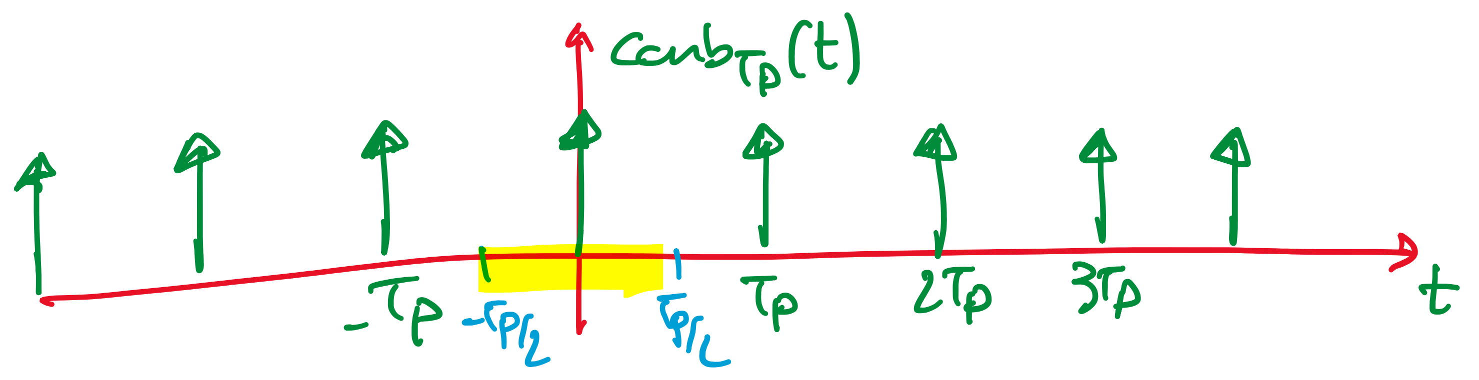
Le13

Thursday, 30 March 2023 09:04

Es 1a $s(t) = \text{comb}_{T_p}(t) = \text{rep}_{T_p}\,\delta(t)$

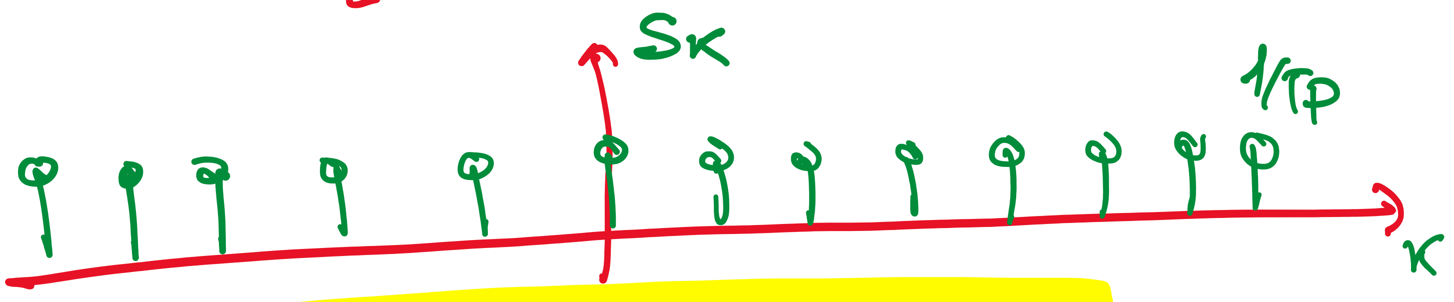


$S_K = ?$

$\omega_0 = 2\pi / T_p$

$$S_K = \frac{1}{T_p}\int_{\cancel{t_0}\,-T_p/2}^{\cancel{t_0+T_p}\,T_p/2} \cancel{s(t)}\,\delta(t)\, e^{-j\omega_0 K t}\,dt = \frac{1}{T_p}$$

$e^{-j\omega_0 K \cdot 0}$

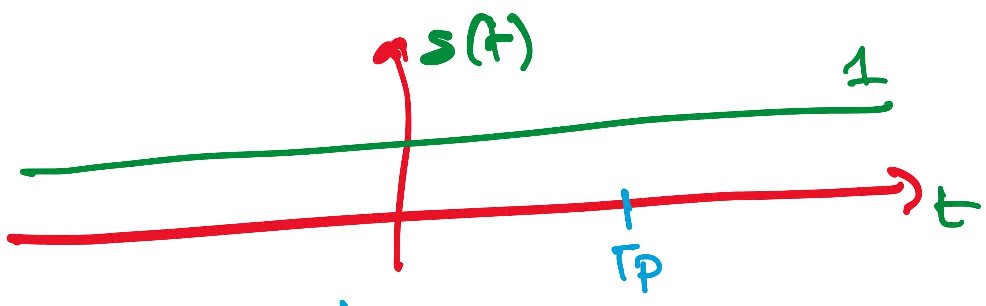


$$\boxed{s(t) = \text{comb}_{T_p}(t) \xrightarrow{\mathcal{F}} S_K = 1/T_p}$$

delta periodica — segnale costante

$$\text{comb}_{T_p}(t) = \frac{1}{T_p}\sum_{K=-\infty}^{+\infty} e^{j\omega_0 K t}, \quad \omega_0 = 2\pi/T_p$$

Es 1b $s(t) = 1$



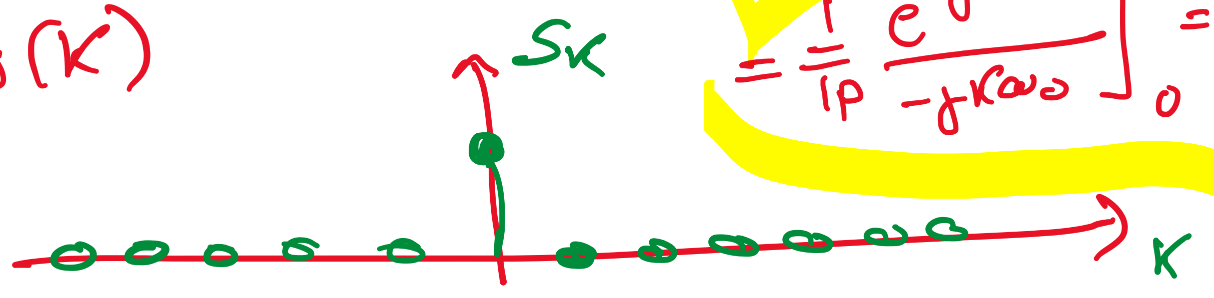
$$S_K = \frac{1}{T_p}\int_0^{T_p} 1 \cdot e^{-jK\omega_0 t}\,dt \qquad \omega_0 = 2\pi/T_p$$

$$= \frac{1}{T_p}\int_0^{T_p} \underbrace{e^{-jK\omega_0 t}}_{\text{periodico } T_p}\,dt = \begin{cases} 0 & K \neq 0 \\ 1 & K = 0 \end{cases}$$

$$= \frac{1}{T_p}\left[\frac{e^{-jK\omega_0 t}}{-jK\omega_0}\right]_0^{T_p} = \frac{e^{-jK\omega_0 T_p} - 1}{-jK\omega_0 T_p} = \frac{1-1}{-jK\omega_0 T_p} \quad K \neq 0$$

($\omega_0 T_p = 2\pi$)

$= \delta(K)$



$$\boxed{s(t) = 1 \xrightarrow{\mathcal{F}} S_K = \delta(K)}$$

segnale costante — delta discreto

DUALITA' SEGNALE COSTANTE $\xleftrightarrow{\mathcal{F}}$ DELTA

Es 1a parte 2 $s(t) = \text{comb}_{T_p}(t)$

$S_K = \frac{1}{T_p}$

$m_s = S_0 = \frac{1}{T_p}$

$$P_s = \sum_{K=-\infty}^{+\infty} |S_K|^2 = \sum_{K=-\infty}^{+\infty} \frac{1}{T_p^2} = \infty$$

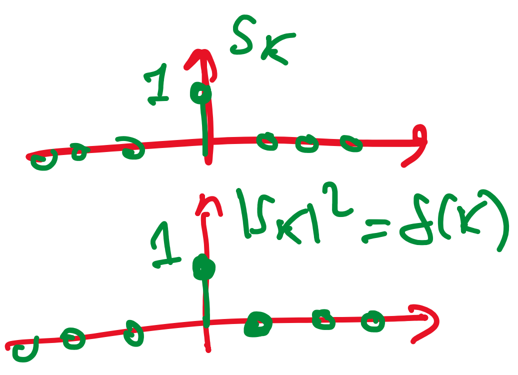
Es 1b parte 2

$s(t) = 1$

$S_K = \delta(K)$

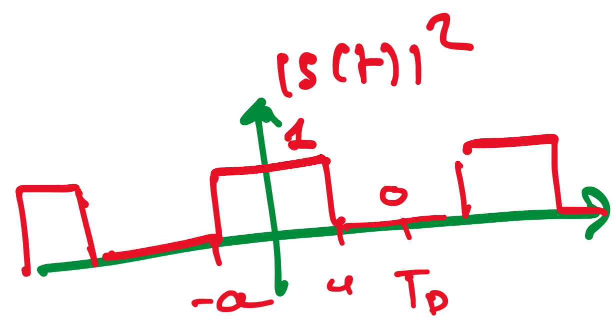
$m_s = S_0 = 1$

$$P_s = \sum_{K=-\infty}^{+\infty} |S_K|^2 = 1$$



CASO ONDA QUADRA

$s(t) = \text{rep}_{T_p}\,\text{rect}\left(\frac{t}{2a}\right)$ $\quad d = \frac{2a}{T_p}$



$S_K = d\,\text{sinc}(Kd)$

$m_s = S_0 = d = \frac{2a}{T_p}$

$$P_s = \sum_{K=-\infty}^{+\infty} |S_K|^2 = \sum_{K=-\infty}^{+\infty} d^2\,\text{sinc}^2(Kd) = ?$$

$= d$ ma si trova dal dominio del tempo