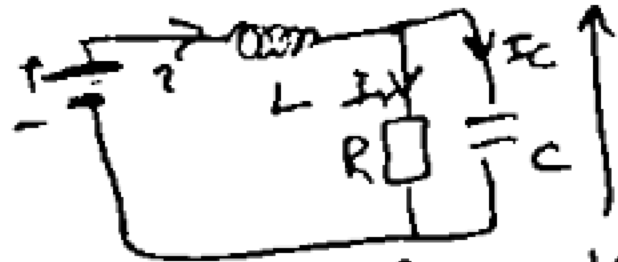
TP 1 : 

TD+ $\Rightarrow$ (1) **TD+**

1) la fonction du Transfère $\frac{V_s}{V_e} = \frac{V_c/V_R}{E}$?

On a :

$V_e = V_L + V_R = L \frac{di}{dt} + R i_r$ —— (1)

$I = I_R + I_C$ —— (2)

$V_R = V_C$ —— (3)

(1) $\Rightarrow V_e = L \frac{d}{dt}(I_R + I_C) + R i_r$

$V_e = L \frac{dI_R}{dt} + L \frac{dI_C}{dt} + R i_r$

3) $\Rightarrow R i_r = \frac{1}{C} \int i_C \cdot dt \Rightarrow$

$\boxed{I_C = RC \frac{di_r}{dt}}$ $\Rightarrow$ (4) $\Rightarrow$ (1) $\Rightarrow$

$V_e = L \frac{dI_R}{dt} + L\left(RC \frac{di_r}{dt}\right) + R i_r$

$V_e = LRC \frac{d^2 i_r}{dt^2} + L \frac{di_r}{dt} + R i_r$

Laplace

$V_e(p) = LRC\, i_r(p) p^2 + L i_r(p) p + R i_r(p)$ —— (T)

$V_s(p) = R i_r(p)$ $\rightarrow$ (6)

$$\frac{V_s(p)}{V_e(p)} = \frac{R \cancel{i_r(p)}}{LRC \cancel{i_r(p)} p^2 + L \cancel{i_r(p)} p + R \cancel{i_r(p)}}$$

$$\frac{V_s(p)}{V_e(p)} = \frac{R}{LRCp^2 + Lp + R}$$

AN : $(R = 2, L = \cancel{C = 1}, V = 1)$

$$\frac{V_s(p)}{V_e(p)} = \frac{\;\cdots\;}{2p^2 + p + 2}$$

2) l'equation d'etat du sys

(1) $\Rightarrow$

$\frac{di}{dt} = -\frac{R}{L} i_r + \frac{1}{L} V_e \rightarrow$ (1) (8)

On a : 4 $\Rightarrow$

$\frac{di_r}{dt} = \frac{1}{RC} i_C \rightarrow$ (4) *

(2) $\Rightarrow$

(3) $\Rightarrow v_e = L\frac{d}{dt}(i_r + i_c) + R i_r$

$v_e = L\frac{di_r}{dt} + L\frac{di_c}{dt} + R i_r$

mais (4) $\Rightarrow \frac{di_r}{dt} = \frac{1}{RC} i_c$ donc

$v_e = \frac{L i_c}{RC} + L\frac{di_c}{dt} + R i_r \Rightarrow$

$$\frac{di_c}{dt} = \frac{V_e}{L} - \frac{1}{RC} i_c - \frac{R}{L} i_r$$

$$\begin{cases} \frac{di}{dt} = -\frac{R}{L} i_r + \frac{1}{L} v_e \\ \frac{di_r}{dt} = \frac{1}{RC} i_c \\ \frac{di_c}{dt} = -\frac{R}{L} i_r - \frac{1}{RC} i_c + \frac{V_e}{L} \end{cases}$$

AN: $\dot{X} = \begin{bmatrix} 0 & -2 & 0 \\ 0 & 0 & \frac{1}{2} \\ 0 & -2 & -\frac{1}{2} \end{bmatrix}$ $B\begin{bmatrix} 2 \\ 0 \\ 2 \end{bmatrix}$ Just

~~Donc~~ Mais on pose : $\begin{cases} i(i_L) = x_1 \Rightarrow \dot{x}_1 = \frac{di}{dt} \\ i_r = x_2 \Rightarrow \dot{x}_2 = \frac{di_r}{dt} \\ i_c = x_3 \Rightarrow \dot{i}_c = \frac{di_c}{dt} \end{cases}$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & -\frac{R}{L} & 0 \\ 0 & 0 & \frac{1}{RC} \\ 0 & -\frac{R}{L} & -\frac{1}{RC} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} \frac{1}{L} \\ 0 \\ \frac{1}{L} \end{bmatrix} V_e.$$