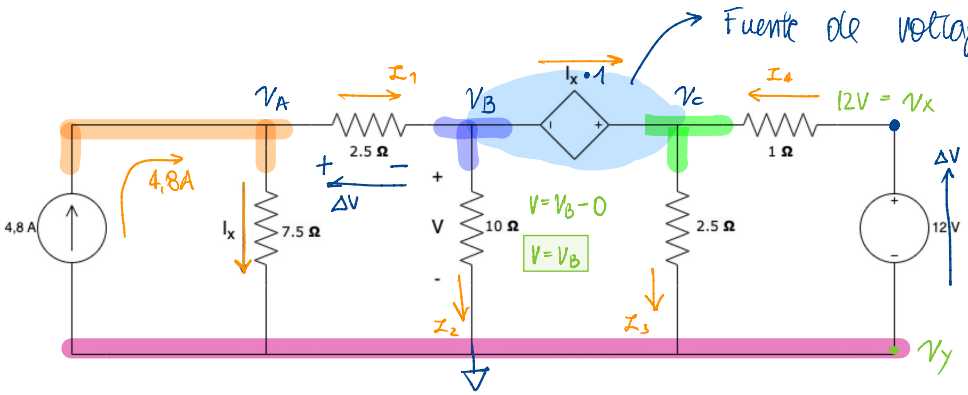
Problema 3

Considerando el circuito de la Figura 3 utilice el médodo de voltajes de nodos para calcular el voltaje V mostrado en el circuito.



N° ecuaciones: n° nodos esenciales − 1 + n° fuentes dependientes = 4 − 1 + 1 = 4

LCK$_A$: $4{,}8A - \frac{V_A}{7.5} - \left(\frac{V_A - V_B}{2.5}\right) = 0$

$$-V_A\left(\frac{1}{7.5} + \frac{1}{2.5}\right) + V_B\left(\frac{1}{2.5}\right) = -4{,}8 \quad /\cdot(-1)$$

$$\boxed{\frac{8}{15}V_A - 0.4\,V_B = 4.8} \quad (1)$$

LCK$_{SN}$: $+\left(\frac{V_A - V_B}{2.5}\right) - \left(\frac{V_B}{10}\right) - \left(\frac{V_C}{2.5}\right) + \left(\frac{12 - V_C}{1}\right) = 0$

$$V_A\left(\frac{1}{2.5}\right) - V_B\left(\frac{1}{2.5} + \frac{1}{10}\right) - V_C\left(\frac{1}{2.5} + 1\right) + 12 = 0$$

$$\boxed{0.4V_A - 0.5V_B - 1.4V_C = -12} \quad (2)$$

E$_{SN}$: $V_C - V_B = V_F = I_X \Rightarrow \boxed{V_C - V_B = I_X}$ (3)

$V_C - V_B = \frac{V_A}{7.5} \Rightarrow \boxed{V_C = \frac{V_A}{7.5} + V_B}$ (*)

E$_{FD}$: $\boxed{I_X = \frac{V_A}{7.5}}$ (4)

(*) en (2): $0.4V_A - 0.5V_B - 1.4\left(\frac{V_A}{7.5} + V_B\right) = 0$

$$\vdots$$

$$V_A = \frac{75}{16}(1.9V_B - 12)$$

Remplazando en (1):

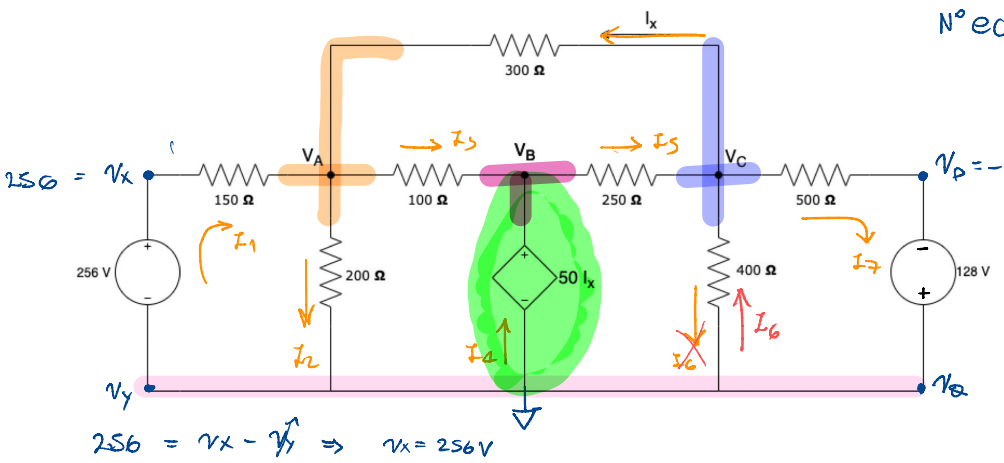
$$\frac{8}{15}\cdot\frac{75}{16}(1.9V_B - 12) - 0.4V_B = 4.8$$

$$\vdots$$

$$\boxed{V_B = V = 8\,[V]}$$

Problema 4

Calcule la potencia disipada por la resistencia de 300[Ω] en el circuito de la Figura 4.



N° ecuaciones : 4

$V_p = -128V$

$128 = V_0 - V_p \Rightarrow V_p = -128\,[V]$

$256 = V_x - V_y \Rightarrow V_x = 256\,V$

LCK V_A : $+\left(\frac{256 - V_A}{150}\right) - \left(\frac{V_A}{200}\right) - \left(\frac{V_A - V_B}{100}\right) + \left(\frac{V_C - V_A}{300}\right) = 0$ | E_{FD} : $\frac{V_C - V_A}{300} = I_x$ (1)

$$-V_A\left(\frac{1}{150} + \frac{1}{200} + \frac{1}{100} + \frac{1}{300}\right) + V_B\left(\frac{1}{100}\right) + V_C\left(\frac{1}{300}\right) + \frac{256}{150} = 0$$

$$-\frac{1}{40}V_A + \frac{1}{100}V_B + \frac{1}{300}V_C + \frac{256}{150} = 0 \quad / \cdot 600$$

$$-15V_A + 6V_B + 2V_C = -1024 \quad (2)$$

$i_1 = \frac{256 - 62.5}{150} > 0$

$i_2 \geq 0$

$i_3 = \frac{V_A - V_B}{100} =$

:

$I_6 = \frac{V_C}{400} = \frac{-8}{400} < 0$

LCK V_C : $+\left(\frac{V_B - V_C}{250}\right) - \left(\frac{V_C}{400}\right) - \left(\frac{V_C - (-128)}{500}\right) - \left(\frac{V_C - V_A}{300}\right) = 0$ (+128)

$$+V_A\left(\frac{1}{300}\right) + V_B\left(\frac{1}{250}\right) - V_C\left(\frac{1}{250} + \frac{1}{400} + \frac{1}{500} + \frac{1}{300}\right) - \frac{128}{500} = 0$$

$$\frac{1}{300}V_A + \frac{1}{250}V_B - \frac{71}{6000}V_C - \frac{128}{500} = 0 \quad / \cdot 6000$$

$$20V_A + 24V_B - 71V_C = 1536 \quad (3)$$

$50I_x = V_B$ (4) $\rightarrow$ $50\left(\frac{V_C - V_A}{300}\right) = V_B$

$\frac{V_C - V_A}{6} = V_B \Rightarrow V_C - V_A = 6V_B$ (1.4)

$0 = V_A + 6V_B - V_C$

$3 \times 3 \cdot 3 \times 1$

$$\begin{pmatrix} -15 & 6 & 2 \\ 20 & 24 & -71 \\ 1 & 6 & -1 \end{pmatrix}\begin{pmatrix} V_A \\ V_B \\ V_C \end{pmatrix} = \begin{pmatrix} -1024 \\ 1536 \\ 0 \end{pmatrix}$$

G

$V_a = 62.5\,V$ | $V_0 = -11.75\,V$ | $V_c = -8$ | $I_x = -0.235\,A$

$P_{300\Omega} = i_x^2 \cdot 300 = 16,568\,W$