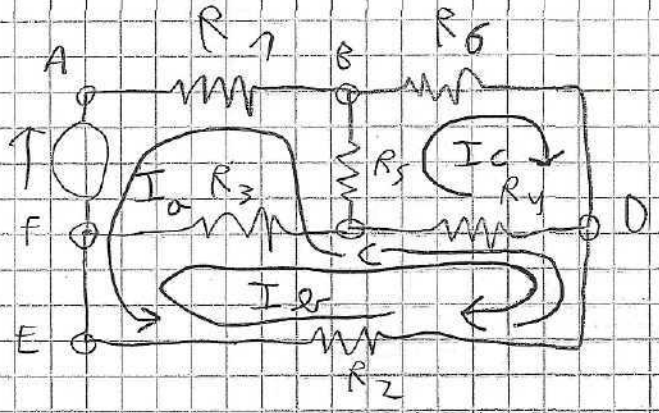
HAGGE LUCAS | 02-090027-4 | FECHA: | HOJA:

Capitulo 3 guia de ejercicios

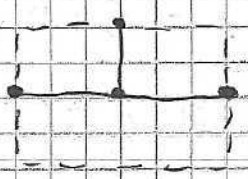
3.7)



1) Nodos efectivos: 4
Ramas efectivas: 6
Nodos totales: 5
Ramas totales: 7
(no se contabilizaron nodos y ramas ficticios)

2)

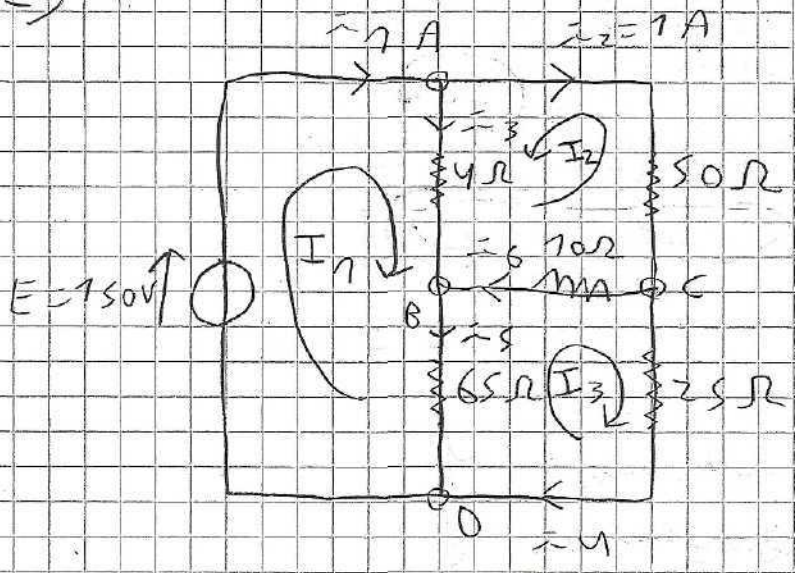
3)



4)

5) Para que dos mallas sean LI, deben diferir en al menos una rama, en este caso cada malla contiene una rama de forma exclusiva.

3.2)



M1) $150V = 4\Omega(I_1 + I_2) + 65\Omega(I_1 -$

M2) $0 = 10\Omega(I_2 + I_3) + 50\Omega I_2$

$+ 4\Omega(I_1 + I_2)$

M3) $0 = 25\Omega I_3 + 65\Omega(I_3 - I_1)$

$+ 10\Omega(I_2 + I_3)$

$I_3 = 0,65 I_1 - 0,1 I_2$

$I_2 = -0,156 I_3 - 0,0625 I_1$

$I_2 = -0,166 I_1$

NOTA:

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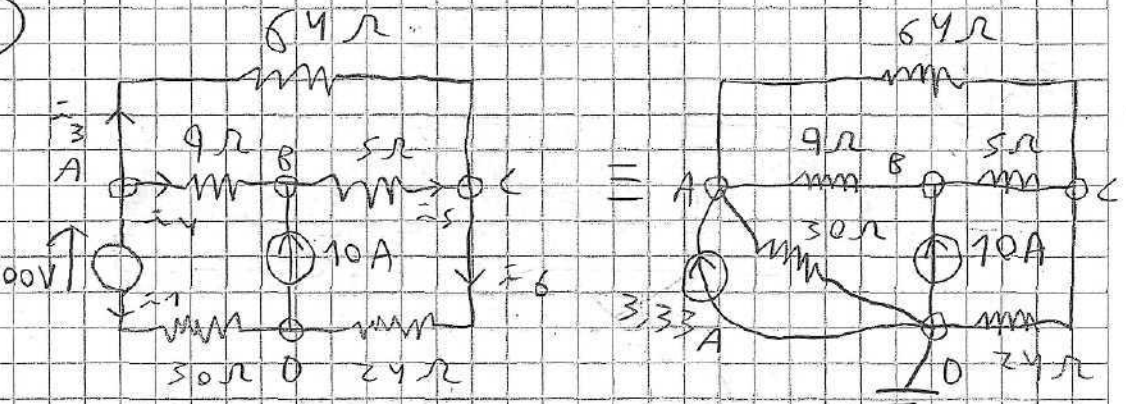
$$150V = I_1 \cdot 69\Omega + 4\Omega I_2 - 65\Omega I_3$$

$$150V = I_1 \cdot 69\Omega - 0{,}664\Omega I_1 - 42{,}25\Omega I_1 - 1{,}079\Omega I_1$$

$I_1 = 6A$
$I_2 = -1A$
$I_3 = 4A$

3.3)



$$\begin{pmatrix} 3{,}33A \\ 10A \\ 0A \end{pmatrix} = \begin{pmatrix} \frac{1}{9\Omega} + \frac{1}{30\Omega} + \frac{1}{64\Omega} & -\frac{1}{9\Omega} & -\frac{1}{64\Omega} \\ -\frac{1}{9\Omega} & \frac{1}{9\Omega} + \frac{1}{5\Omega} & -\frac{1}{5\Omega} \\ -\frac{1}{64\Omega} & -\frac{1}{5\Omega} & \frac{1}{64\Omega} + \frac{1}{5\Omega} + \frac{1}{24\Omega} \end{pmatrix} \begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix}$$

$$V_A = \frac{\Delta a}{\Delta} \qquad V_B = \frac{\Delta b}{\Delta}$$

$$V_C = \frac{\Delta c}{\Delta}$$

NOTA:

$$\Delta = 2,46\ 10^{-3}\ \frac{1}{\Omega^3}$$

$$\Delta_a = 0,45\ \frac{A}{\Omega^2} \qquad \Delta_b = 0,515\ \frac{A}{\Omega^2}$$

$$\Delta_c = 0,427\ \frac{A}{\Omega^2}$$

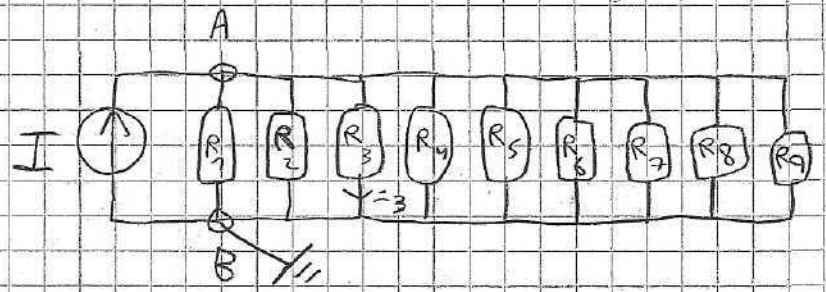
$$P_{E_1} = -276,33\ W$$

$$V_A = 182,9\ V \qquad V_B = 209,34\ V$$

$$V_C = 173,57\ V \qquad V_0 = 0$$

$$P_{I_2} = 2093,4\ W$$

3.4)



$$i_3 = \frac{V_{AB}}{R_3} \qquad V_A - V_B = V_{AB}$$

$$V_B = 0$$

$$(I) = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5} + \frac{1}{R_6} + \frac{1}{R_7} + \frac{1}{R_8} + \frac{1}{R_9}\right)(V_A)$$

$$i_3 = \frac{I}{R_3\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5} + \frac{1}{R_6} + \frac{1}{R_7} + \frac{1}{R_8} + \frac{1}{R_9}\right)}$$

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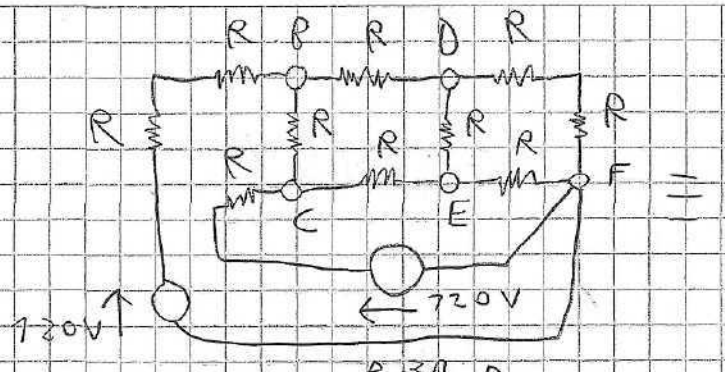
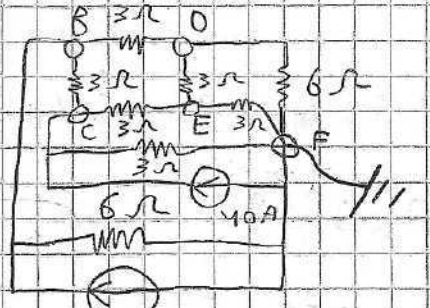
3.5)





$R = 3\Omega$

$V_F = 0$

$$\begin{pmatrix} 20A \\ 40A \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} \frac{1}{3\Omega}+\frac{1}{3\Omega}+\frac{1}{6\Omega} & -\frac{1}{3\Omega} & -\frac{1}{3\Omega} & 0 \\ -\frac{1}{3\Omega} & \frac{1}{3\Omega}+\frac{1}{3\Omega}+\frac{1}{3\Omega} & 0 & -\frac{1}{3\Omega} \\ -\frac{1}{3\Omega} & 0 & \frac{1}{3\Omega}+\frac{1}{3\Omega}+\frac{1}{6\Omega} & -\frac{1}{3\Omega} \\ 0 & -\frac{1}{3\Omega} & -\frac{1}{3\Omega} & \frac{1}{3\Omega}+\frac{1}{3\Omega}+\frac{1}{3\Omega} \end{pmatrix} \begin{pmatrix} V_B \\ V_C \\ V_D \\ V_E \end{pmatrix}$$

$V_B = \frac{\Delta_B}{\Delta}$ $\quad \Delta = \frac{256}{81}\frac{1}{\Omega^4}$

$V_C = \frac{\Delta_C}{\Delta}$ $\quad \Delta_B = \frac{640}{27}\frac{A}{\Omega^3}$

$\Delta_C = \frac{680}{27}\frac{A}{\Omega^3}$

NOTA:

$$V_B = \frac{960}{13} = 73,84\,V$$

$$V_C = \frac{1020}{13} = 78,46\,V$$

$$V_A = 120\,V$$

$$V_{AC} = 41,54\,V$$

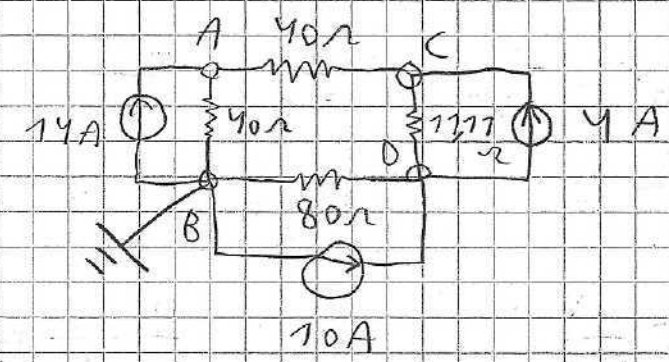
$$\dot{z}_{AC} = 13,84\,A \qquad V_{AB} = 46,16\,V$$

$$\dot{z}_{AB} = 7,69\,A$$

$$\boxed{\dot{z}_{FA} = 27,53\,A}$$

$$\boxed{P_E = 2583,6\,W}$$

3.6)



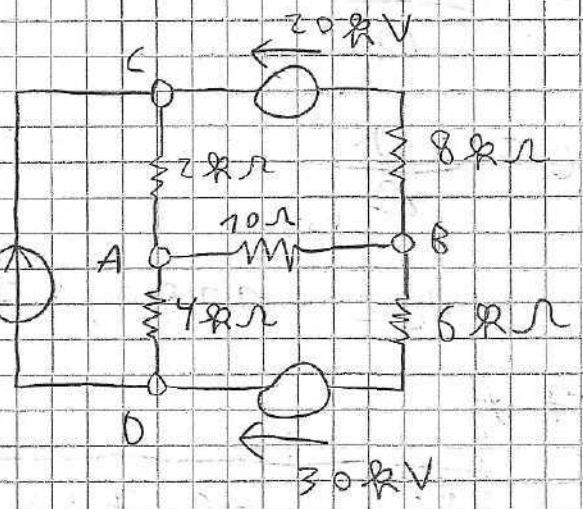
$$V_B = 0$$

$$\begin{pmatrix} 14A \\ 4A \\ 10A - 4A \end{pmatrix} = \begin{pmatrix} \frac{1}{40\Omega} + \frac{1}{40\Omega} & -\frac{1}{40\Omega} & 0 \\ -\frac{1}{40\Omega} & \frac{1}{40\Omega} + \frac{1}{11,11\Omega} & -\frac{1}{11,11\Omega} \\ 0 & -\frac{1}{11,11\Omega} & \frac{1}{80\Omega} + \frac{1}{11,11\Omega} \end{pmatrix} \begin{pmatrix} V_A \\ V_C \\ V_D \end{pmatrix}$$

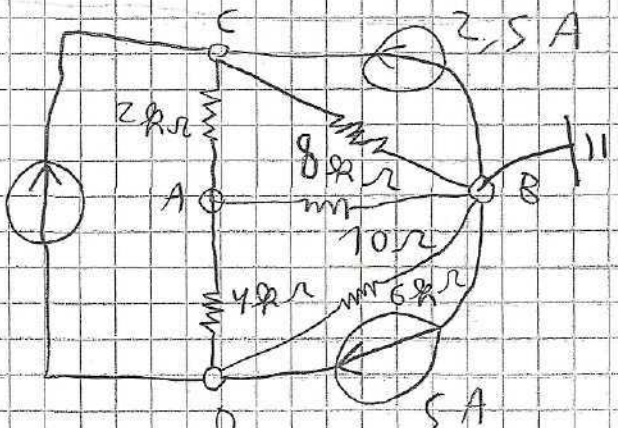
NOTA:

$$V_A = \frac{\Delta a}{\Delta} \qquad V_C = \frac{\Delta c}{\Delta} \qquad V_0 = \frac{\Delta d}{\Delta}$$

3.7)



$$g = \frac{S}{\Omega}$$



$$V_B = 0$$

$$I_3 = \frac{5 V_A}{\Omega}$$

$$\begin{pmatrix} V_A \\ V_C \\ V_0 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ I_3 + 2{,}5\,A \\ 5\,A - I_3 \end{pmatrix} = \begin{pmatrix} \frac{1}{4\,k\Omega} + \frac{1}{2\,k\Omega} + \frac{1}{10\Omega} & \frac{-1}{2\,k\Omega} & \frac{-1}{4\,k\Omega} \\ \frac{-1}{2\,k\Omega} & \frac{1}{2\,k\Omega} + \frac{1}{8\,k\Omega} & 0 \\ -\frac{1}{4\,k\Omega} & 0 & \frac{1}{6\,k\Omega} + \frac{1}{4\,k\Omega} \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ 2{,}5A \\ 5A \end{pmatrix} = \begin{pmatrix} \frac{1}{4k\Omega} + \frac{1}{2k\Omega} + \frac{1}{10\Omega} & \frac{-1}{2k\Omega} & \frac{-1}{4k\Omega} \\ \frac{-1}{2k\Omega} & \frac{5}{\Omega} & \frac{1}{2k\Omega} + \frac{1}{8k\Omega} \\ \frac{-1}{4k\Omega} + \frac{5}{\Omega} & 0 & \frac{1}{6k\Omega} + \frac{1}{4k\Omega} \end{pmatrix} \begin{pmatrix} V_A \\ V_C \\ V_D \end{pmatrix}$$

$$V_A = \frac{D_a}{D} \qquad V_C = \frac{D_c}{D}$$

$$V_D = \frac{D_d}{D}$$

$V_A =$ $V_C =$

$V_D =$

$V_{AB} =$

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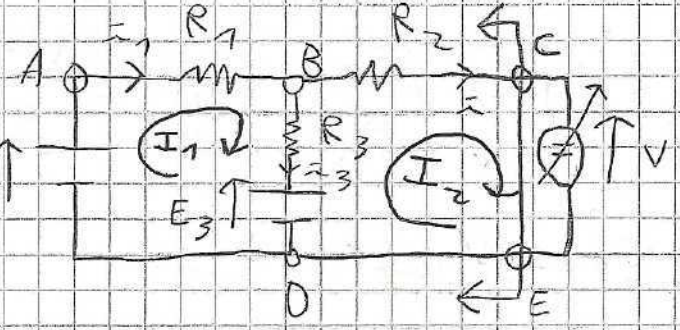
3.8)

1)



$$E_1 - E_3 = R_1 I_1 + R_3 (I_1 - I_2)$$

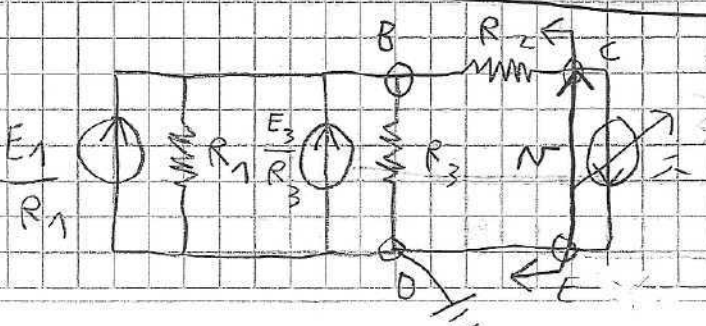
$$E_3 - V = R_2 I_2 + R_3 (I_2 - I_1)$$

$$I_1 = \frac{E_1 - E_3 + R_3 I_2}{(R_1 + R_3)} \qquad I_2 = i$$

$$V = E_3 - R_2 I_2 - R_3 I_2 + R_3 \left(\frac{E_1 - E_3 + R_3 I_2}{R_1 + R_3} \right)$$

$$V = E_3 + \frac{R_3 E_1 - R_3 E_3}{R_1 + R_3} + i \left(-R_2 - R_3 + \frac{R_3^2}{R_1 + R_3} \right)$$

2)



NOTAS:

$$\begin{bmatrix} \frac{E_1}{R_1} + \frac{E_3}{R_3} - i \end{bmatrix} = \begin{bmatrix} \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1} \end{bmatrix} \begin{bmatrix} V_B \end{bmatrix}$$

$V_B = 0 \rightarrow V_E = V_0 \rightarrow V_E = 0$

$V_{CE} = V_C - V_E = V_C = v$

$V_C + R_2 \cdot i = V_B$

$$v = \frac{\frac{E_1}{R_1} + \frac{E_3}{R_3} - i}{\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}} - R_2 i$$

$$v = -\frac{E_1}{R_1\left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}\right)} - \frac{E_3}{R_3\left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}\right)}$$

$$= i\left(\frac{-1}{\left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}\right)} - R_2\right)$$

$$i = \frac{-\frac{E_1}{R_1} - \frac{E_3}{R_3}}{\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}} + \frac{v}{\frac{-1}{\left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_1}\right)} - R_2}$$

NOTA:

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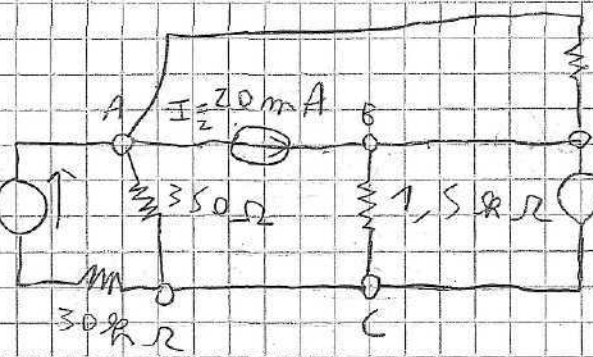
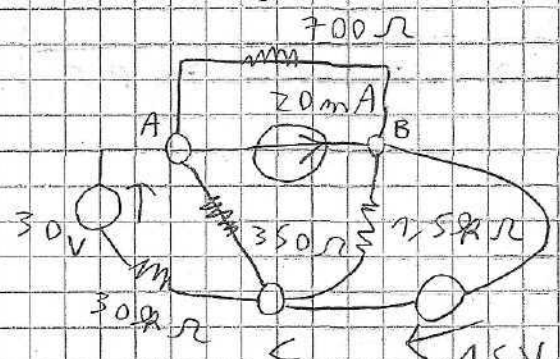
3.9)

a)





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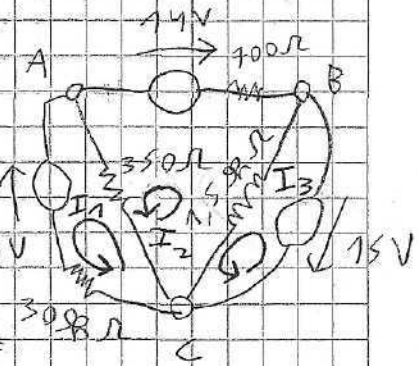
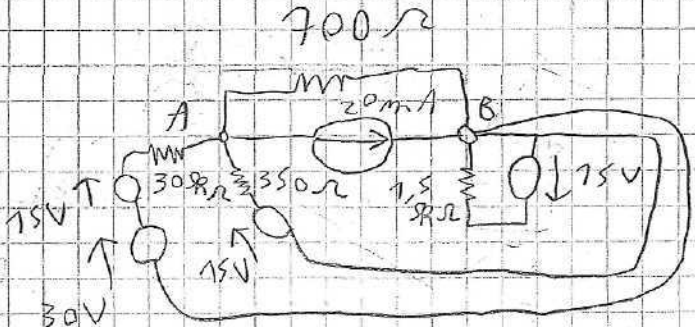


$$\begin{pmatrix} -30V \\ -14V \\ -15V \end{pmatrix} = \begin{pmatrix} 30k\Omega + 350\Omega & -350\Omega & 0 \\ -350\Omega & 350\Omega + 1,5k\Omega + 700\Omega & -1,5k\Omega \\ 0 & -1,5k\Omega & 1,5k\Omega \end{pmatrix} \begin{pmatrix} I_1 \\ I_2 \\ I_3 \end{pmatrix}$$

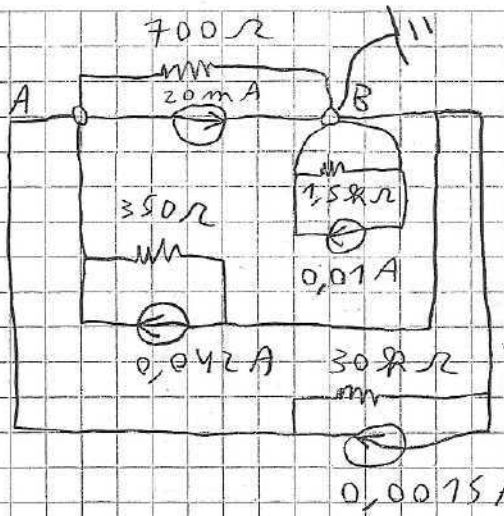
$I_1 = -7,3mA \quad I_2 = -28mA$

$I_3 = -38mA$

b)



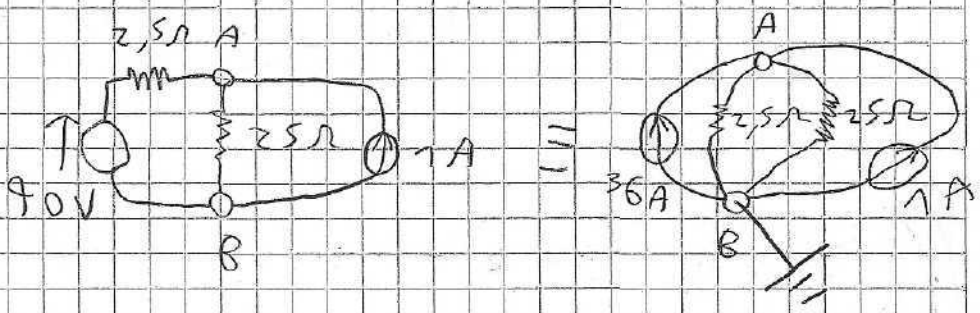
NOTA:



$V_A = 5,44V$

$$0,0235A = \left(\frac{1}{700\Omega} + \frac{1}{350\Omega} + \frac{1}{30k\Omega}\right) \cdot V_A$$

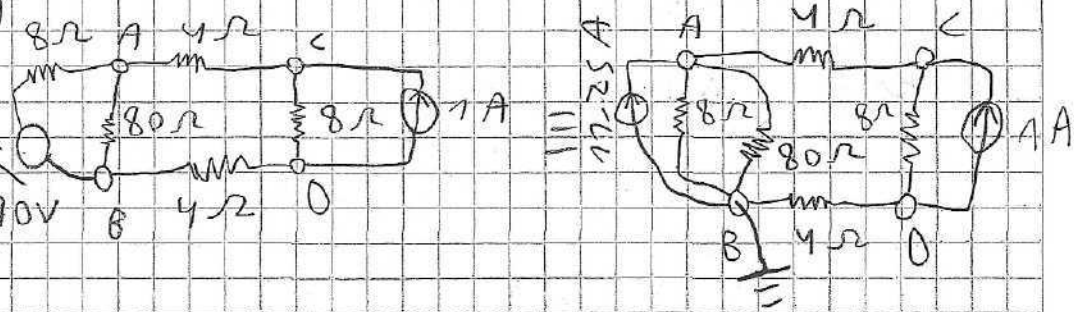
3.70)



$$[36A + 1A] = \left[\frac{1}{2,5\Omega} + \frac{1}{25\Omega}\right] [V_A]$$

$$\boxed{84,09V = V_A} \qquad V_B = 0$$

3.77)



$V_B = 0$

NOTA:

$$\begin{bmatrix} 11{,}25\,A \\ 1\,A \\ -1\,A \end{bmatrix} = \begin{bmatrix} \frac{1}{8\Omega} + \frac{1}{80\Omega} + \frac{1}{4\Omega} & -\frac{1}{4\Omega} & 0 \\ -\frac{1}{4\Omega} & \frac{1}{4\Omega} + \frac{1}{8\Omega} & -\frac{1}{8\Omega} \\ 0 & -\frac{1}{8\Omega} & \frac{1}{4\Omega} + \frac{1}{8\Omega} \end{bmatrix} \begin{bmatrix} V_A \\ V_C \\ V_D \end{bmatrix}$$

NOTA: