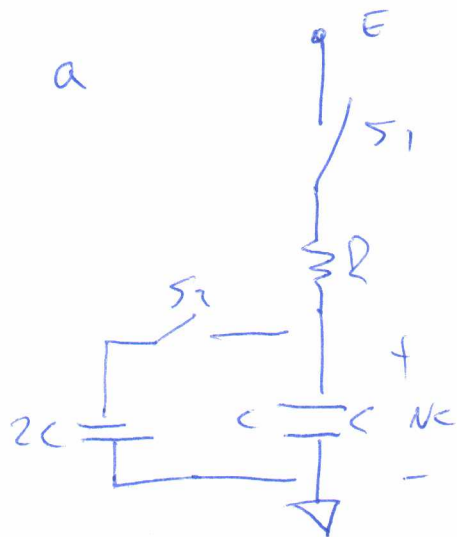


EXAMEN SISTEMAS LINEALES 2
JULIO 2016

Problema 3



TRAMO 1 $t \in [0, \tau]$

S_1 ON

S_2 OFF

$$\begin{cases} V_c(t) = E(1 - e^{-t/\tau}) \\ i_{S_2}(t) = 0 \end{cases}$$

$\forall t \in [0, \tau]$

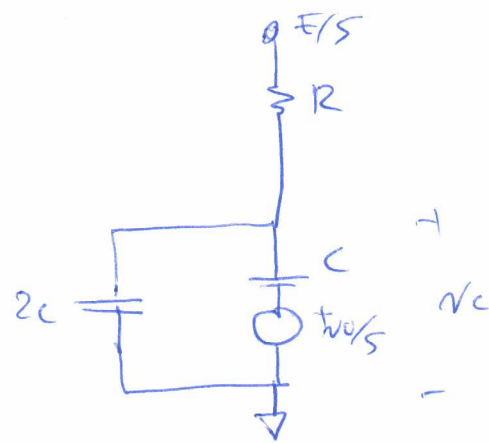
TRAMO 2 $t \in [\tau, +\infty)$

$$t' = t - \tau$$

DATO PREVIO

$$V_c(0^-) = E(1 - e^{-1}) \triangleq V_0$$

$$V_{2C}(0^-) = 0$$



$$V_c(s) = \frac{E}{s} \frac{\frac{1}{3Cs}}{R + \frac{1}{3Cs}} + \frac{V_0}{s} \frac{1/(2C)}{R/(2C) + \frac{1}{Cs}}$$

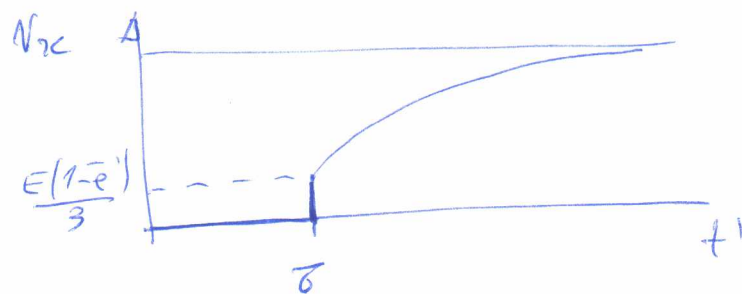
$$\Rightarrow V_c(s) = \frac{E}{s(1+3\tau s)} + \frac{V_0}{s} \frac{\tau s}{1+3\tau s}$$

$$V_c(t) = E(1 - e^{-t/3\tau}) + \frac{V_0}{3} e^{-t/3\tau}$$

$$\Rightarrow N_c(t) = \begin{cases} E(1 - e^{-t/\tau}) & t \in [0, \tau) \\ E \left[1 - e^{-\frac{(t-\tau)}{3\tau}} \right] + \frac{E(1-e^{-1})}{3} e^{-\frac{(t-\tau)}{3\tau}} & t \in [\tau, +\infty) \end{cases}$$

$$N_c(\tau^-) = V_0 = E(1-e^{-1}); N_c(\tau^+) = \frac{E(1-e^{-1})}{3}$$

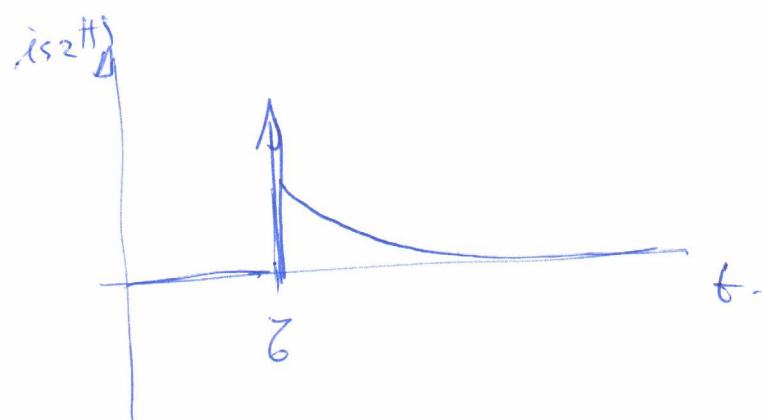
$$i_{s2}(t') = 2C \frac{d}{dt'} N_c(t')$$



$$= 2C \frac{E(1-e^{-1})}{3} \delta(t')$$

$$+ E \left[-1 + \frac{1-e^{-1}}{3} \right] \left[-\frac{1}{3\tau} \right] e^{-\frac{t'}{3\tau}}$$

$$\Rightarrow i_{s2}(t) = \begin{cases} 0 & t \in [0, \tau) \\ 2C \frac{E(1-e^{-1})}{3} \delta(t) + E \left[\frac{2+e^{-1}}{3} \right] \frac{1}{3\tau} e^{-\frac{t-\tau}{3\tau}} & t \in [\tau, +\infty) \end{cases}$$

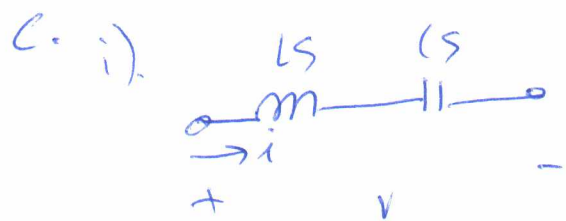


3.

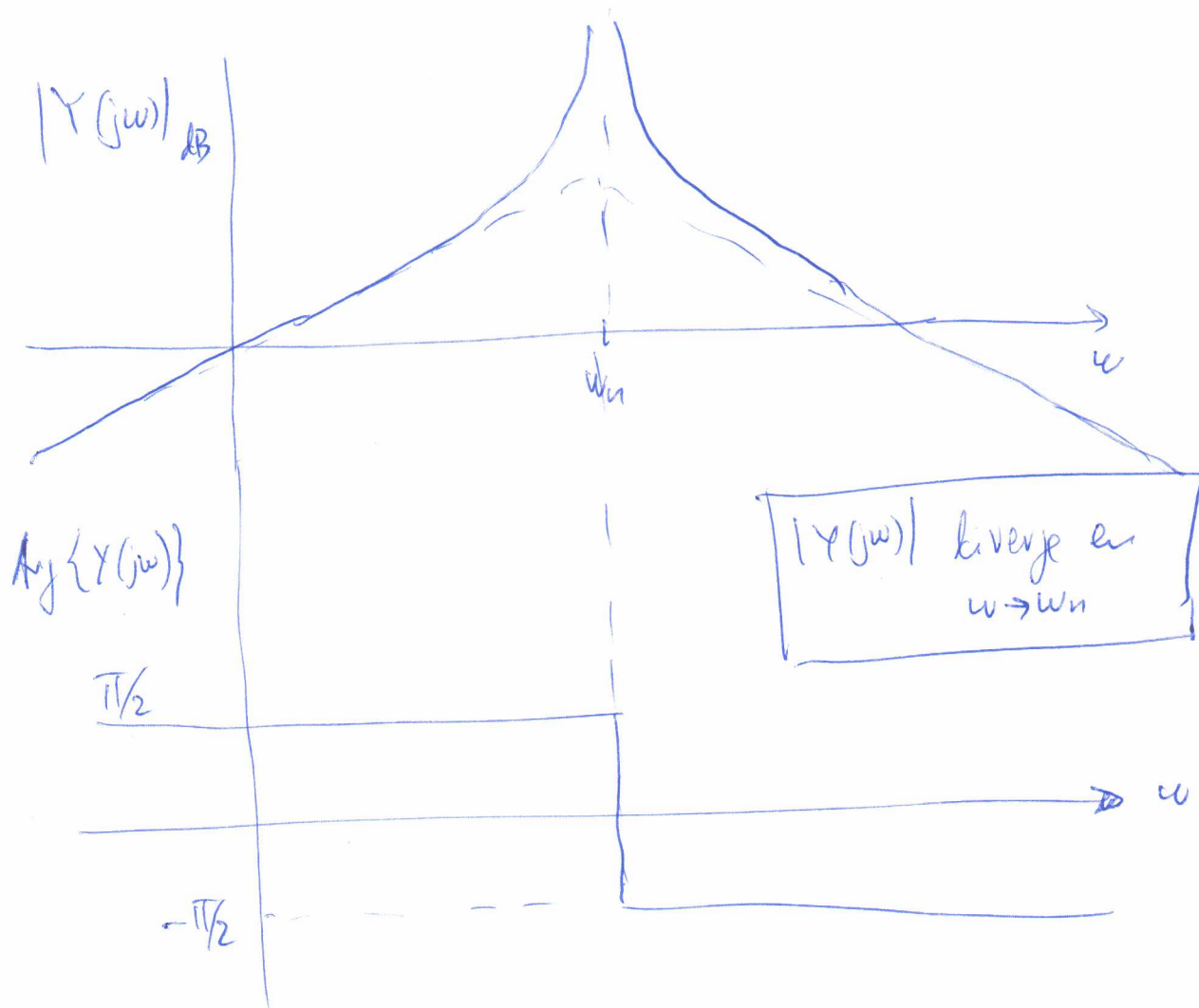
$$b. H(s) = \frac{Ls + 100R}{(Ls + R)(1 + 100RCs + Lcs^2)}$$

$H(s)$ estable BIBO

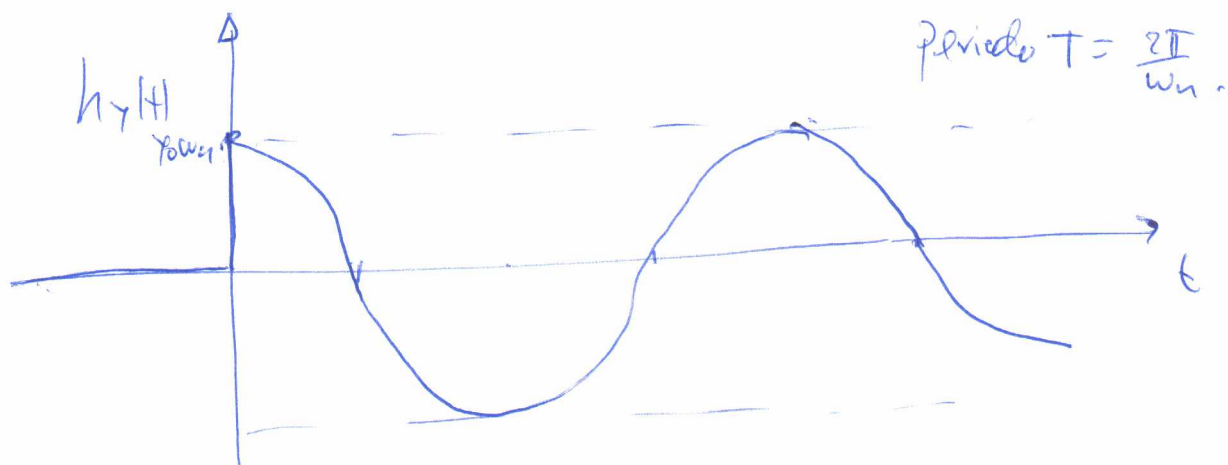
como $|v(t)|$ es acotada $\Rightarrow |u(t)|$ es acotada.



$$Y(s) = \frac{Cs}{1 + Lcs^2} = \frac{Y_0 \omega_n s}{s^2 + \omega_n^2}$$



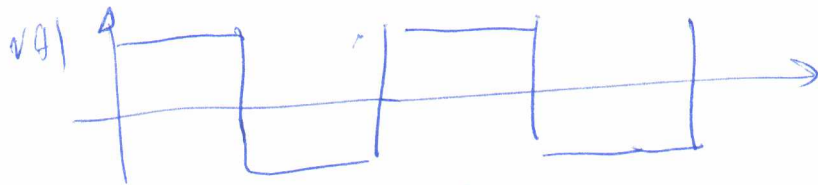
C. ii) $h_y(t) = \int_{-\infty}^t \gamma(s) ds = \int_{-\infty}^t \left\{ \frac{Y_0 \omega_n s}{s^2 + \omega_n^2} \right\} ds = Y_0 \omega_n \cos \omega_n t$



C. iii) Existe, si, porque el sistema es inestable. Tiene polos en el eje.

d. El punto crea una entrada $N(t)$ que puede solo tomar los valores $\{-E, +E\}$

Basta tomar $N(t)$ cuadrada de frecuencia ω_n .



esta entrada tiene fundamental no nula, que tendrá una respuesta no acotada (ver BODE).