$$E[x_c^2] = \frac{1}{2}(-1)^2 + \frac{1}{2}(+2)^2 = \frac{5}{2} \qquad x_c \in A_s = \{-1, 2\}$$

$$E[x_s^2] = \frac{1}{2}(-1)^2 + \frac{1}{2}(+1)^2 = 1 \qquad x_s \in A_s = \{-1, 1\}$$

$$p(t) = 2B\,\mathrm{sinc}(2Bt) - B\,\mathrm{sinc}\left(2B\left(t - \frac{1}{2B}\right)\right) - B\,\mathrm{sinc}\left(2B\left(t + \frac{1}{2B}\right)\right)$$

$$P(f) = \mathrm{rect}\left(\frac{f}{2B}\right) - \left[\frac{1}{2}\,\mathrm{rect}\left(\frac{f}{2B}\right)\left[e^{-j2\pi f\frac{1}{2B}} + e^{j2\pi f\frac{1}{2B}}\right]\right]$$

$$= \mathrm{rect}\left(\frac{f}{2B}\right)\left[1 + \cos\left(\frac{\pi f}{B}\right)\right]$$

$$E_p = \int_{-\infty}^{+\infty} P^2(f)\,df = \int_{-B}^{B}\left[1 + \cos\left(\frac{\pi f}{B}\right)\right]^2 df$$

$$= \int_{-B}^{B} 1\,df + \int_{-B}^{B}\cos^2\left(\frac{\pi f}{B}\right)df + 2\int_{-B}^{B}\cos\left(\frac{\pi f}{B}\right)df$$

$$\cos\left(2\pi f \cdot \frac{1}{2B}\right)$$

periodo

$$= 2B + \frac{1}{2}\int_{-B}^{B} 1\,df + \underbrace{\frac{1}{2}\int_{-B}^{B}\cos\left(\frac{2\pi f}{B}\right)df}_{=0} + 0$$

$$= 2B + \frac{1}{2}\cdot 2B = 3B$$

$$E_s = \frac{1}{2}\left(\frac{5}{2} + 1\right)3B = \boxed{\frac{21}{4}B}$$

2) $P_{n_{u_c}} = P_{n_{u_s}} = N_0 \, E_{H_R} = \boxed{2 N_0 B}$ $\qquad H_R(f) = \mathrm{rect}\left(\frac{f}{2B}\right)$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad \overset{\shortparallel}{P_{n_u}}$

passa-basso ideale di banda "B"

3) $P_E(M) = P_E^c(b)\left(1 - P_E^s(b)\right) + P_E^s(b)\left(1 - P_E^c(b)\right) + P_E^c(b)\, P_E^s(b)$

$P_E^c(b)$, $P_E^s(b)$

- ASSENZA DI ISI
- $h(0)$

$$\Rightarrow h(t) = p(t) \otimes \tilde{c}(t) \otimes h_R(t) = p(t) \otimes h_R(t)$$

$$H(f) = P(f) H_R(f) = P(f) \quad \Rightarrow \quad h(t) = p(t)$$

$$P(f) \neq 0 \qquad |f| \leq B$$

$$h(t)\Big|_{t=nT} = h(nT) = 2B\,\mathrm{sinc}(2BnT) - B\,\mathrm{sinc}\left[2B\left(nT - \frac{1}{2B}\right)\right] - B\,\mathrm{sinc}\left[2B\left(nT + \frac{1}{2B}\right)\right]$$

$$T = \frac{1}{B}$$

$$= 2B\,\mathrm{sinc}\left(\cancel{2B}\frac{n}{\cancel{B}}\right) - B\,\mathrm{sinc}\left[2B\left(\frac{n}{B} - \frac{1}{2B}\right)\right] - B\,\mathrm{sinc}\left[2B\left(\frac{n}{B} + \frac{1}{2B}\right)\right]$$

$$h[n] = 2B\,\mathrm{sinc}(2n) - B\,\underset{0\ \forall n}{\underset{\parallel}{\mathrm{sinc}[2n-1]}} - B\,\underset{0\ \forall n}{\underset{\parallel}{\mathrm{sinc}[2n+1]}}$$

$$= 2B\,\delta[n]$$

$\Downarrow$ soddisfa il criterio di Nyquist nel tempo

$\Downarrow$

verifica l'assenza di ISI

$$h(0) = 2B$$

$$P_E^c(b) = \frac{1}{2} Q\left(\frac{h(0)}{\sqrt{P_{nu}}}\right) + \frac{1}{2} Q\left(\frac{2h(0)}{\sqrt{P_{nu}}}\right)$$

$$P_E^s(b) = \frac{1}{2} Q\left(\frac{h(0)}{\sqrt{P_{nu}}}\right) + \frac{1}{2}\left(\frac{h(0)}{\sqrt{P_{nu}}}\right)$$

$$\boxed{\begin{aligned}
P_E^c(b) &= \frac{1}{2} Q\left(\frac{2B}{\sqrt{2N_0B}}\right) + \frac{1}{2} Q\left(\frac{4B}{\sqrt{2N_0B}}\right)\\
P_E^s(b) &= Q\left(\frac{2B}{\sqrt{2N_0B}}\right)\\
P_E(M) &= P_E^c(b)\left(1 - P_E^s(b)\right) + P_E^s(b)\left(1 - P_E^c(b)\right) + P_E^c(b)\,P_E^s(b)
\end{aligned}}$$

Es. # 1. 26/06/2018

1	2	3	IMPIANTI
$P(I_1) = 50\%$	$P(I_2) = 30\%$	$P(I_3) = 20\%$	produzione
$P_{d_1} = 0.02$	$P_{d_2} = 0.05$	$P_{d_3} = 0.01$	prob. di produrre una lavatrice difett.