Segnali t.c. → periodici
- Sviluppo in Serie di F.
- TCF se introduciamo la delta di Dirac

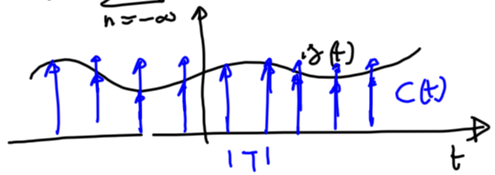
→ aperiodici
- TCF

Segnali t.d. (sequenze) → periodiche
- TDF (serie discreta)

→ aperiodiche
TF sequenza

finite
⇓
periodicizzazione
TDF

$$c(t) = \sum_{n=-\infty}^{+\infty} \delta(t - nT)$$



$$s_c(t) = s(t) \sum_{n=-\infty}^{+\infty} \delta(t - nT) = \sum_{n=-\infty}^{+\infty} s(nT)\, \delta(t - nT)$$

$$\mathcal{F}_c[s_\delta(t)] = \mathcal{F}_c\left[\sum_{n=-\infty}^{\infty} s(nT)\,\delta(t-nT)\right] =$$

$$= \sum_{n=-\infty}^{+\infty} s(nT)\,\mathcal{F}_c[\delta(t-nT)] =$$

$$= \sum_{n=-\infty}^{+\infty} s(nT)\, e^{-j2\pi nTf} = \sum_{n=-\infty}^{+\infty} s[n]\, e^{-j2\pi nTf} =$$

$$\triangleq \overline{S}(f)$$

$$s[n] = T\int_0^{1/T} \overline{S}(f)\, e^{j2\pi nfT}\, df$$

1) <u>frequenza normalizzata</u> $F = fT = f/f_c$

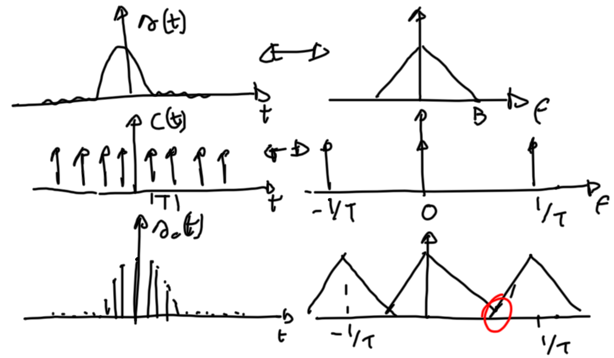
2) <u>pulsazione normalizzata</u> $\omega = 2\pi F$

1) $$\overline{S}(F) = \sum_{n=-\infty}^{\infty} s[n]\, e^{-j2\pi nF}$$

$$s[n] = \int_0^1 \overline{S}(F)\, e^{j2\pi nF}\, dF$$

2) $$\overline{S}(\omega) = \sum_{n=-\infty}^{\infty} s[n]\, e^{-jn\omega}$$

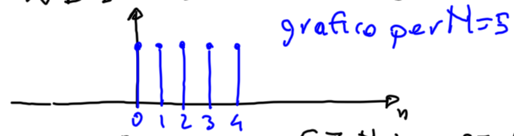
$$s[n] = \int_0^{2\pi} \overline{S}(\omega)\, e^{jn\omega}\, d\omega$$



$1/T \geq 2B$

$\boxed{Es}$

$x[n] = u[n] - u[n-M]$



$$X(f) = \sum_{n=-\infty}^{+\infty} x[n]\, e^{-j2\pi n f T} = \sum_{n=0}^{M-1} e^{-j2\pi n f T} =$$

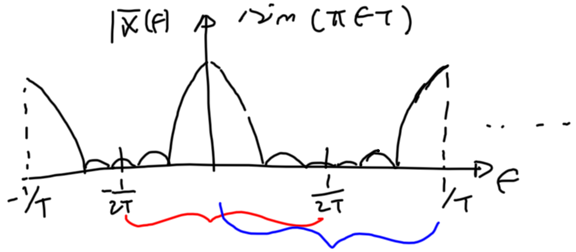
$$= \sum_{n=0}^{M-1} \left(e^{-j2\pi f T}\right)^n$$

$$\sum_{n=0}^{M-1} q^n = \frac{1-q^M}{1-q}$$

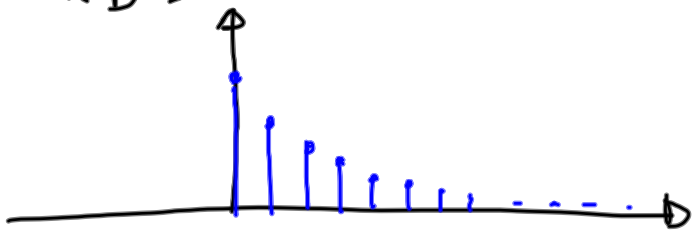
$$\rightarrow = \frac{1-e^{-j2\pi f T M}}{1-e^{-j2\pi f T}} =$$

$$= \frac{e^{-j\pi f T M}}{e^{-j\pi f T}} \; \frac{e^{j\pi f T M} - e^{-j\pi f T M}}{e^{j\pi f T} - e^{-j\pi f T}} =$$

$$= e^{-j\pi f T (M-1)} \cdot \frac{\sin(\pi f T M)}{\sin(\pi f T)}$$



$$x[n] = a^n u[n] \quad , \quad |a| < 1$$



$$\overline{X}(f) = \sum_{n=-\infty}^{+\infty} x[n]\, e^{-j2\pi n f T} = \sum_{n=0}^{+\infty} a^n e^{-j2\pi n f T} =$$

$$= \sum_{n=0}^{+\infty} \left(a e^{-j2\pi f T}\right)^n \qquad \sum_{n=0}^{\infty} q^n = \frac{1}{1-q}$$

$$= \frac{1}{1 - a e^{-j2\pi f T}} =$$

$$= \frac{1}{(1 - a\cos 2\pi f T) + j\, a \sin 2\pi f T} \; — \in \text{I, IV quadr.}$$

$$|\overline{X}(f)| = \frac{1}{\sqrt{(1 - a\cos 2\pi f T)^2 + a^2 \sin^2(2\pi f T)}}$$

$$\angle \overline{X}(f) = -\operatorname{atg} \frac{a \sin 2\pi f T}{1 - a \cos 2\pi f T}$$

T_0 , N_0 T

$m T_0 = N_0 T$

$T_0 = 8$ sec

$T = 1$ sec

$m \, 8 = N_0 \cdot 1$

$m = 1$

$N_0 = 8$