COMPITINO 24/5/02

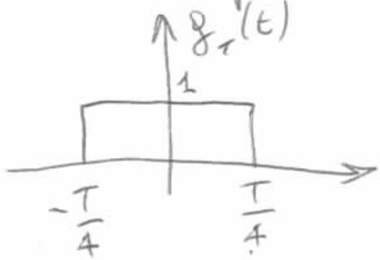
PAM binario

$$g_T(t) = rect\left(\frac{t}{(T/2)}\right) \qquad T = 1\,msec$$

Nell'ipotesi che:

- $c(t) = rect\left(\frac{t}{(T/2)}\right)$
- $w(t)$ introdotto dal canale sia bianco con $S_w(f) = N_0/2$ e $N_0 = \frac{1}{6}\cdot 10^{-10}\ V^2/Hz$
- I simboli siano $\pm 1$ equiprobabili ed ind.

1. La risposta in frequenza $G_T(f)$



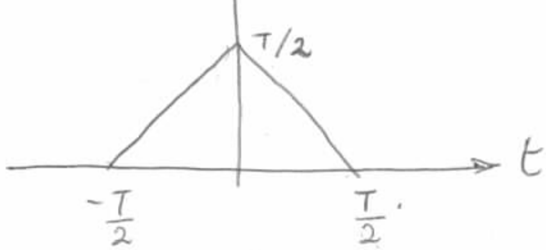

$$G_T(f) = \frac{T}{2}\, sinc\left(\frac{fT}{2}\right)$$

2. La risposta impulsiva $g_R(t)$ per avere max SNR all'istante di campionamento e per avere no ISI

II° cond. di progetto:

$$g_R(t) = K\, g_{TC}(t_0 - t)$$

ancora una volta $t_0 = 0$ perché $c(t)$ e $g_T(t)$ non introducono ritardo




$$g_R(t) = K\, g_{TC}(-t) = K\, \underbrace{g_{TC}(t)}_{\text{è pari}}$$

$$g(t) = g_T(t) \otimes c(t) \otimes g_R(t)$$

I° cond. di progetto:

$$g(mT) = g_{TC}(t) \otimes K\, g_{TC}(t)\Big|_{t=mT} = \begin{cases} 1 & m = 0 \\ 0 & m \neq 0 \end{cases}$$

$$g(0) = K\int_{-\infty}^{+\infty} g_{TC}^2(t)\,dt = K\cdot 2\cdot\frac{T^2}{4}\int_0^{T/2}\left(1-\frac{2t}{T}\right)^2 dt =$$

$$= \frac{KT^2}{2}\int_0^{T/2}\left(1-\frac{4t}{T}+\frac{4t^2}{T^2}\right)dt = \frac{KT^2}{2}\left(t-\frac{2t^2}{T}+\frac{4t^3}{3T^2}\right)\Big|_0^{T/2} = \frac{KT^2}{2}\left(\frac{T}{2}-\frac{T}{2}+\frac{T}{6}\right) = \frac{KT^3}{12}$$

$$g(0) = 1 \Rightarrow K = 12/T^3$$

$$\Rightarrow g_R(t) = \frac{12}{T^3}\, g_{TC}(t)$$

3. Calcolare P(e) con $\lambda = 0$. Si esprima il risultato in termini di $Q(\cdot)$, esplicitando il valore numerico dell'argomento.

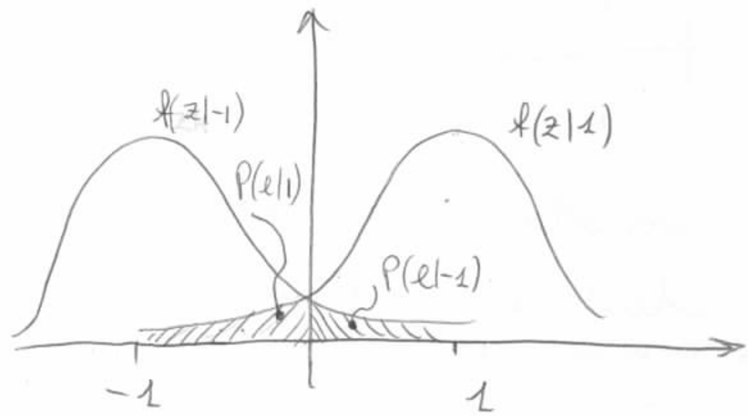
$$z_K = a_K + n_K$$

$$n(t) = w(t) \otimes g_{TC}(t)\cdot K$$

$$\Rightarrow \sigma_n^2 = \int_{-\infty}^{+\infty} S_n(f)\,df = \frac{N_0}{2}\,\frac{144}{T^6}\int_{-\infty}^{+\infty} g_{TC}^2(t)\,dt = \frac{N_0}{2}\cdot\frac{144}{T^6}\cdot\frac{T^3}{12} = \frac{6\cdot N_0}{T^3}$$

$$P(e|1) = Q\left(\frac{m_{z|1}-\lambda}{\sigma_n}\right) =$$

$$= Q\left(\frac{1}{\sigma_n}\right)$$




$$P(e) = Q\left(\frac{1}{\sigma_n}\right) = Q\left(\sqrt{\frac{T^3}{6\,N_0}}\right)$$