Soluzione 20/02/2017

Es. 2

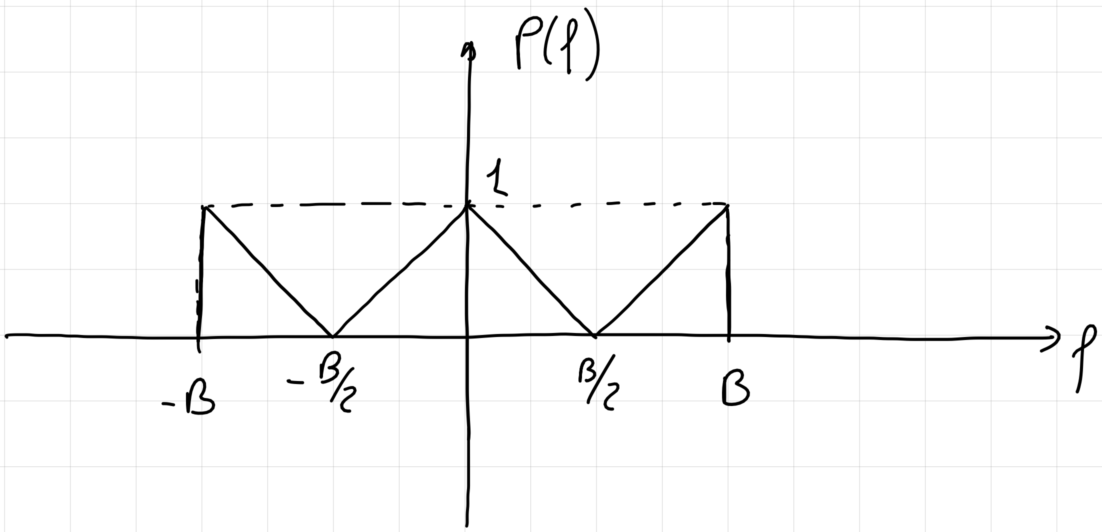
$$E_s = E[x_n^2]\, E_p$$

$$E[x_n^2] = \frac{1}{2}(-2)^2 + \frac{1}{2}(1)^2 = \frac{5}{2}$$

$$E_p = \int_{-\infty}^{+\infty} |P(f)|^2 \, df$$

$$P(f) = \mathrm{rect}\left(\frac{f}{2B}\right) - \left(1 - \frac{|f|}{B/2}\right) \mathrm{rect}\left(\frac{f}{B}\right) \otimes \left[\delta\left(f - \frac{B}{2}\right) + \delta\left(f + \frac{B}{2}\right)\right]$$

$$= \mathrm{rect}\left(\frac{f}{2B}\right) - \left[\left(1 - \frac{|f - B/2|}{B/2}\right) \mathrm{rect}\left(\frac{f - B/2}{B}\right) + \left(1 - \frac{|f + B/2|}{B/2}\right) \mathrm{rect}\left(\frac{f + B/2}{B}\right)\right]$$



$$\int_{-\infty}^{+\infty} |P(f)|^2 \, df = 4 \cdot \frac{1}{3} \frac{B}{2} = \frac{2}{3} B$$

$$\boxed{E_s = \frac{5}{2} \cdot \frac{2}{3} B = \frac{5}{3} B}$$

2) $$\boxed{P_{n_u} = \frac{N_0}{2}\int_{-\infty}^{+\infty} |H_R(f)|^2 \, df = \frac{N_0}{2} \cdot 2B = N_0 B}$$

3) $$h(t) = p(t) \otimes h_R(t) \qquad \left(c(t) = \delta(t) \right)$$

$$H(f) = P(f)\, H_R(f) = P(f)$$

$$\Downarrow$$

$$h(t) = p(t) \Rightarrow \boxed{h[n] = p[n] = p(nT) = \begin{cases} B & n=0 \\ 0 & n \neq 0 \end{cases}}$$

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NO ISI

4) $h(0) = B$

$$\boxed{P_E(b) = \frac{1}{2} Q\left(\frac{2B}{\sqrt{N_0 B}}\right) + \frac{1}{2} Q\left(\frac{B}{\sqrt{N_0 B}}\right)}$$