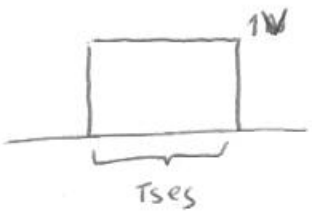
BOLETÍN TEMA - 7

① TX BINARIA ANTIPODAL



$s_1(t)$, $s_2(t)$

$d(t) = s_2(t) - s_2(t)$

$\rho = \frac{\int_{-\infty}^{\infty} s_2(t) \cdot s_2(t)}{Eb}$

Ruido con potencia $\frac{No}{2} = 10^{-3} \Rightarrow No = 2 \cdot 10^{-3}$

$P_E = 10^{-3} \Rightarrow$ ¿Vo ?

$P_E = Q\left(\sqrt{\frac{Ed}{2No}}\right) =$

$= Q\left(\sqrt{\frac{Eb(1-\rho)}{No}}\right)$

SEÑAL ANTIPODAL $\Leftrightarrow s_2(t) = -s_1(t)$

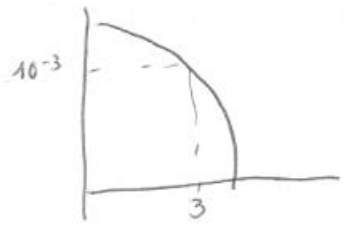
$\Downarrow$

$\rho = -1$

$\Downarrow$

$P_E = Q\left(\sqrt{\frac{2Eb}{No}}\right)$

$P_E = 10^{-3} = Q\left(\sqrt{\frac{2Eb}{No}}\right) = Q(x)$



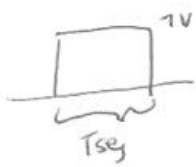
$10^{-3} = Q(3)$

$\Downarrow$

$3 = \sqrt{\frac{2Eb}{No}}$, $\frac{2Eb}{No} = 9$

$\frac{2Eb}{2 \cdot 10^{-3}} = 9$; $Eb = 9 \cdot 10^{-3} = Ep$

$\Downarrow$ $T = 9 \cdot 10^{-3}$ seg



$\Rightarrow Ep = T \cdot 1^2 = T$

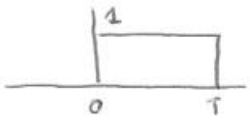
BINARIO

$V_s\left(\frac{simB}{seg}\right) = \frac{1}{T} = \frac{1}{9} 10^3 \frac{sim}{seg} \Rightarrow V_b = \frac{1}{9} 10^3$ bps

bits por segundo

(3) Tx BINARIA ANTIPODAL

$$p(t) = \underbrace{A e^{-t}}_{p_1(t)} \underbrace{[u(t) - u(t-T)]}_{p_2(t)} \longrightarrow p_2(t)$$



a) ¿E_p?

$$E_p = \int_{-\infty}^{\infty} p^2(t)\,dt = \int_0^T \left(Ae^{-T}\right)^2 dt =$$

$$= \int_0^T A^2 e^{-2T}\,dt = A^2 \cdot \left(-\frac{1}{2}\right) e^{-2T}\Big]_0^T = -\frac{A^2}{2}\left(e^{-2T} - 1\right) = \frac{A^2}{2}\left(1 - e^{-2T}\right)$$

b) $R_{p(t)} = p(t) * p^*(-t) \overset{p(t)\ \text{real}}{=} p(t) * p(-t) = p(-t) * p(t) = \int p(\tau) \cdot p(t-\tau)\,d\tau$

c) $D.E.E. : |P(\omega)|^2 = P(\omega)\, P^*(\omega)$

d) ¿$h_{opt}(t)$?

$$\boxed{h_{opt}(t) = k\left[s_1(T-\tau) - s_2(T-\tau)\right]}$$

ANTIPODAL $\Rightarrow s_2(t) = -s_1(t) \Rightarrow h_{opt}(t) = k\left[s_2(T-t) - (-s_1(T-t))\right] =$

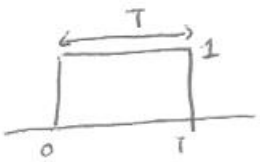
$$= \underbrace{k \cdot 2}_{k'} \cdot s_1(T-t)$$

SEÑAL ANTIPODAL

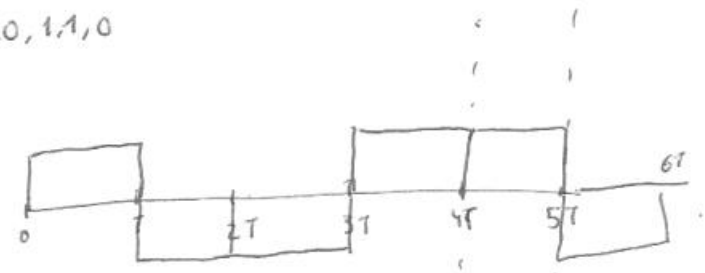
$$\boxed{h_{opt}(t) = k' \cdot s_1(T-\tau)}$$

c) pulso en $[4T, 5T]$ → LTI: F.A. $h_{opt}(t)$ → ¿?

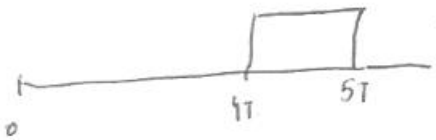
$p(t)$



1, 0, 0, 1, 1, 0



I_k (1, −1, −1, 1, 1, 1)
I_0 I_1 I_2 I_3 I_4 I_5



$$I_4\, p(t-4T) * k'\, p(T-t) = I_4 k' \underbrace{p(t-4T)}_{p(t)*\delta(t-4T)} * p(T-t) \overset{*}{=}$$

$p(-t)$ $p(-t+T)$ = $p(-t)*\delta(t-T)$

$$\overset{*}{=} I_4 k' \underbrace{p(t) * p(-t)}_{R_p(t)} * \underbrace{\delta(t-4T) * \delta(t-T)}_{\delta(t-5T)} = \boxed{I_4 k' R_p(t-5T)}$$

siempre se cumple

$I_4 k'$: constante del pulso