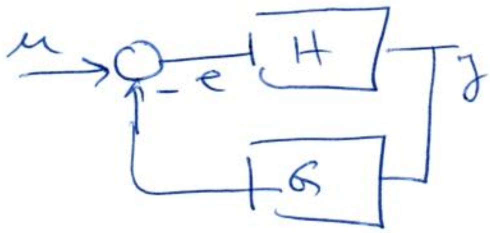
SEGUNDO PARCIAL 2017
SISTEMAS LINEALES 2

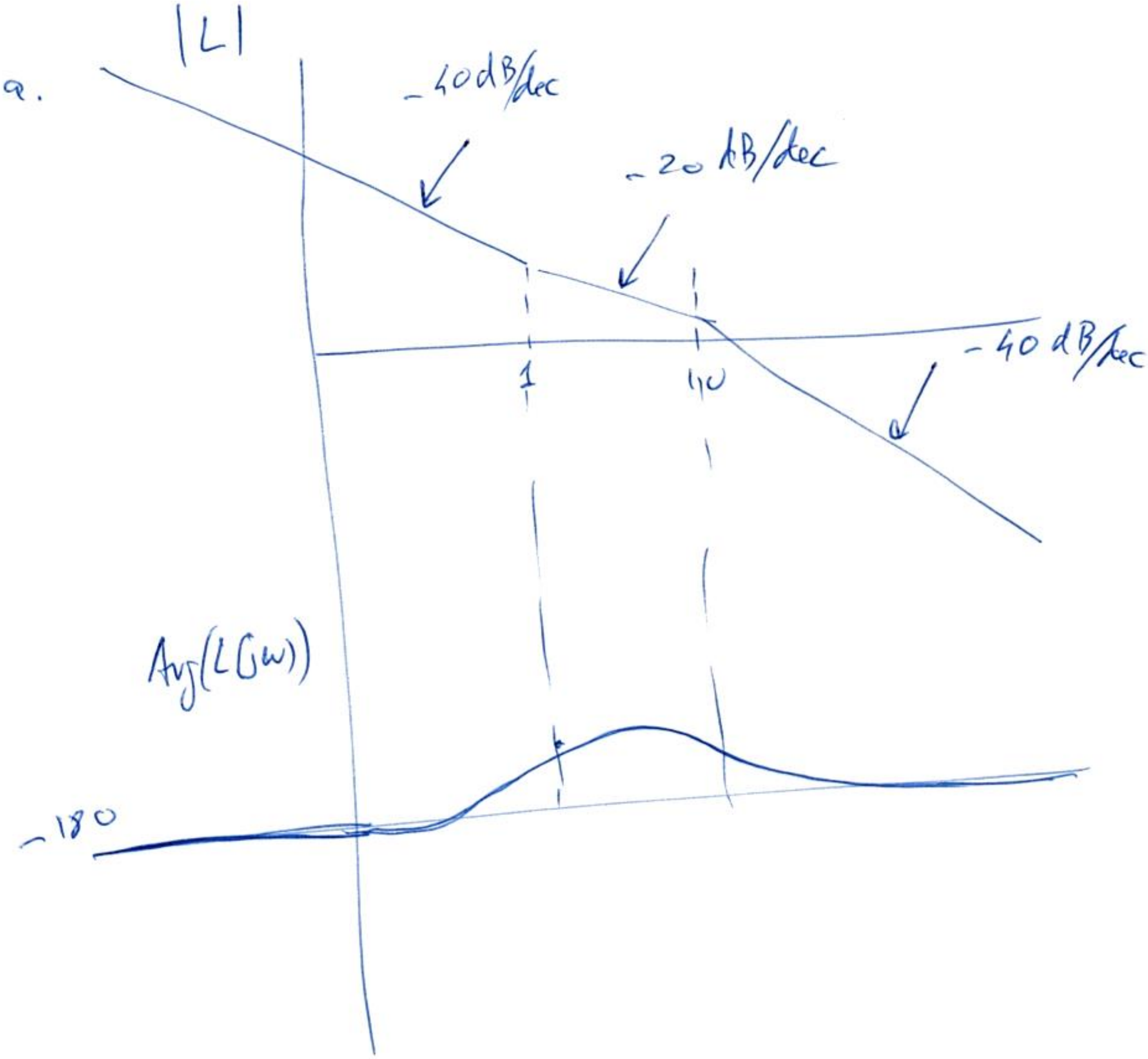
I

Problema 1



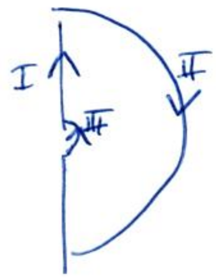
$$L = HG = 10 \frac{1}{s^2} \frac{s+1}{s+10}$$

a.



Ej 1

b. Se cumplen H1, H2 ✓

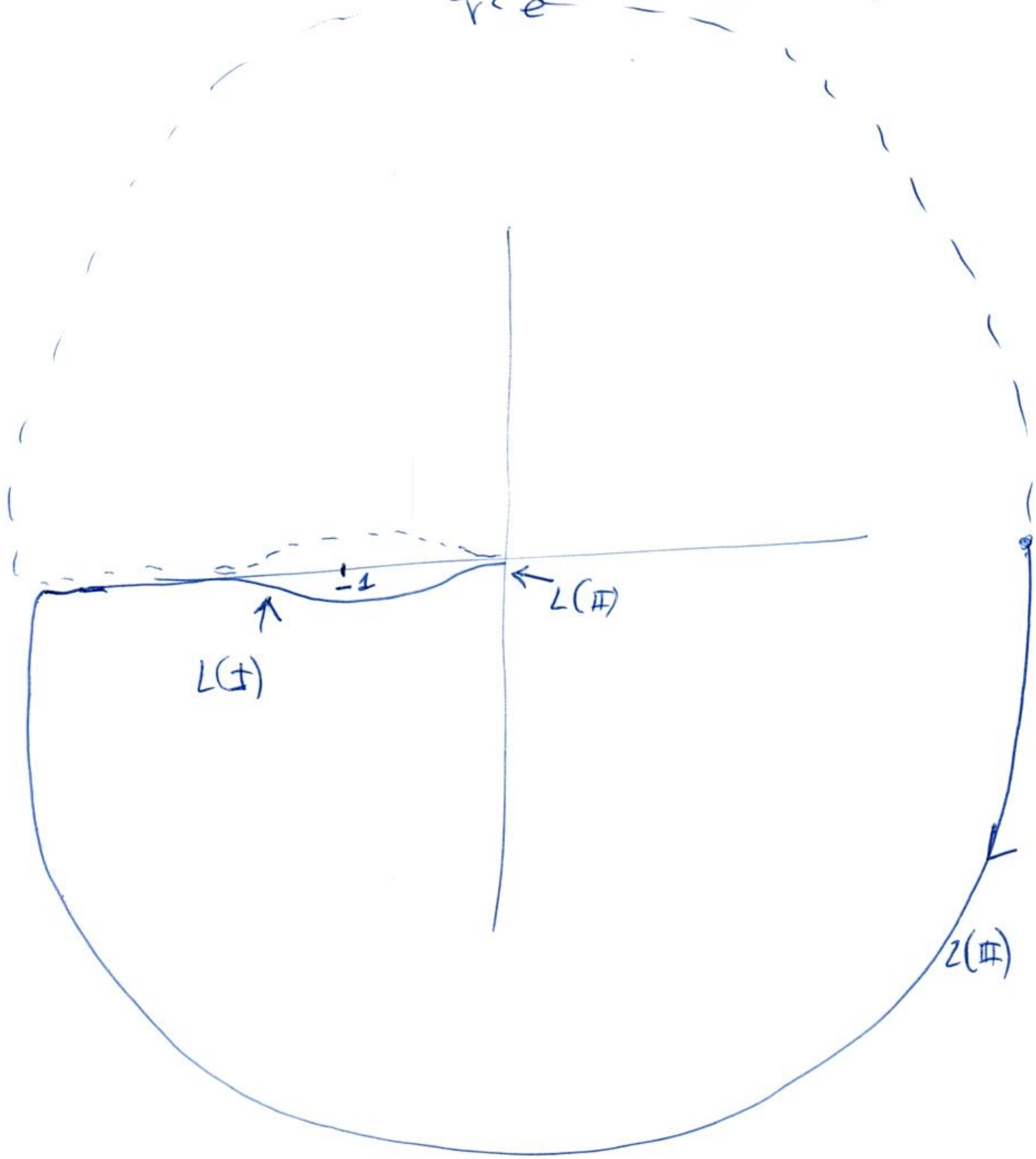


$L(\mathrm{I})$: Bode

$L(\mathrm{II}) = 0$ (FRREP)

$L(\mathrm{III})$: $\;s = \lim_{r \to 0} r e^{j\theta} \quad \theta : [0 \to \pi/2]$

$$L(\mathrm{III}) = \frac{1}{r^2 e^{2j\theta}} \, 10 \, \frac{1}{10} = \frac{1}{r^2} e^{-2j\theta} \quad \theta : 0 \to \pi/2$$



N = 0

P = 0

Z = 0 ESTABLE.

Ej 1

e.

$$E(s) = S(s) \cdot U(s) = \frac{1}{1+L(s)} \frac{1}{s}$$

$sE(s) = \frac{1}{1+L(s)}$ estable x parte b. Sin polos RHP.

$\Rightarrow$ TVF $\quad e_\infty = \lim_{s \to 0} sE(s) = \lim_{s \to 0} \frac{1}{1+L(s)} = \boxed{0 = e_\infty}$

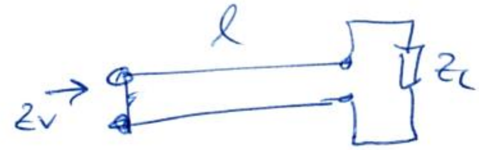
Ej 3

a. $Z_0 = \sqrt{\frac{R+jL\omega}{G+jC\omega}} \simeq \sqrt{\frac{L}{C}} = \sqrt{\frac{1.6\,10^{-7}}{10^{-10}}} = \sqrt{1.6\,10^{3}} = 40\,\Omega.$ I

$\omega = 2\pi f = 200\pi\,10^{6}$ rad/s

$\Rightarrow \boxed{Z_L = Z_0 = 40\,\Omega}$

b. Línea sin pérdidas



$$Z_v = Z_0 \cdot \frac{Z_L + jZ_0 \operatorname{tg}\beta l}{Z_0 + jZ_L \operatorname{tg}\beta l}$$

$$\beta = \operatorname{Im}\gamma = \operatorname{Im}\sqrt{j\omega L\, j\omega C} = \omega\sqrt{LC} = \omega\sqrt{1.6\,10^{-17}} = \omega\sqrt{16}\sqrt{10^{-18}}$$

$$\boxed{\beta = \omega \cdot 4 \cdot 10^{-9}}$$

Si $Z_L = 0$ $\quad Z_v^{cc} = jZ_0 \operatorname{tg}\beta l$

$Z_L = \infty$ $\quad Z_v^{ab} = -j\frac{Z_0}{\operatorname{tg}\beta l}$

la impedancia que ve el emisor, al comienzo de la línea es

$Z_v^{cc} = jZ_0 \operatorname{tg}\beta l$

Para que no sea detectable midiendo amplitudes, debe ser

$|Z_v^{cc}| = |Z_0|$ $\quad \Rightarrow \operatorname{tg}\beta l = 1$

operación con $\qquad$ operación normal $\qquad \Rightarrow \beta l = \pi/4 \quad \lambda = 2\pi/\beta$

Ej 3

c. el paralelo de ambos stubs (abierto y en cc) tiene impedancia vista

$$Z_{intruso} = Z_v^{cc} \,//\, Z_v^{ab} = \frac{Z_v^{cc} \cdot Z_v^{ab}}{Z_v^{cc} + Z_v^{ab}}$$

Basta que $Z_v^{cc} = -Z_v^{ab}$ para que $Z_{intruso} = 0$

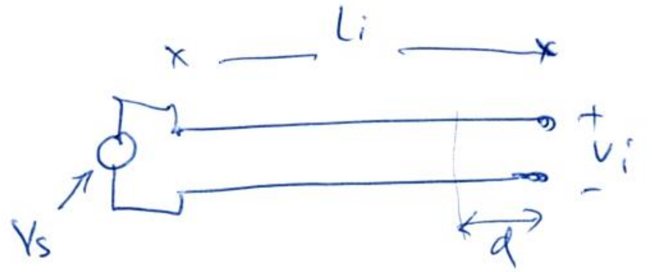
$$\Rightarrow \; j Z_0 \operatorname{tg} \beta l_i = -\left[-j \frac{Z_0}{\operatorname{tg} \beta l_i} \right] \Rightarrow \operatorname{tg} \beta l_i = \pm 1$$

Basta $\operatorname{tg} \beta l_i = 1$ y $\boxed{l_i = \frac{\lambda}{8}}$

para la línea principal

$$|V(z)| = |V(z=0)| = |V_s| \quad \forall z$$ pues la línea está adaptada

la línea abierta del intruso:



(la fase no importa)

$$V(d=0) = |V_s|\,|1 + \rho_T e^{-j2\beta 0}| = |V_s|\,|1+\rho_T|$$

$$\rho_T = Z_L - Z_0 = 1 \quad \Rightarrow \boxed{V_i = 2|V_s|}$$