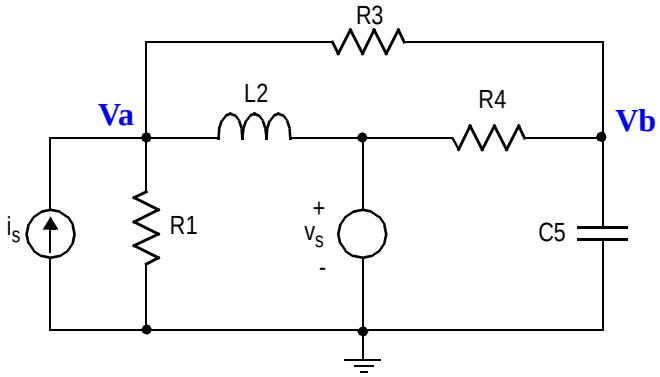
GEl-16132 Circuits
Corrigé du Test no. 2

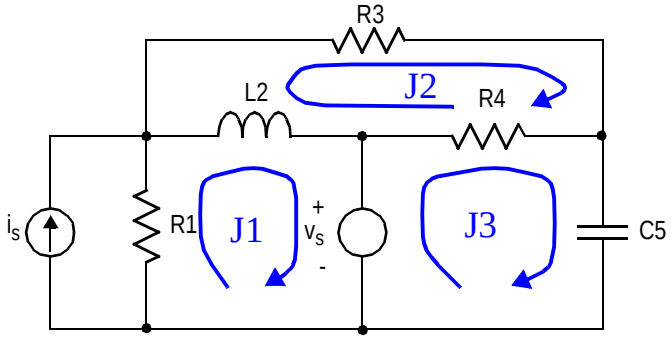
Question no.1

a) Méthode des noeuds



$$\begin{bmatrix} \frac{1}{R_1}+\frac{1}{R_3}+\frac{1}{L_2}\int dt & -\frac{1}{R_3} \\ -\frac{1}{R_3} & \frac{1}{R_3}+\frac{1}{R_4}+C_5\frac{d}{dt} \end{bmatrix} \begin{bmatrix} V_a \\ V_b \end{bmatrix} = \begin{bmatrix} i_s+\frac{1}{L_2}\int v_s dt \\ \frac{v_s}{R_4} \end{bmatrix}$$

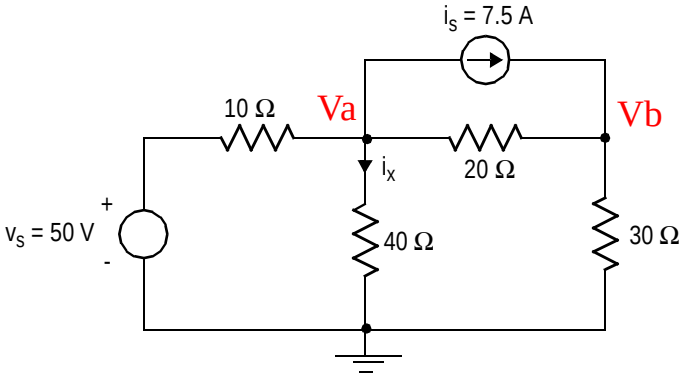
b) Méthode des mailles



$$\begin{bmatrix} R_1+L_2\frac{d}{dt} & -L_2\frac{d}{dt} & 0 \\ -L_2\frac{d}{dt} & R_3+R_4+L_2\frac{d}{dt} & -R_4 \\ 0 & -R_4 & R_4+\frac{1}{C_5}\int dt \end{bmatrix} \begin{bmatrix} J_1 \\ J_2 \\ J_3 \end{bmatrix} = \begin{bmatrix} R_1 i_s - v_s \\ 0 \\ v_s \end{bmatrix}$$

Question no.2

a) Méthode des noeuds



$$\begin{bmatrix} \frac{1}{10}+\frac{1}{40}+\frac{1}{20} & -\frac{1}{20} \\ -\frac{1}{20} & \frac{1}{20}+\frac{1}{30} \end{bmatrix} \begin{bmatrix} V_a \\ V_b \end{bmatrix} = \begin{bmatrix} \frac{50}{10}-7.5 \\ 7.5 \end{bmatrix}$$

$$\begin{bmatrix} 0.175 & -0.05 \\ -0.05 & 0.0833 \end{bmatrix} \begin{bmatrix} V_a \\ V_b \end{bmatrix} = \begin{bmatrix} -2.5 \\ 7.5 \end{bmatrix}$$

b) On calcule la tension V_a par la méthode Cramer:

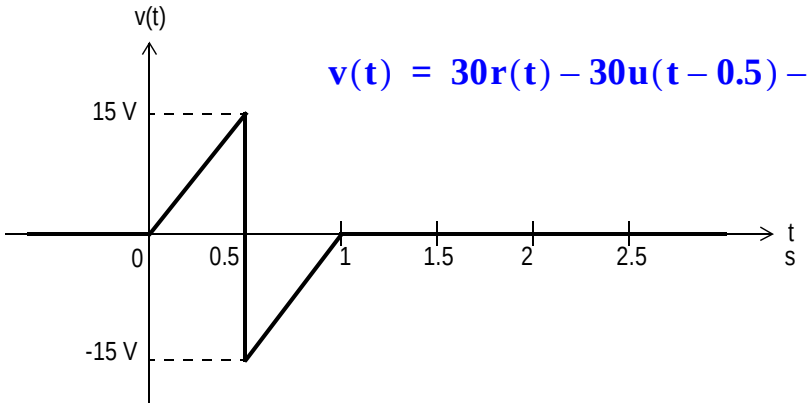
$$V_a = \frac{\begin{vmatrix} -2.5 & -0.05 \\ 7.5 & 0.0833 \end{vmatrix}}{\begin{vmatrix} 0.175 & -0.05 \\ -0.05 & 0.0833 \end{vmatrix}} = \frac{0.1667}{0.0121} = 13.8 \text{ V}$$

Alors, le courant i_x est égal à:

$$i_x = \frac{V_a}{40} = \frac{13.8}{40} = 0.345 \text{ A}$$

Question no.3

a)



$$v(t) = 30r(t) - 30u(t-0.5) - 30r(t-1)$$

b)