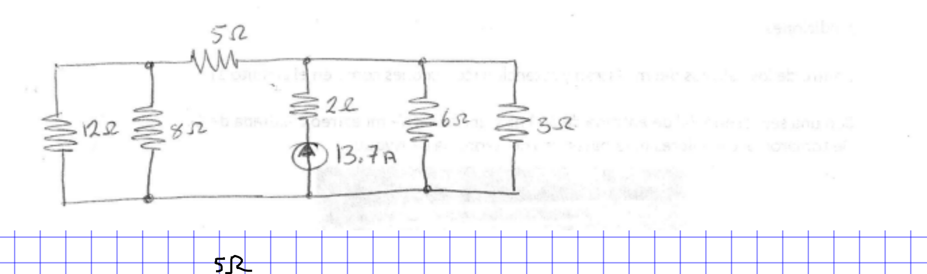
Clase 1 | 10.10.2022

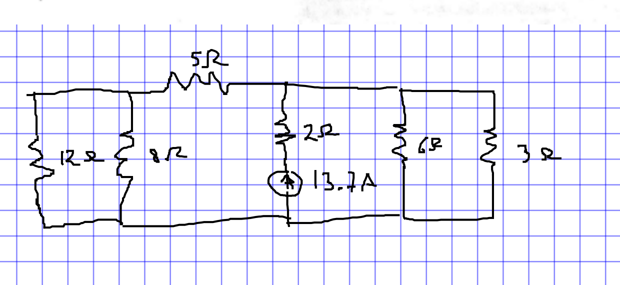
Guía de Circuitos de CA y CD

• Para el siguiente circuito encontrar las corrientes en todas las resistencias.



Sol:

a)



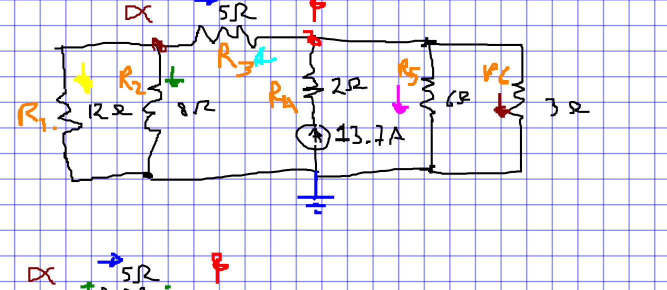
1)

$i_{R_1} =$ $\qquad$ $i_{R_4} = \underline{13.7\,A}$

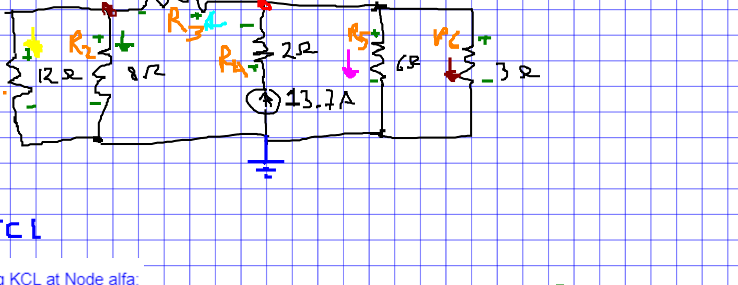
$i_{R_2} =$ $\qquad$ $i_{R_5} =$

$i_{R_3} =$ $\qquad$ $i_{R_6} =$

2)



3)



4) KCL

Applying KCL at Node alfa

M.C.

12	8	5	2
6	4	5	2
3	2	5	2
3	1	5	3
1		5	5
		1	

$>4 >24 >120$

$-i_{R_1} - i_{R_2} - i_{R_3} = 0$

$-\frac{V_\alpha}{R_1} - \frac{V_\alpha}{R_2} - \frac{V_\alpha - V_\beta}{R_3} = 0$

$-\frac{V_\alpha}{12} - \frac{V_\alpha}{8} - \frac{V_\alpha - V_\beta}{5} = 0$

$-10V_\alpha - 15V_\alpha - 24V_\alpha + 24V_\beta = 0$

$-49V_\alpha + 24V_\beta = 0 \cdots (1)$

Applying KCL at Node beta

$-i_{R_3} + i_{R_4} - i_{R_5} - i_{R_6} = 0$

$-\frac{V_\beta - V_\alpha}{R_3} - \frac{V_\beta}{R_5} - \frac{V_\beta}{R_6} = -13.7\,A$

$-\frac{V_\beta - V_\alpha}{5} - \frac{V_\beta}{6} - \frac{V_\beta}{3} = -13.7\,A$

$-6V_\beta + 6V_\alpha - 5V_\beta - 10V_\beta = -411\,V$

$6V_\alpha - 21V_\beta = -411V \cdots (2)$

Por sustitución

De (1):

$V_\alpha = \frac{24V_\beta}{49} \cdots (3)$

$6\left(\frac{24V_\beta}{49}\right) - 21V_\beta = -411V$

$V_\beta = \frac{-411V}{\left(\frac{144}{49} - 21\right)} = \underline{22.75V}$

$V_\alpha = \frac{24}{49}(22.75V) = \underline{11.14V}$

Applying Ohm's Law

$i_{R_1} = \frac{V_\alpha}{R_1} = \frac{11.14V}{12\Omega} = \underline{0.92\,A}$

$i_{R_2} = \frac{V_\alpha}{R_2} = \frac{11.14V}{8} = \underline{1.39\,A}$

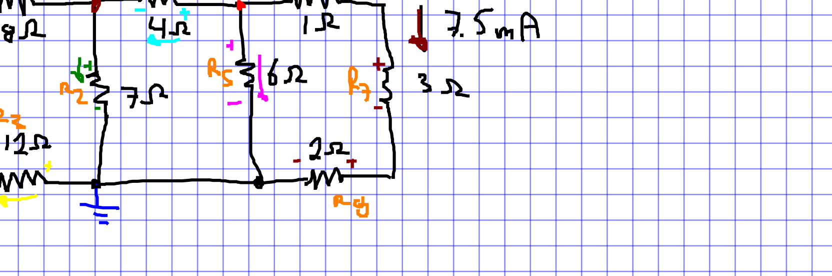
$i_{R_3} = \frac{V_\alpha - V_\beta}{R_3} = \frac{11.14V - 22.75V}{5} = \underline{-2.32\,A}$

$i_{R_4} = \underline{13.7\,A}$

$i_{R_5} = \frac{V_\beta}{R_5} = \frac{22.75V}{6} = \underline{3.79\,A}$

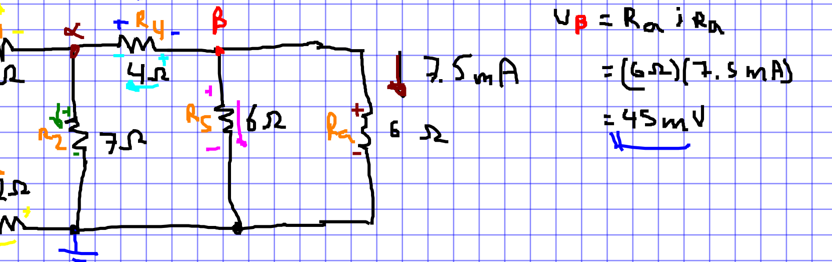
$i_{R_6} = \frac{V_\beta}{R_6} = \frac{22.75V}{3} = \underline{7.58\,A}$

• Para el siguiente circuito encuéntrese la fuente de Voltaje Vs la cual da como resultado una corriente de 7.5mA en el resistor de 3Ω.



Sol:

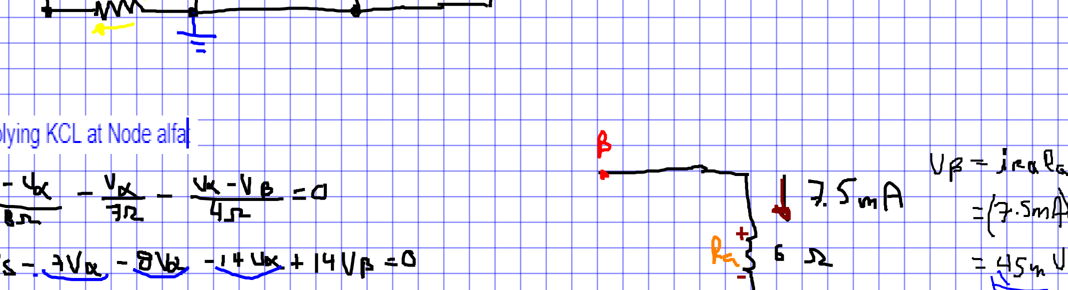
a)



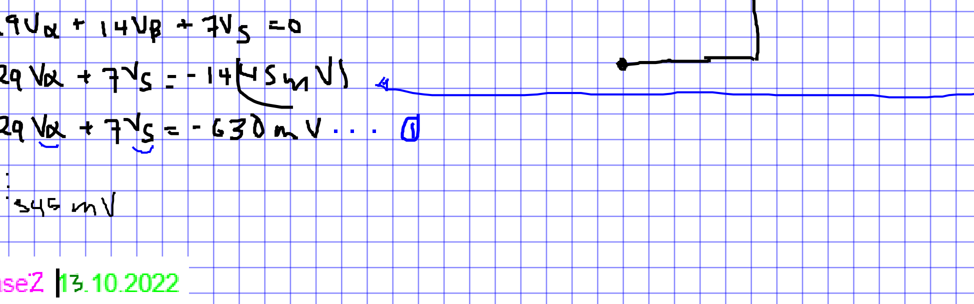
1) $V_s = ?$

$i_{3\Omega} = 7.5mA$

2)



3)



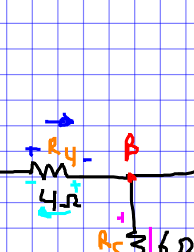
$V_\beta = R_\alpha i_{R_\alpha}$

$= (6\Omega)(7.5mA)$

$= \underline{45mV}$

4)

Applying KCL at Node alfa



$V_\beta = i_{R_\alpha} R_\alpha$

$= (7.5mA)(6\Omega)$

$= 45mV$

$\frac{V_s - V_\alpha}{8\Omega} - \frac{V_\alpha}{7\Omega} - \frac{V_\alpha - V_\beta}{4\Omega} = 0$

$7V_s - 7V_\alpha - 8V_\alpha - 14V_\alpha + 14V_\beta = 0$

$-29V_\alpha + 14V_\beta + 7V_s = 0$

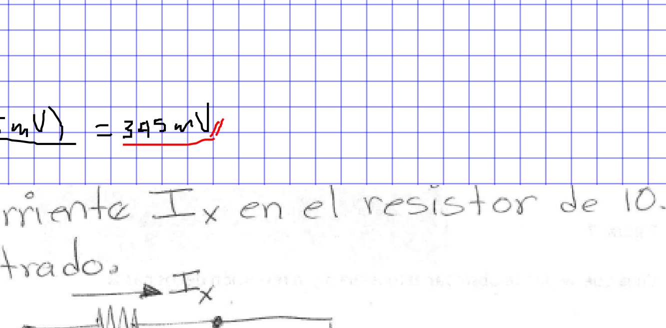
$-29V_\alpha + 7V_s = -14(45mV)$

$-29V_\alpha + 7V_s = -630mV \cdots (1)$

345mV

Clase2 | 13.10.2022

Applying KCL at Node Beta



$-i_{R_4} - i_{R_5} - 7.5mA = 0$

$-\frac{V_\beta - V_\alpha}{4\Omega} - \frac{V_\beta}{6\Omega} = 7.5mA$

$-3V_\beta + 3V_\alpha - 2V_\beta = 90mA$

$3V_\alpha - 5V_\beta = 90mV$

$3V_\alpha = 90mV + 225mV$

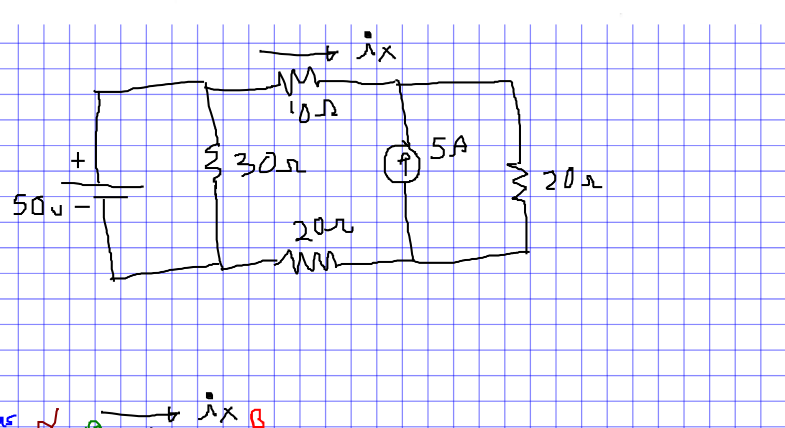
$V_\alpha = \frac{315mV}{3} = \underline{105mV}$

De 1:

$V_s = \frac{-630mV + 29V_\alpha}{7}$

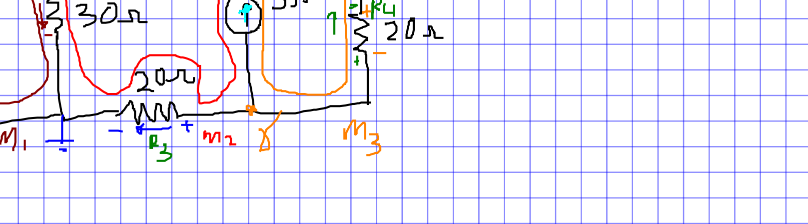
$= \frac{-630mV + 29(105mV)}{7} = \underline{345mV}$

• Obténgase la corriente I_x en el resistor de 10Ω del circuito mostrado.



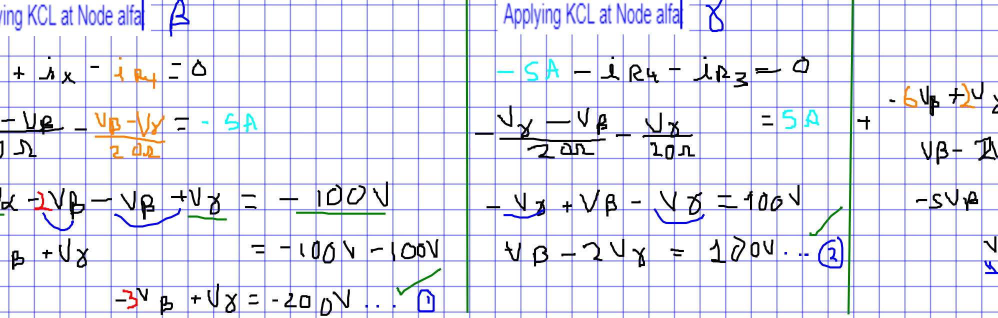
Sol:

a)



1) $i_x = ?$

2) Etiquetamos



3) Red. (1)

$V_\alpha = 50V$

4)

Applying KCL at Node alfa β

$5A + i_x - i_{R_3} = 0$

$\frac{V_\alpha - V_\beta}{10\Omega} - \frac{V_\beta - V_\gamma}{20\Omega} = -5A$

$2V_\alpha - 2V_\beta - V_\beta + V_\gamma = -100V$

$-3V_\beta + V_\gamma = -100V - 100V$

$-3V_\beta + V_\gamma = -200V \cdots (1)$

Applying KCL at Node alfa γ

$-5A - i_{R_4} - i_{R_3} = 0$

$\frac{V_\gamma - V_\beta}{20\Omega} - \frac{V_\gamma}{20\Omega} = 5A$

$-V_\gamma + V_\beta - V_\gamma = 100V$

$V_\beta - 2V_\gamma = 100V \cdots (2)$

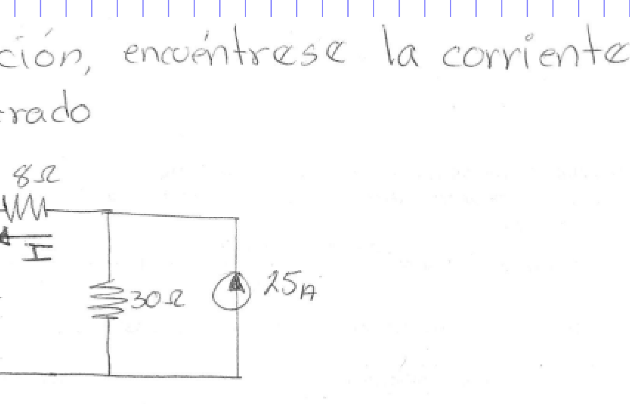
$-6V_\beta + 2V_\gamma = -400V$

$V_\beta - 2V_\gamma = 100V$

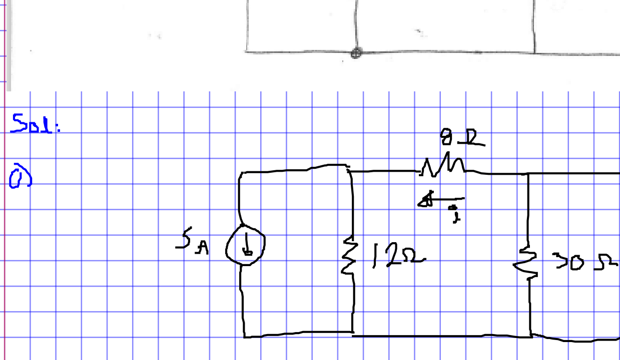
$-5V_\beta = -300V$

$\underline{V_\beta = 60V}$

$i_x = \frac{V_\alpha - V_\beta}{10\Omega} = \frac{(50 - 60)V}{10\Omega} = \underline{-1A}$

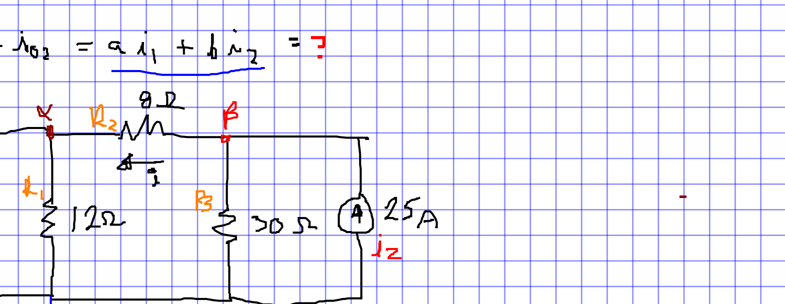


Comp.



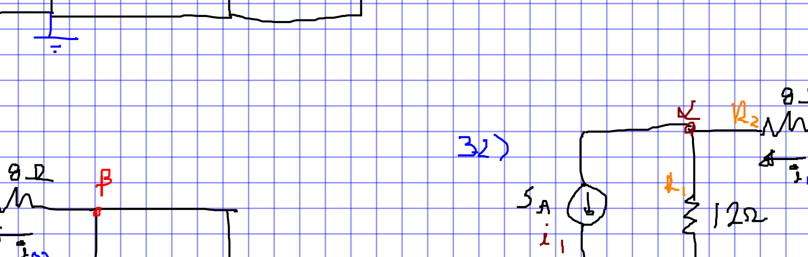
P4

• Usando superposición, encuéntrese la corriente I del circuito mostrado



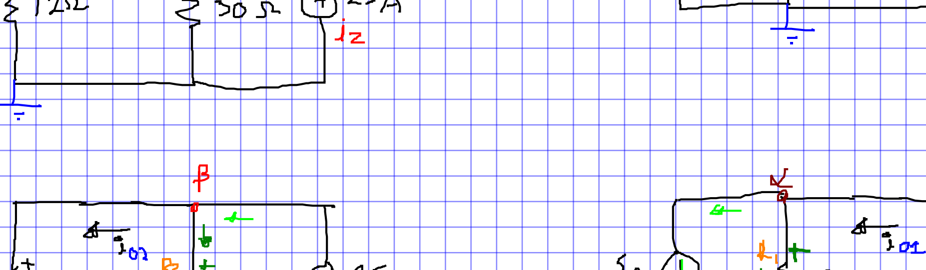
Sol:

a)



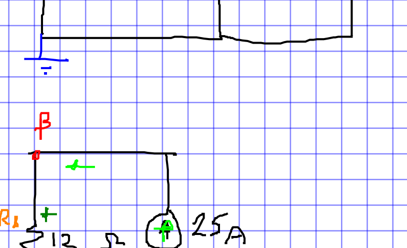
1) $i = i_{01} + i_{02} = a i_1 + b i_2 = ?$

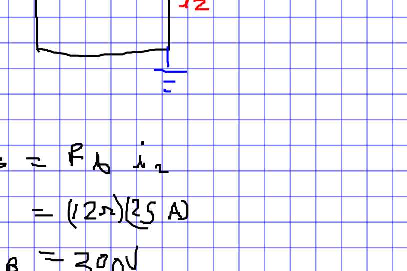
2)

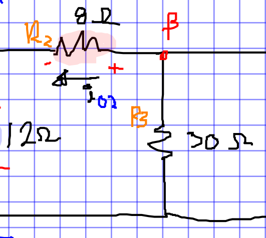


3) Red

3.1)



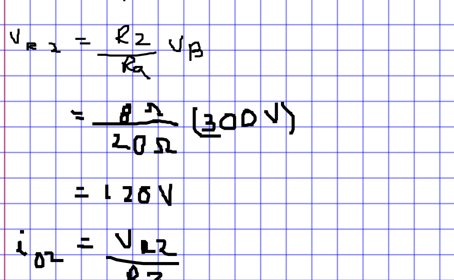




$V_\beta = R_b i_2$

$= (12\Omega)(25A)$

$V_\beta = 300V$



Por divisor de voltaje:

$V_x = \frac{R_x}{R_T} V_T$

$V_{R_2} = \frac{R_2}{R_a} V_\beta$

$= \frac{8\Omega}{20\Omega}(300V)$

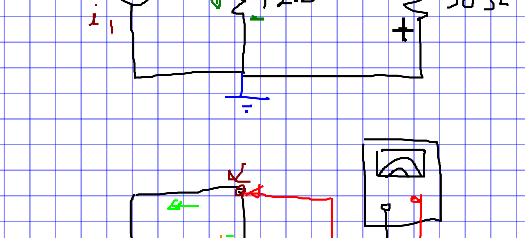
$= 120V$

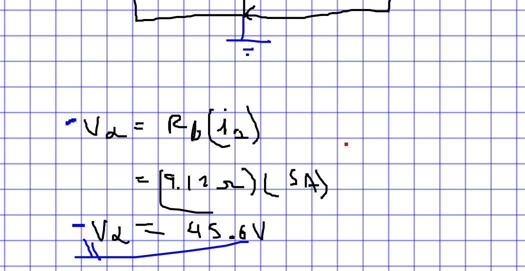
$i_{02} = \frac{V_{R_2}}{R_2}$

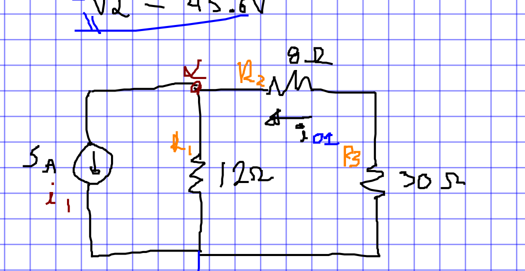
$= \frac{120V}{8\Omega}$

$i_{02} = 15A$

3.2)



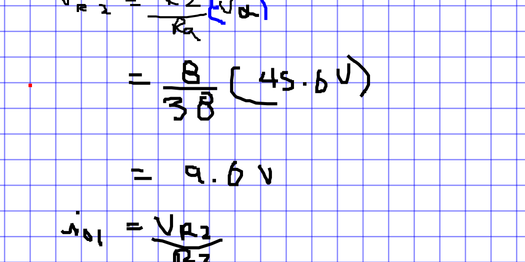




$V_\alpha = R_b(i_1)$

$= (9.12\Omega)(5A)$

$V_\alpha = 45.6V$



Por divisor de voltaje:

$V_{R_2} = \frac{R_2}{R_a}(V_\alpha)$

$= \frac{8}{38}(45.6V)$

$= 9.6V$

$i_{01} = \frac{V_{R_2}}{R_2}$

$= \frac{9.6V}{8\Omega}$

$i_{01} = 1.2A$

$i = i_{01} + i_{02} = 1.2A + 15A = \underline{16.2A}$

Comp.