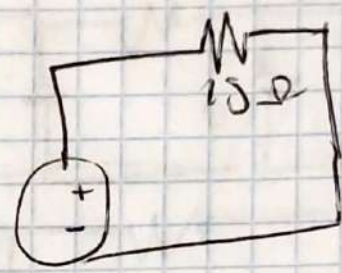


$I = \frac{V}{R}$

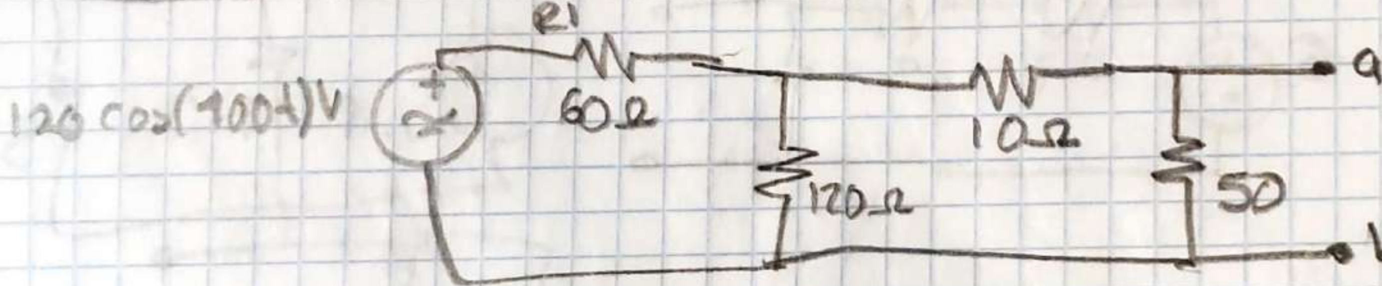
2.3 A

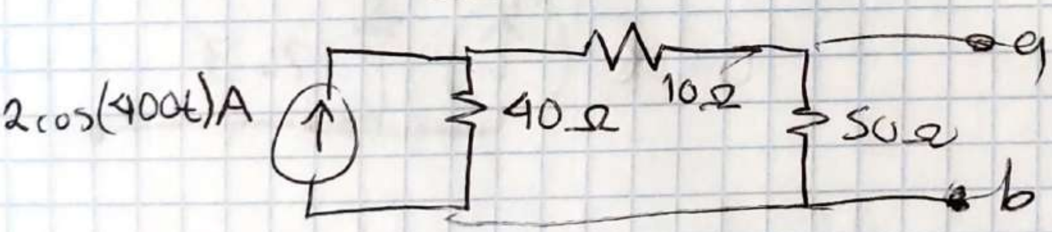


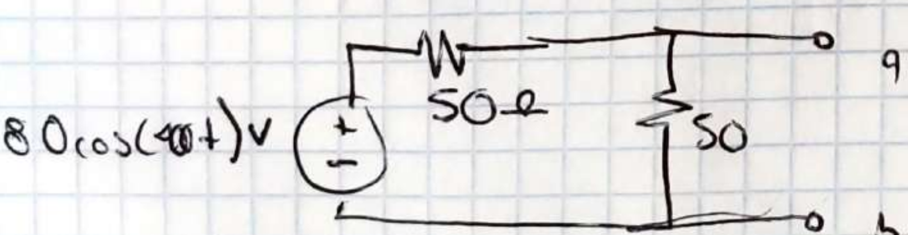


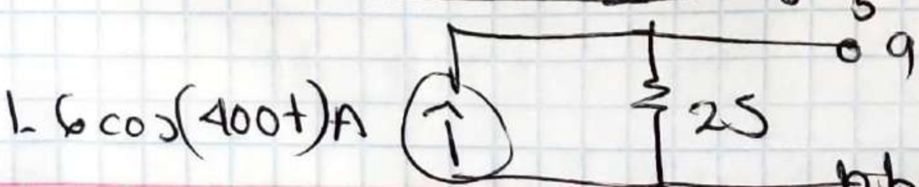


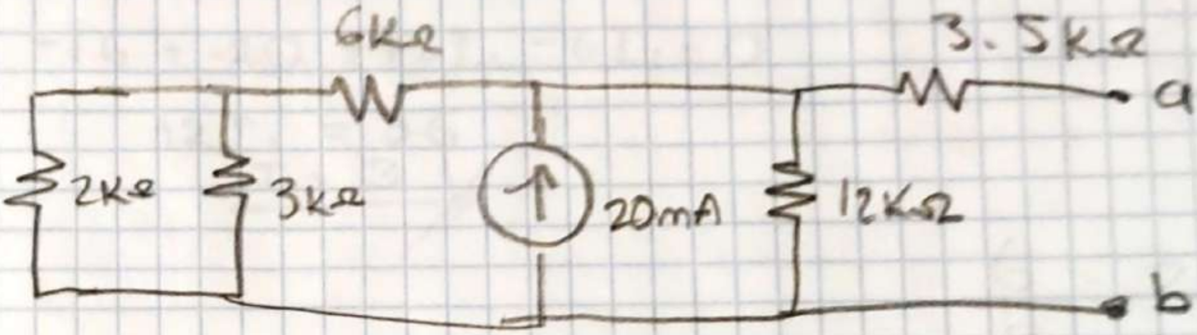
$\boxed{23.33\ V}$

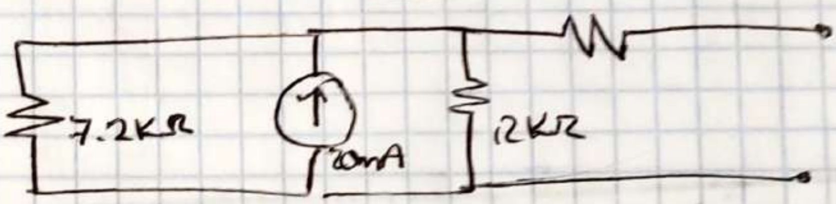


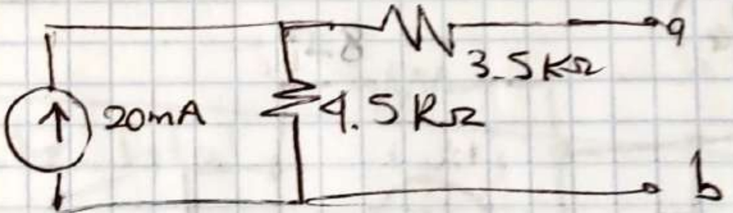




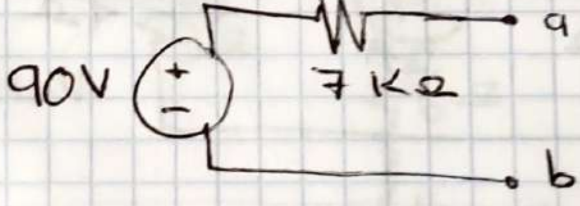



6kΩ
3.5kΩ
a
2kΩ
3kΩ
20mA
12kΩ
b


7.2kΩ
20mA
12kΩ

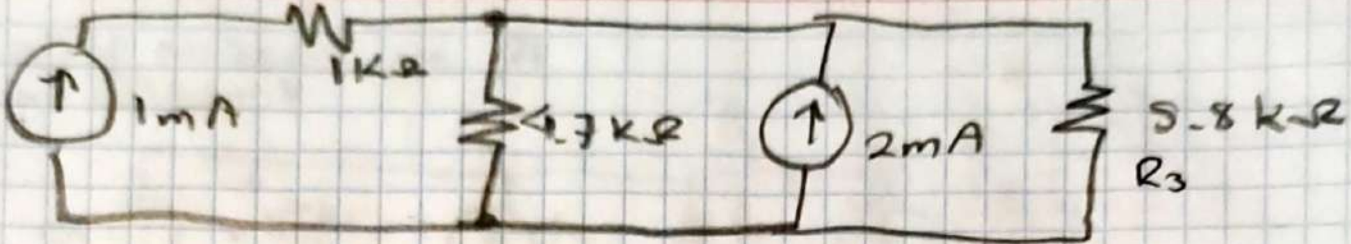

a
3.5kΩ
20mA
4.5kΩ
b

$V=RI$

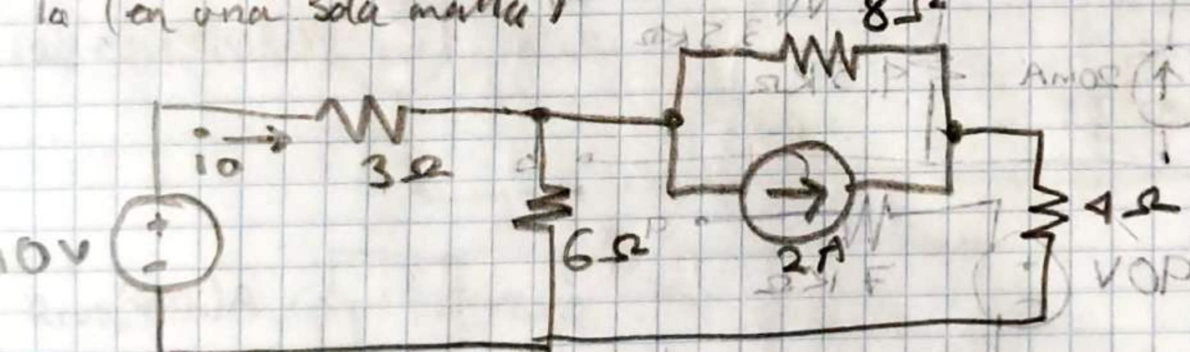

a
90V
+
−
7kΩ
b

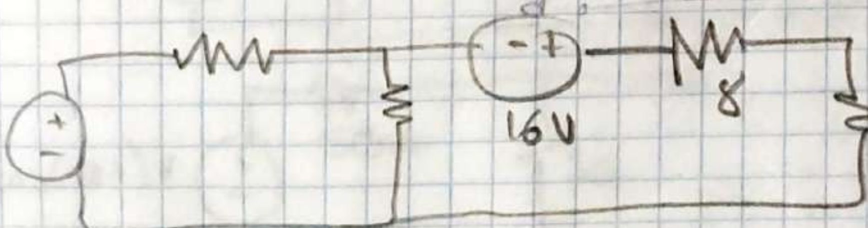
V_{TH}

Pot. en R_3



i_o (en una sola malla)





$-10 + 9I_1 - 6I_2 = 0 \rightarrow$ 1

$-16 + 12I_2 - 6I_1 = 0 \rightarrow$ 2

$6I_2 = -10 + 9I_1$

$I_2 = \dfrac{-10+9I_1}{6}$

$-16 + 12\left(\dfrac{-10+9I_1}{6}\right) - 6I_1 = 0$

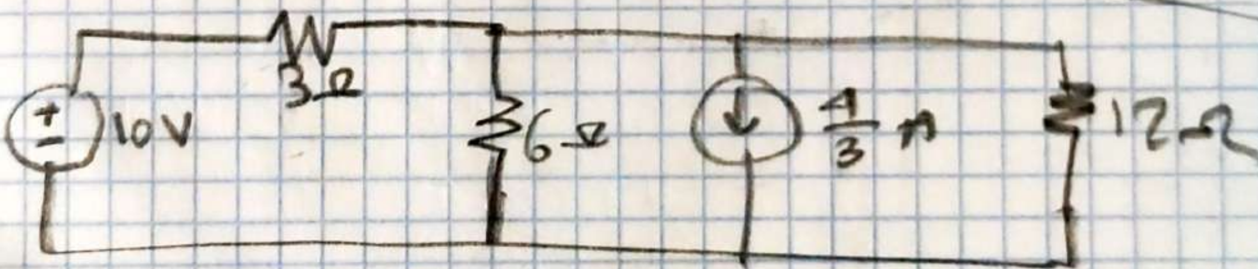
$-16 + -20 + 18I_1 - 6I_1 = 0$

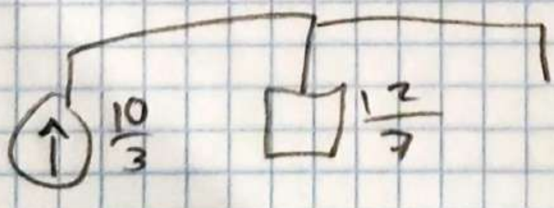
$12I_1 = 36$

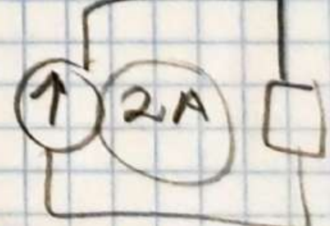
$I_1 = 3$

$\frac{6}{3} = 2$

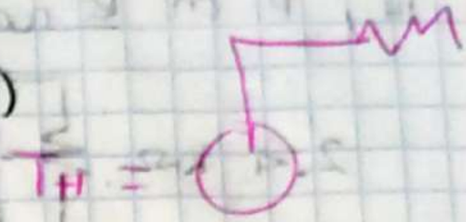
Corriente Total

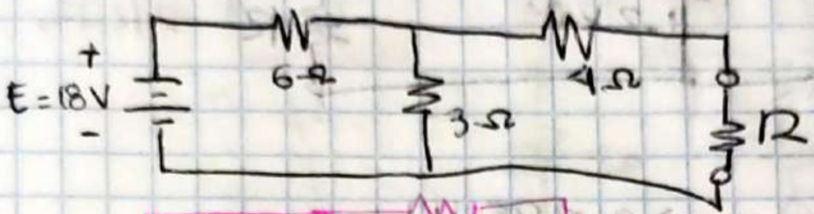


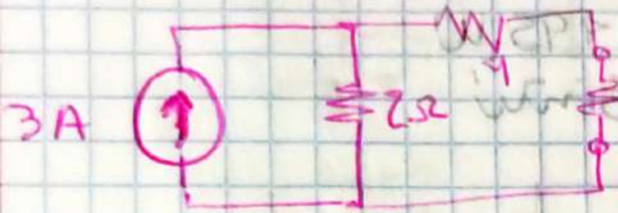


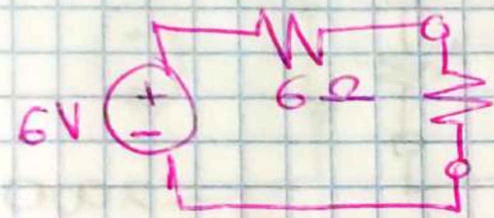


a) Cto eq. TH. externa a R.
b) Corriente a través de R, (2Ω, 30Ω, 100Ω)

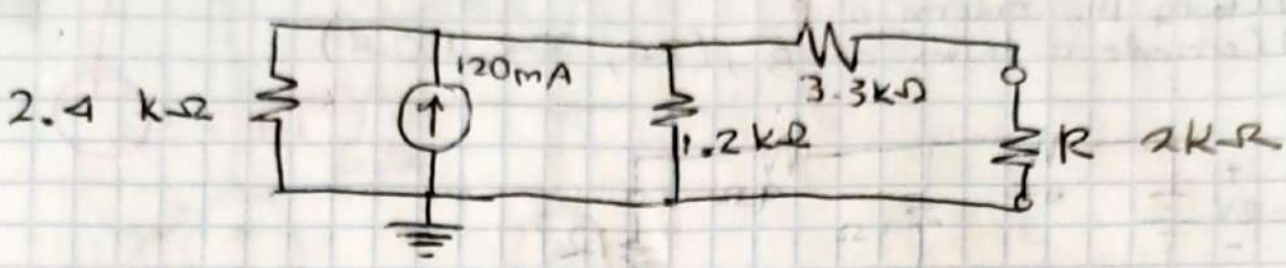








TH, P en R cuando R = 2kΩ y 100kΩ:

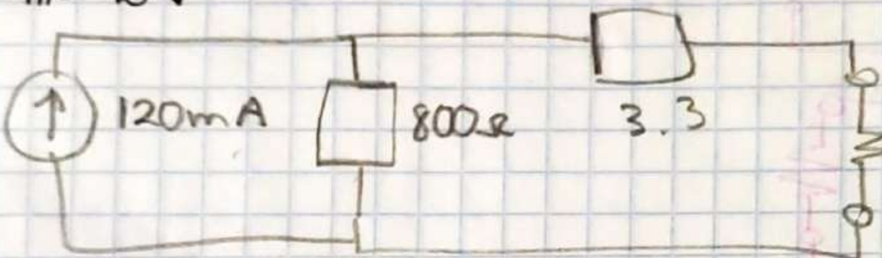


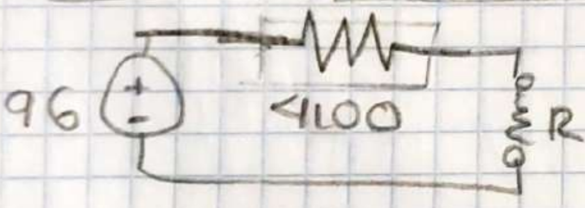
a) $R_{TH} = 4.1\ k\Omega$

$E_{TH} = 96\ V$

b) $2k\Omega \rightarrow 0.495\ W$

$100\ k\Omega \rightarrow 85\ mW$



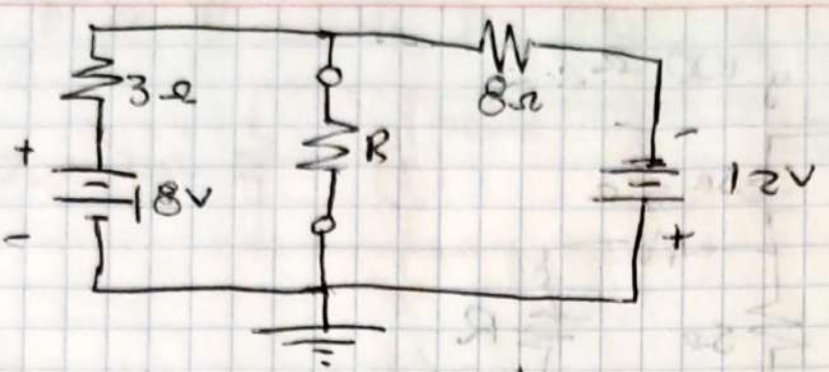


Div. V. $V_R = 96 \frac{2000}{2000 + 4100}$

$V_R = 31.47$

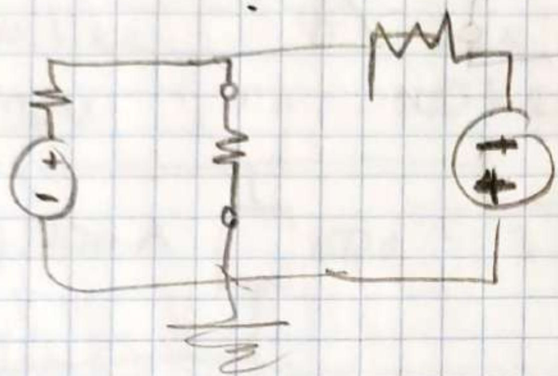
$I = \frac{V}{}$

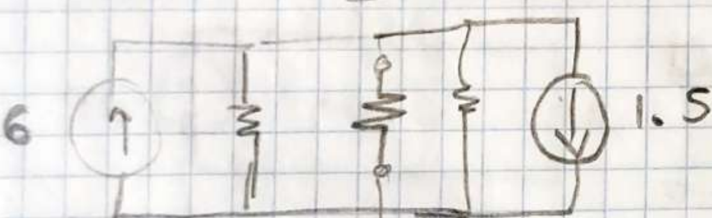
$P = V i =$

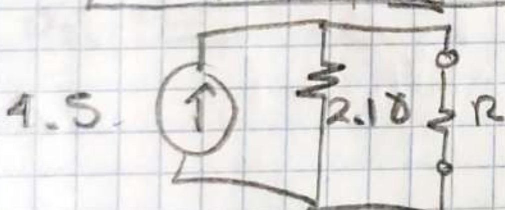


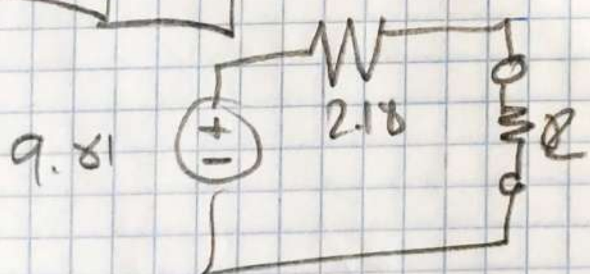
$R_{TH} = 2.18\,\Omega$

$E_{TH} = 9.81\ V$

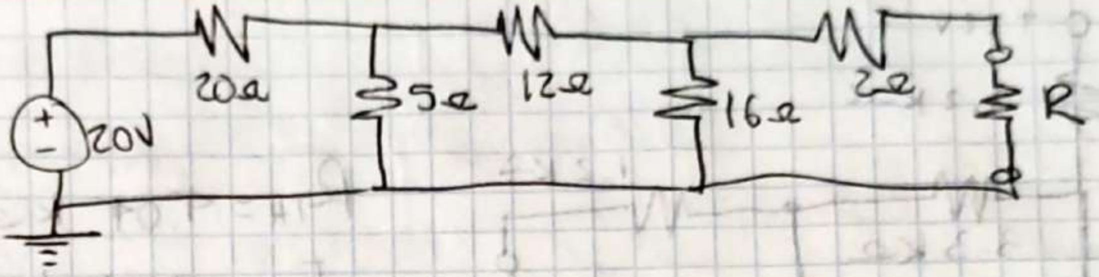








b) I si R=(20, 50, 100)



a) $R_{TH} = 10\Omega$

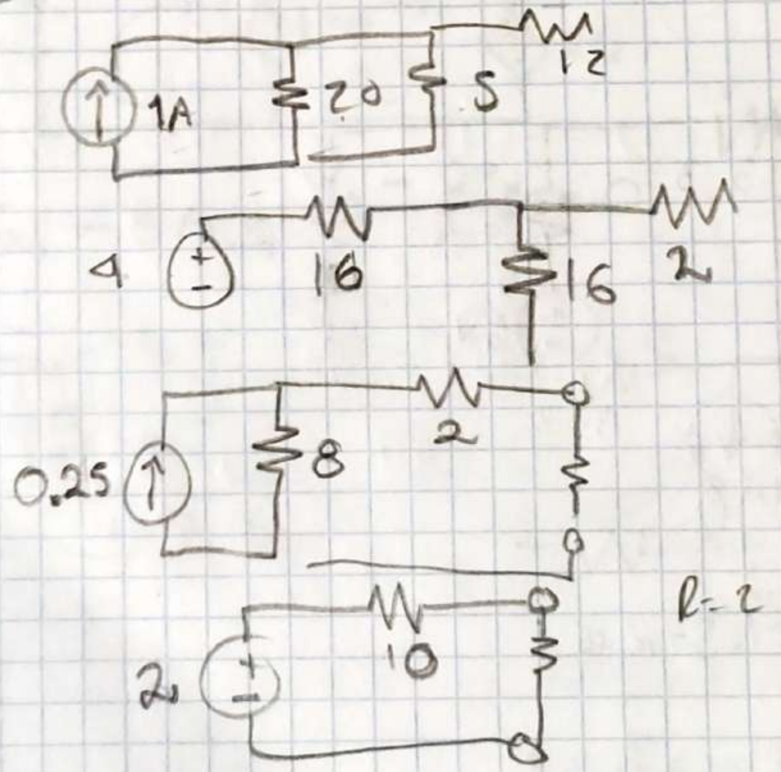
$E_{TH} = 2V$

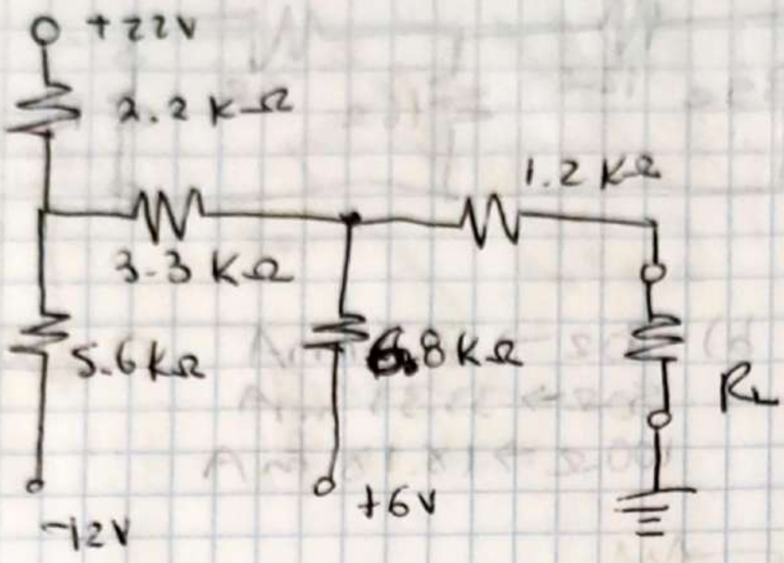
b) 20Ω → 66.67mA

50Ω → 33.33 mA

100Ω → 18.18 mA

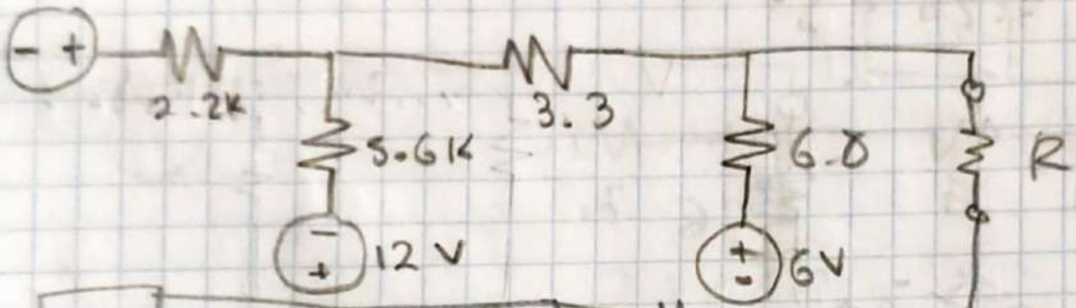
0.06 A

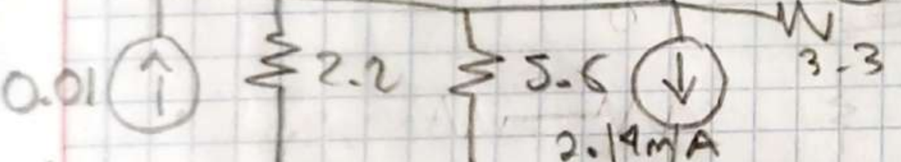


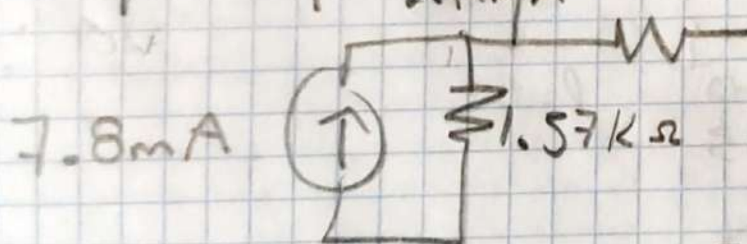


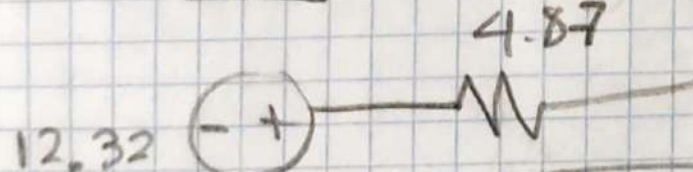
$R_{TH} = 4.04$ kΩ

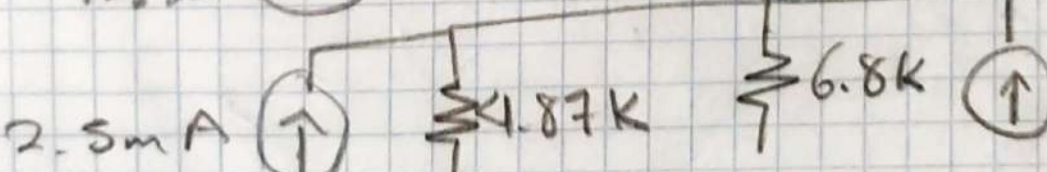
$E_{TH} = 9.71$ V

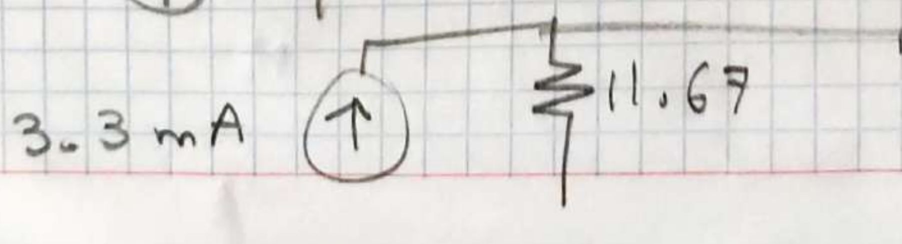




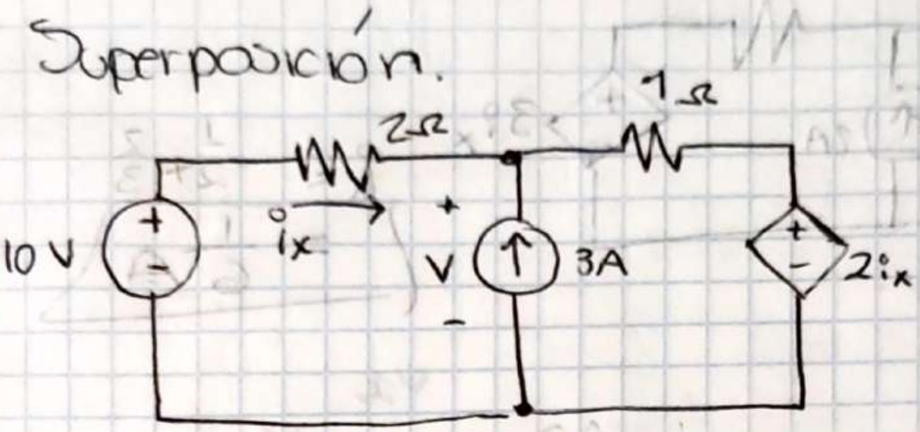




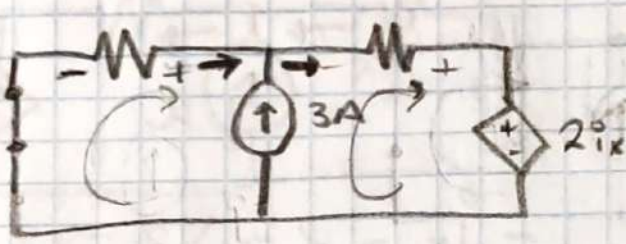




Superposición.



$$i_x = \left(\frac{7}{5}\right) = 1.4A$$



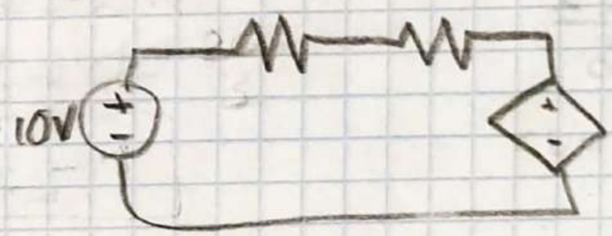
$$i_x = -\frac{V_1}{2} \Rightarrow V_1 = -2i_x$$

$$-I_{x_1} - 3A + \frac{V_1 - 2i_x}{1} = 0$$

$$-I_{x_1} - 3 + -2i_x - 2i_x = 0$$

$$-5i_x = 3$$

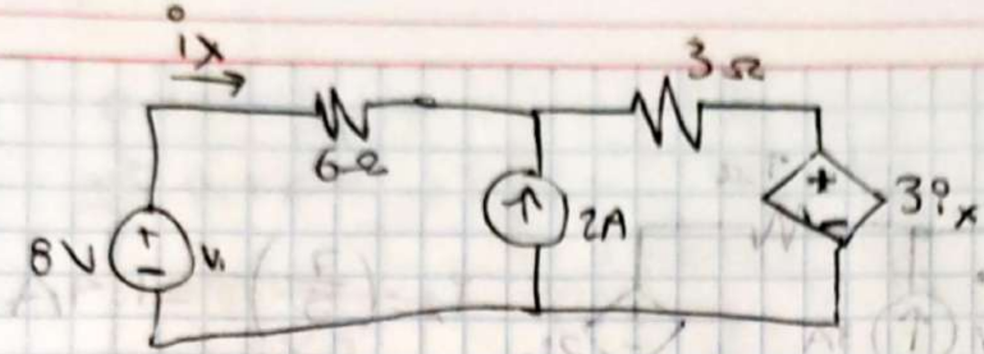
$$i_x = -\frac{3}{5}$$



$$-10V + 3i_{x_2} + 2i_{x_2} = 0$$

$$i_x = \frac{10}{5} = 2$$

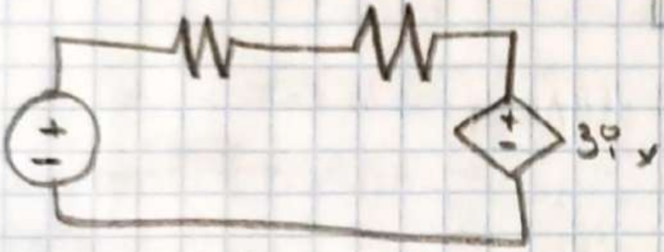
$$7/5$$

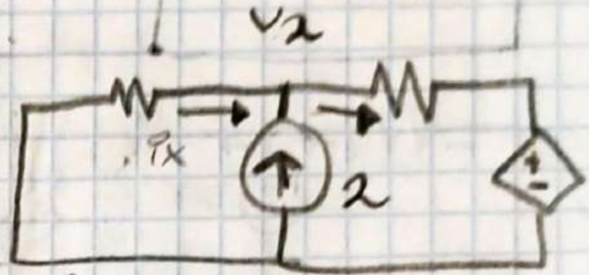


$i_x = -\frac{1}{2} + \frac{2}{3}$

$\boxed{= \frac{1}{6} A}$

CASO 1





$-8 + 9i_x + 3i_x = 0$

$i_x = \frac{8}{12} = \frac{2}{3}$

$-i_x - 2 + \frac{V_2 - 3i_x}{3}$

$-\frac{V_2}{6} = i_x$

$\boxed{-6i_x = V_2}$

$x = \frac{-V_2}{6}$

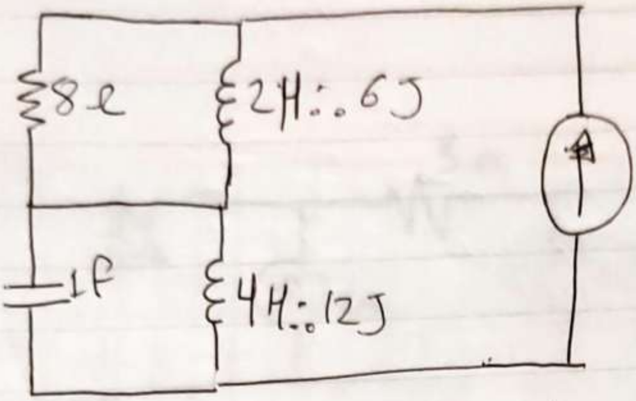
$6i_x = V_2$

$\Rightarrow -i_x - 2 + \frac{(-6i_x - 3i_x)}{3} = 0$

$-i_x - 2 - 3i_x = 0$

$-4i_x = 2$

$\frac{1}{j\omega C}$ $\quad -\frac{1}{\omega C}J$



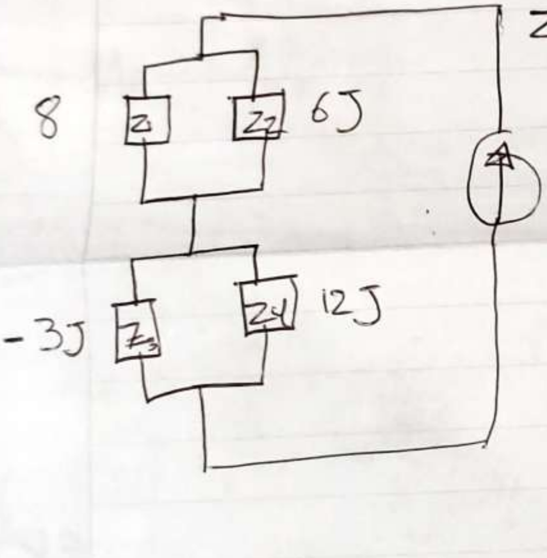
$4\cos(3t+15^\circ)\ A$

$I = 4\angle 15^\circ$

$\omega = 3$ $\quad \omega = 2\pi f$

$f = \frac{\omega}{2\pi}$

LO PONEMOS EN



$$Z_{12} = \frac{(8)(6J)\ (8+6J)}{(8+6J)\ (8+6J)} = \frac{48J(8+6J)}{64+36}$$

$$= \frac{48J(8+6J)}{100} = \frac{384}{100}J + \frac{288}{10}$$

$$= \underline{3.84J + 2.88}$$

$$Z_{23} = \frac{\left(\frac{1}{-3J}\right)(12J)}{\left(\frac{1}{-3J}\right)+(12J)} = \frac{\left(-\frac{1}{3}J\right)(12J)}{\frac{35}{3}J}$$

$$= \frac{\left(-\frac{1}{3}J\right)(12J)\ \cancel{\left(\frac{35}{3}J\right)}}{\frac{35}{3}J} = \underline{-\frac{12J}{35}}$$

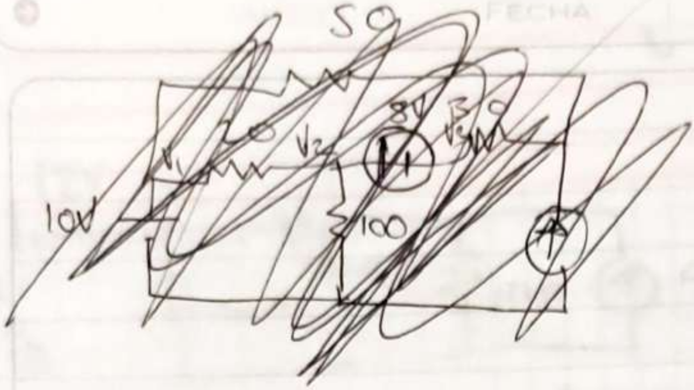
$-\frac{1}{3}J$

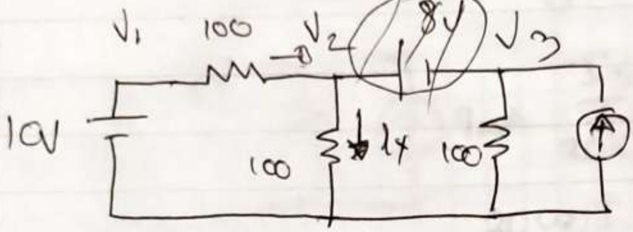
$$V(t) = \left((2.88+3.84J)+\left(-\frac{12}{35}J\right)\right)(4\angle 105^\circ)$$

$$V(t) = (2.88 + 3.49714285)\ (4\angle 105^\circ)$$

$$Vt = (4.53038719\ \angle 50.5275)\ (4\angle 105)$$

$$Vt\ (18.1354\ \angle 155.5275\ V)$$

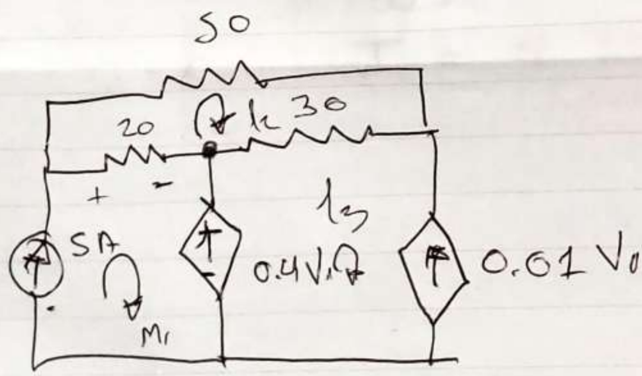




$V_2 - V_3 = 8V$

$V_2 = 8V + V_3$

$$\frac{V_1 - V_2}{100} + \frac{V_2}{100} + \frac{V_3}{100} + 3\text{am}A = 0$$



$I_1 = 5A$

$I_3 = -0.01V_1$

$100I_2 - 20I_1 - 30I_3 = 0$

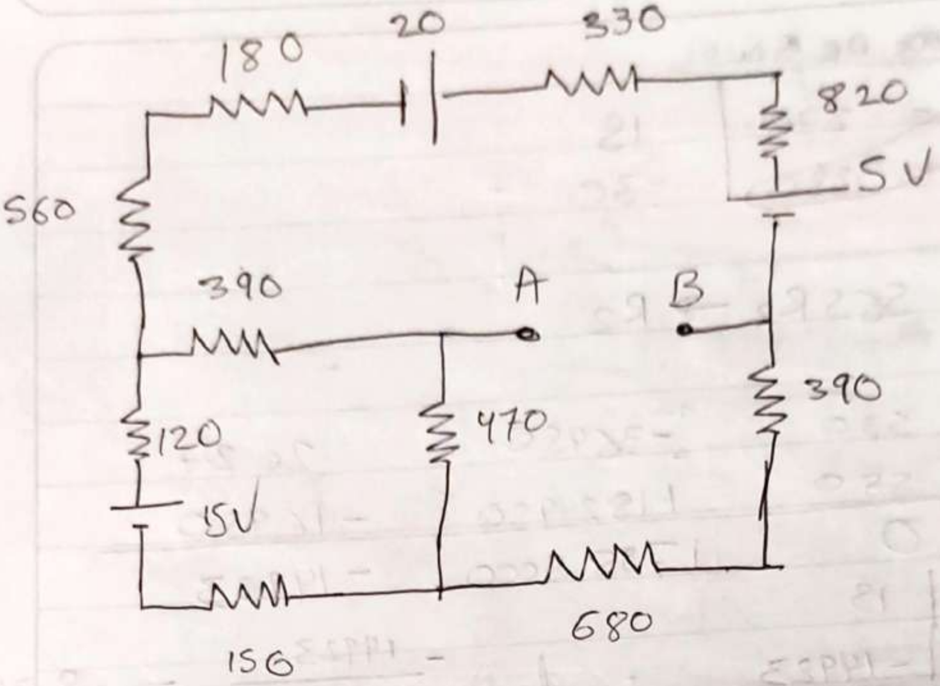
$$\boxed{100I_2 - 100 - 0.3V_1 = 0}$$

$I_2 = \frac{100 + 0.3}{100}$

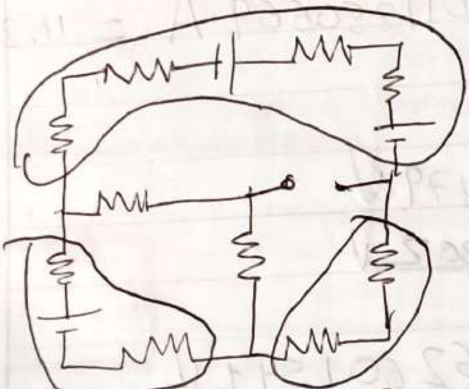
$-V_1 + 0.4V_1 + 20I_1 - 20I_2$

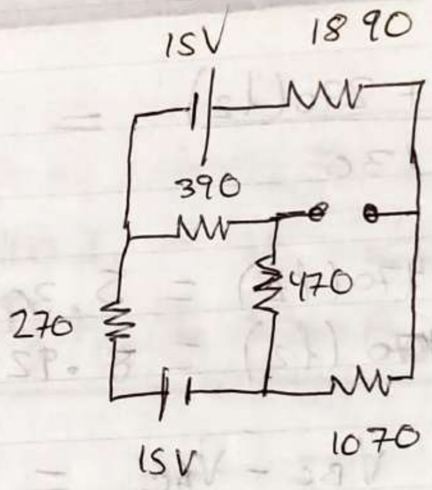
30

$+20I_2 - 20I_2 = V_1 - 0.4V_1$

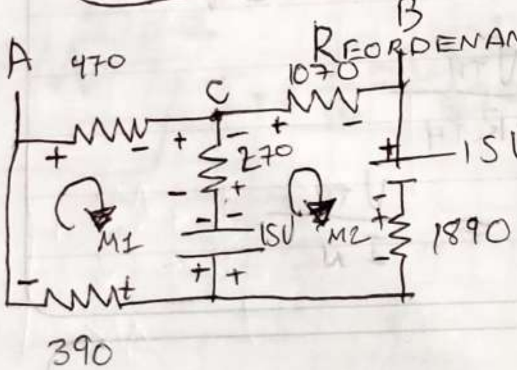


SIMPLIFICANDO





REORDENANDO EL CIRCUITO



APLICAMOS LVK

M_1:

$470I_1 + 390I_1 + 270I_1 - 270I_2 -$

$1130I_1 - 270I_2 = 15V$

M_2:

$1070I_2 + 1890I_2 + 270I_2 - 270I_1 + 30$

$-270I_1 + 3230I_2 = -30$

Por METODO DE GAUSS

$$\begin{array}{l} R_1 \\ R_2 \end{array}\left(\begin{array}{cc|c} 1130 & -270 & 15 \\ -270 & +3230 & -30 \end{array}\right)$$

$135R_1 + 565R_2 \rightarrow R_2$

152 550	-36456	2027
-152 550	+1824950	-16950
0	1788 5000	-14923

$$\left(\begin{array}{cc|c} 1130 & -270 & 15 \\ 0 & 1788500 & -14923 \end{array}\right)$$

$$I_2 = \frac{-14923}{1788500} = -8.34386 mA$$

$$I_1 = \frac{15 + 270(I_2)}{1130} = 0.011280669 A = 11.280669 mA$$

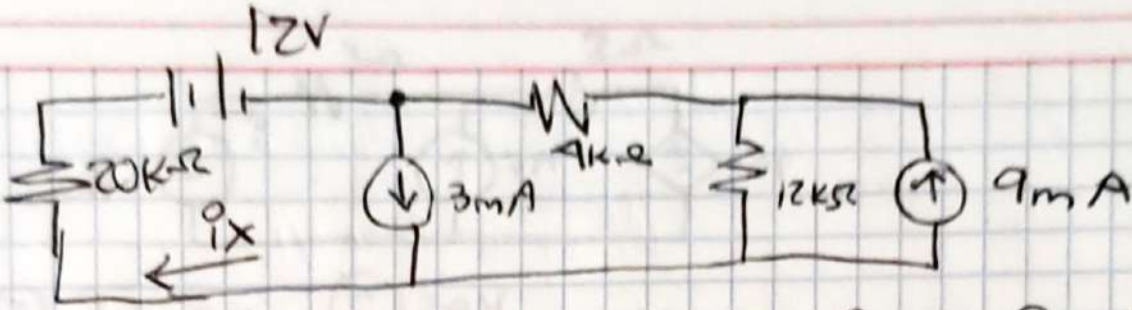
$$V_{AC} = 470(I_1) = 5.30191479 V$$

$$V_{BC} = 1070(I_2) = 8.92779302 V$$

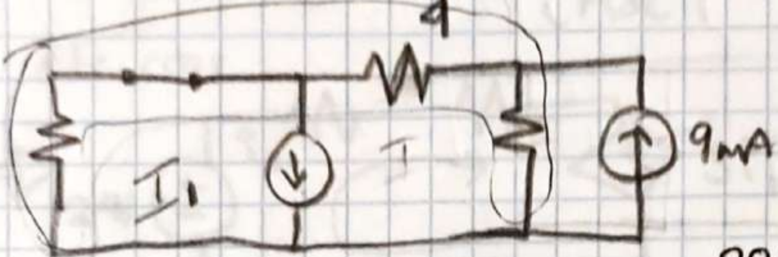
$$V_{AB} = V_{BC} - V_{AC} = 3.62601541 V$$

$$\boxed{V_{AB} = V_{TH}} \qquad I_N = \frac{V_{TH}}{R_{TH}}$$

$$R_{TH} = R_N = \frac{V_{TH}}{I_N}$$



$i_x = -2mA$



$I_3 = 9mA$

$I_1 - I_2 = 3mA$

$20kI_1 + 16kI_2 - 12kI_3 =$

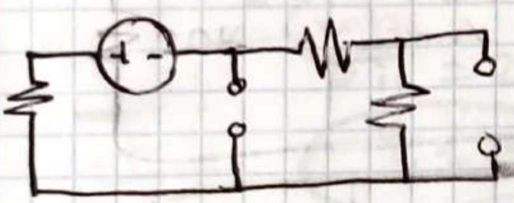
$20000I_1 + 16000I_2 = 108$

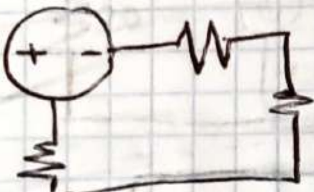
$I_2 = I_1 - 3mA$

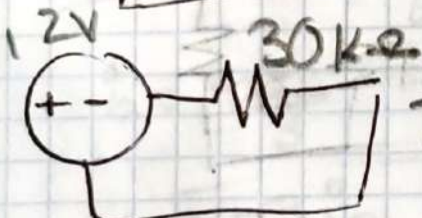
$20000 I_1 + 16000(I_1 - 3mA) = 10$

$36000 I_1 - 48 = 108$

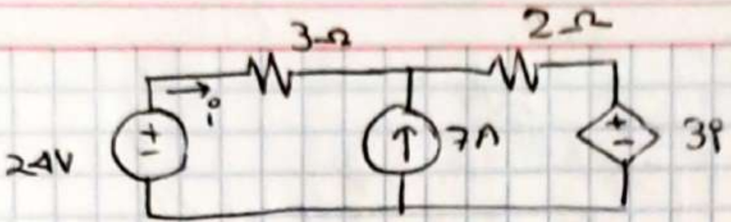
$I_1 = 4.33mA$







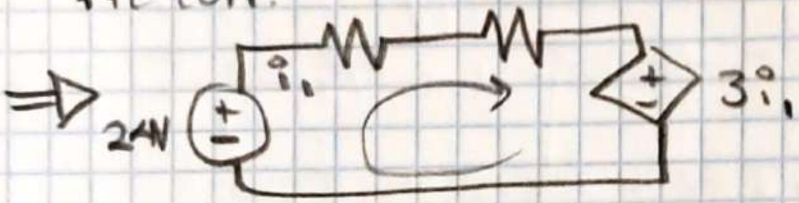
$I_T = \frac{V}{R} = \frac{12V}{30000}$



① I en ± 24V

CASE 1

fte corr.

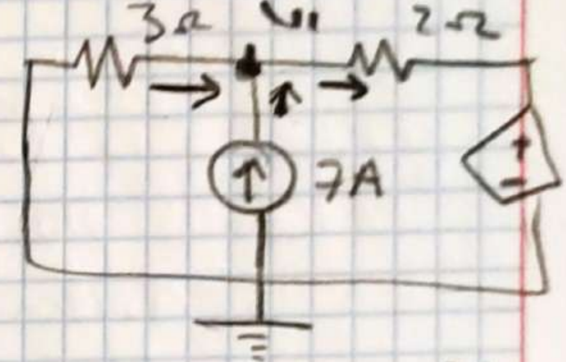


$$-24 + (3+2)i_1 + 3i_1$$

$$8i_1 = 24$$

$$i_1 = 3$$

CASE 2



$$-7 - i_2 + \frac{v_1 - 3i_2}{2} = 0$$

$$-i_2 = \frac{v_1 - 3i_2}{2} + 7$$

$$-i_2 = \frac{v}{2} - \frac{3i_2}{2} + 7$$

$$i_2 = -\frac{v_1}{3}$$

$$v_1 = -3i_2$$

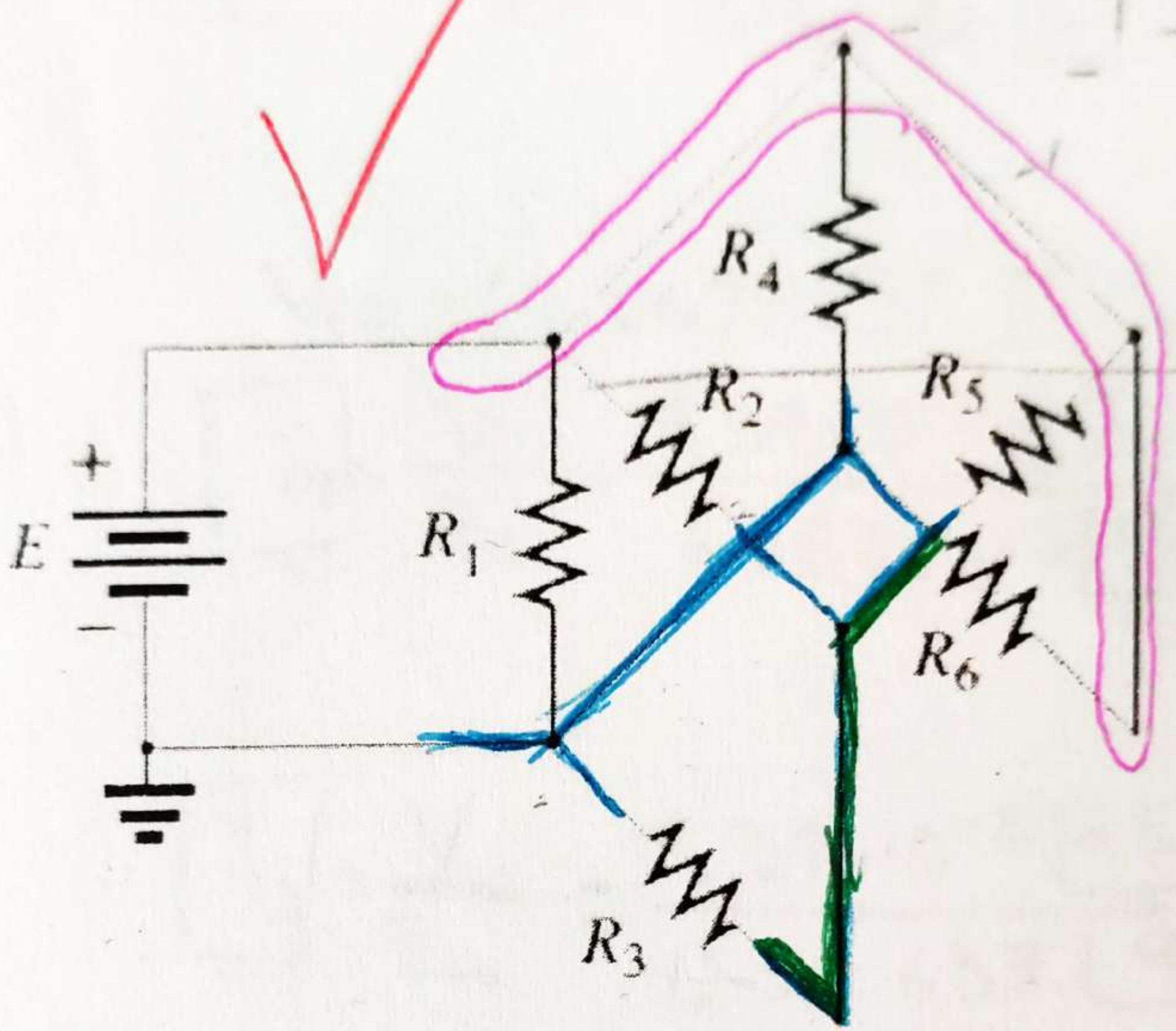
$$-7 - i_2 + \frac{(-3i_2) - 3i_2}{2} = 0$$

$$-7 - i_2 - 3i_2 = 0$$

$$i_2 = -\frac{7}{4}$$

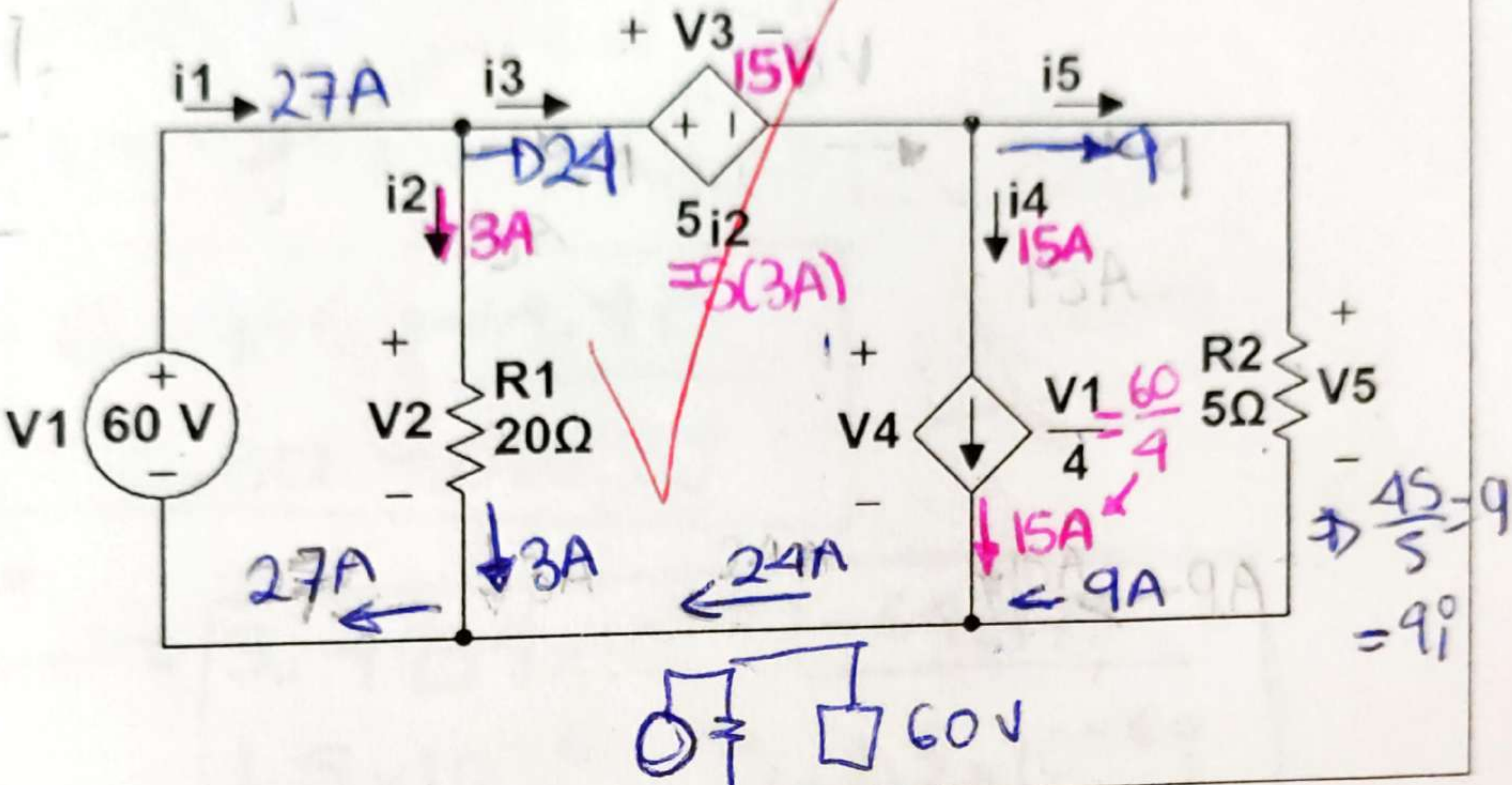
$$i = i_1 + i_2 =$$

3. Considere R1=R2=R3=R4=R5=R6=100Ω.
Calcule la resistencia equivalente.



4. a) Evaluar todas las corrientes y las tensiones.

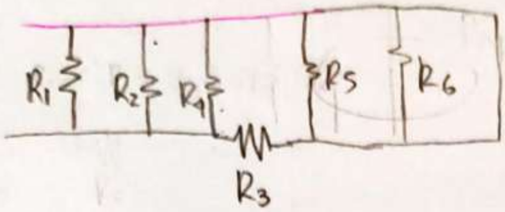
b) Calcular la potencia que absorbe cada uno de los cinco elementos del circuito y mostrar que la suma es cero.



Notas:

men sucio menos un punto.

s desordenados menos un punto.



$R_{5,6} = \frac{(100)(100)}{200} = 50$

$R_{5,6,3} = 150$

$R_{eq} = \frac{1}{\frac{1}{100} + \frac{1}{100} + \frac{1}{100} + \frac{1}{150}} = 27.27\Omega$

4. $V = RI$ $\quad I_{R_1} = \frac{60}{20} = 3A$

$Si_2 = 5(3A) = 15\,V$

$\frac{V_1}{4} = 15\,A$

$V_3 + V_{4,5} = 60V$

$V_{4,5} = 60V - 15V$

$V_{4,5} = 45V$

$I = \frac{V}{R} = \frac{45V}{5} = 9A$

$I_5 = 9A$

$\Rightarrow I_3 = 27A$

$I_1 = 27A$

$I_2 = 3A$

$I_4 = 15A$

$P = Vi$

$P_{V_1} = (60V)(27A) = 1620W$

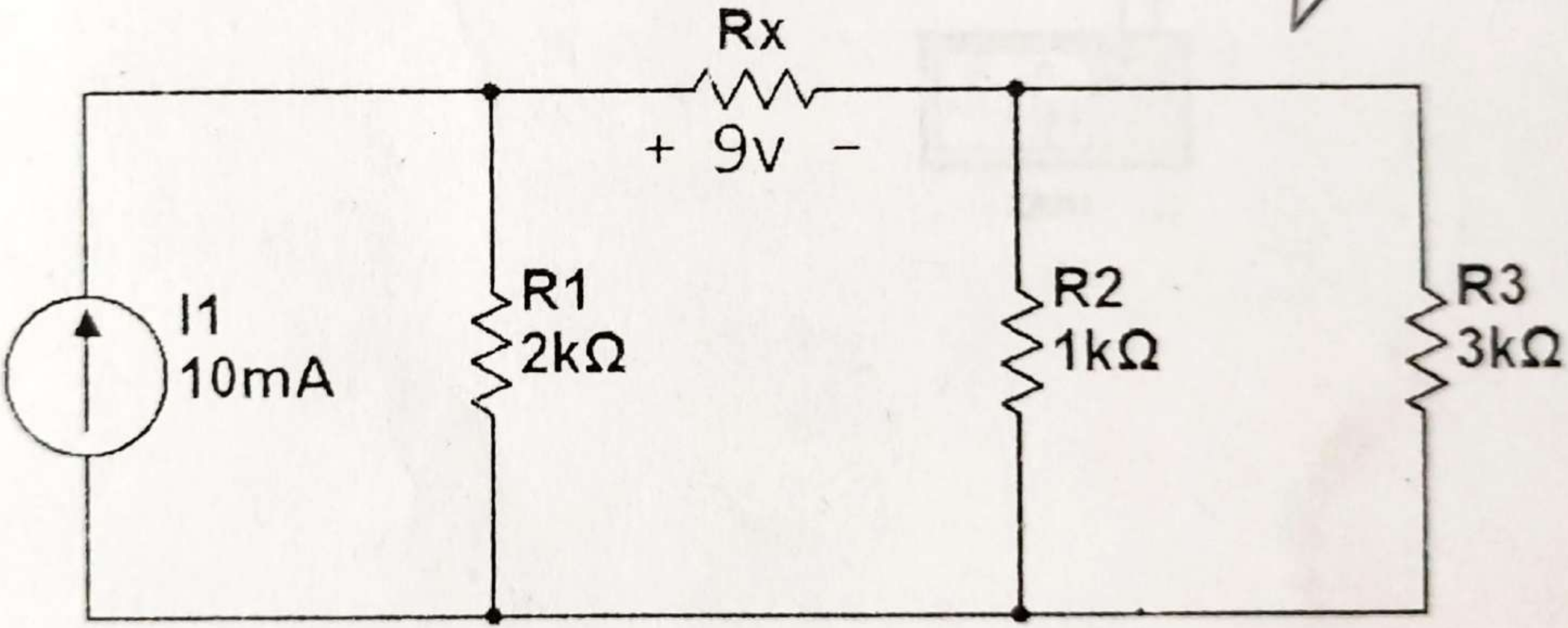
$P_{V_2} = (60V)(3A) = 180W$

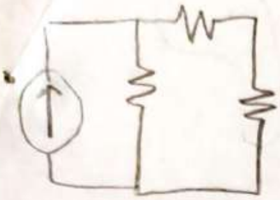
$P_{V_3} = (15V)(24A) = 360W$

$P_{V_4} = (45V)(15A) = 675W$

$P_{V_5} = (45V)(9A) = 405W$

5. Utilizando divisor de corriente, determine la potencia que absorbe la resistencia Rx.

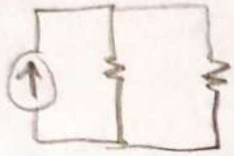




$Req = 750\,\Omega$

$$\frac{1}{\frac{1}{1000} + \frac{1}{3000}} = 750\,\Omega$$

$$V \frac{R_x}{R_x + Req}$$



Eq. 2
$750 + Rx$

$$I_{eq_2} = 10\,mA \frac{\frac{1}{R_x + 750}}{\frac{1}{2000} + \frac{1}{R_x + 750}}$$

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

$$I_{eq} = I_{Rx}$$

$$I_{eq.} = (10 \times 10^{-3}) \frac{\frac{1}{(R_x + 750)}}{\frac{R_x + 750 + 2000}{2000\,(750 + R_x)}}$$

$$= (10 \times 10^{-3}) \frac{2000\,(\cancel{750 + R_x})}{(\cancel{R_x + 750})(R_x + 750 + 2000)}$$

$$I_{Rx} = \frac{20}{R_x + 750 + 2000}$$

$$V = RI$$

$$I_{Rx} = \frac{V_{Rx}}{R_x}$$

$$\Rightarrow \frac{V_{Rx}}{R_x} = \frac{20}{R_x + 750 + 2000}$$

$$9\,(R_x + 750 + 2000) = 20R_x$$

$$9R_x + 6750 + 18000 = 20R_x$$

$$24750 = 11R_x$$

$$R_x = \frac{24750}{11} = 2250\,\Omega \Rightarrow I_{Rx} = \frac{9V}{2250\,\Omega} = 4 \times 10^{-3} = 4\,mA$$

$$P = Vi \qquad P = 9V(4\,mA) = \underline{0.036\,W}$$