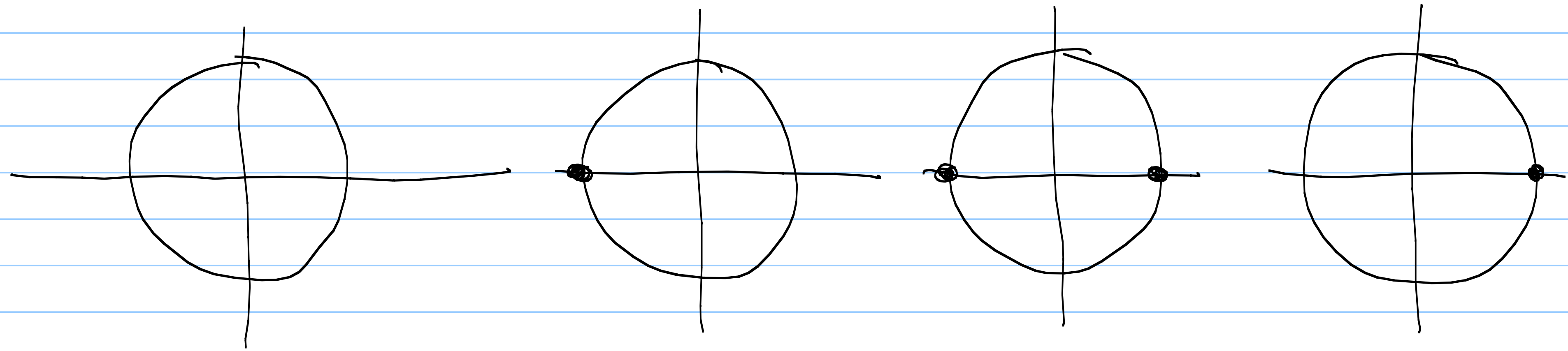
EC 5142 15 Nov. 2011

Note Title 15-11-2011

Constrained Zeros:

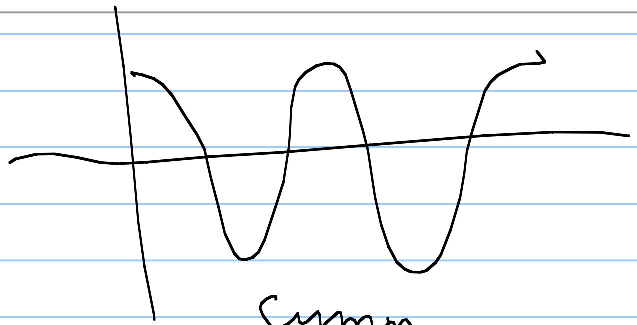


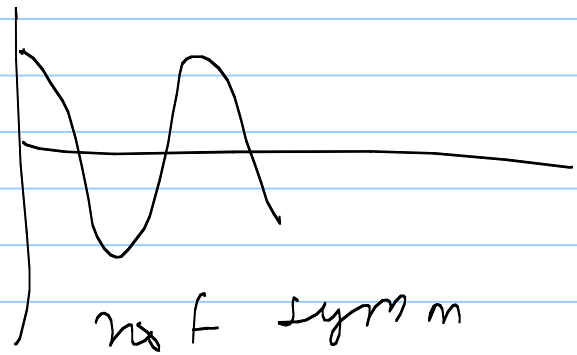
I — Even Symmetry, Odd length

II — Even Symm, Even Length

III — Odd Symm, Odd length

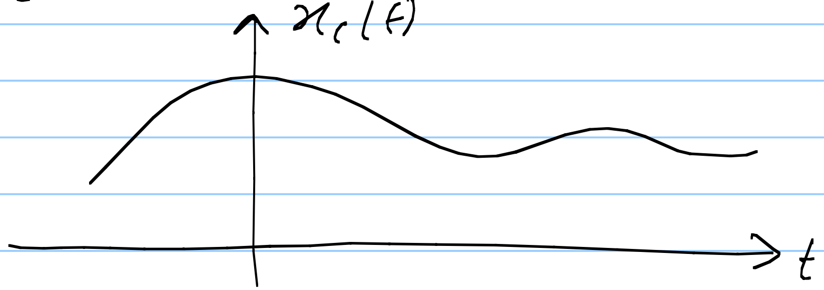
IV — Odd Symm, Even Length



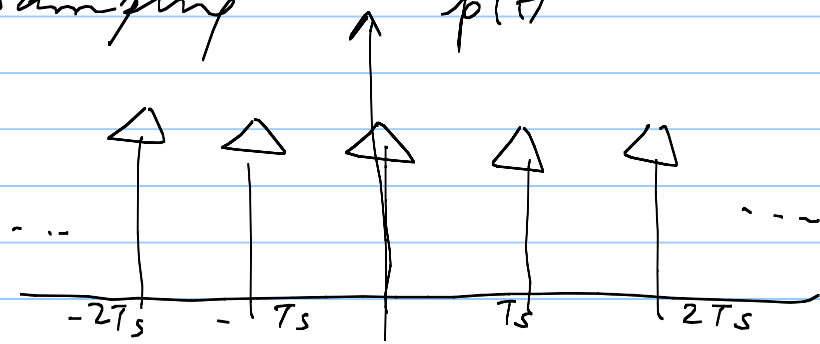


Sampling:

$x_c(t) \longrightarrow$ impulse train sampling $p(t)$



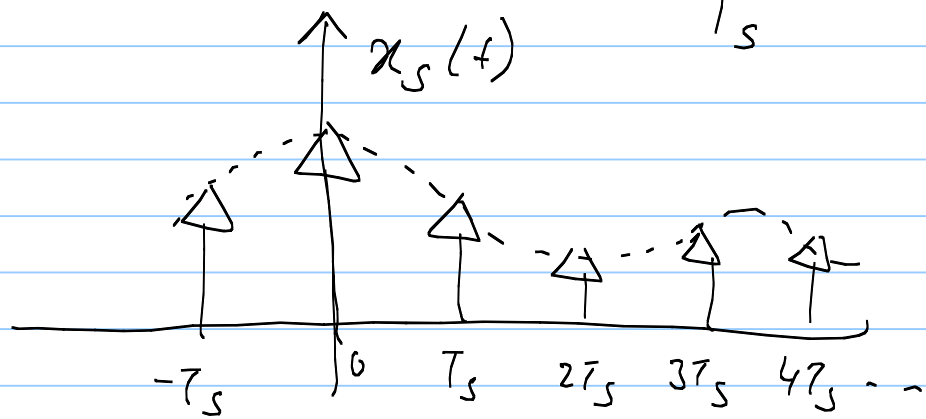
$\times$



$$p(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_s) \longleftrightarrow \frac{1}{T} \sum_{k=-\infty}^{\infty} \delta(F - kF_s)$$

$$F_s = \frac{1}{T_s}$$

$$x_c(t) \cdot p(t) = x_s(t)$$



$$x_s(t) = \sum_{n=-\infty}^{\infty} x_c(t)\, \delta(t - nT_s)$$

$$= \sum_{n=-\infty}^{\infty} x_c(nT_s)\, \delta(t - nT_s)$$

$$X_s(F) = \int_{-\infty}^{\infty} x_s(t)\, e^{-j2\pi F t}\, dt$$

$$= \int_{-\infty}^{\infty} \left[\sum_{n=-\infty}^{\infty} x_c(nT_s)\, \delta(t - nT_s) \right] e^{-j2\pi F t}\, dt$$

$$\overset{?}{=} \sum_{n=-\infty}^{\infty} x_c(nT_s) \int_{-\infty}^{\infty} \delta(t - nT_s)\, e^{-j2\pi F t}\, dt$$

$$= \sum_{n=-\infty}^{\infty} x_c(nT_s)\, e^{-j2\pi F n T_s}$$

$$= \sum_{n=-\infty}^{\infty} x_c(nT_s)\, e^{-j 2\pi \frac{F}{F_s} n}$$

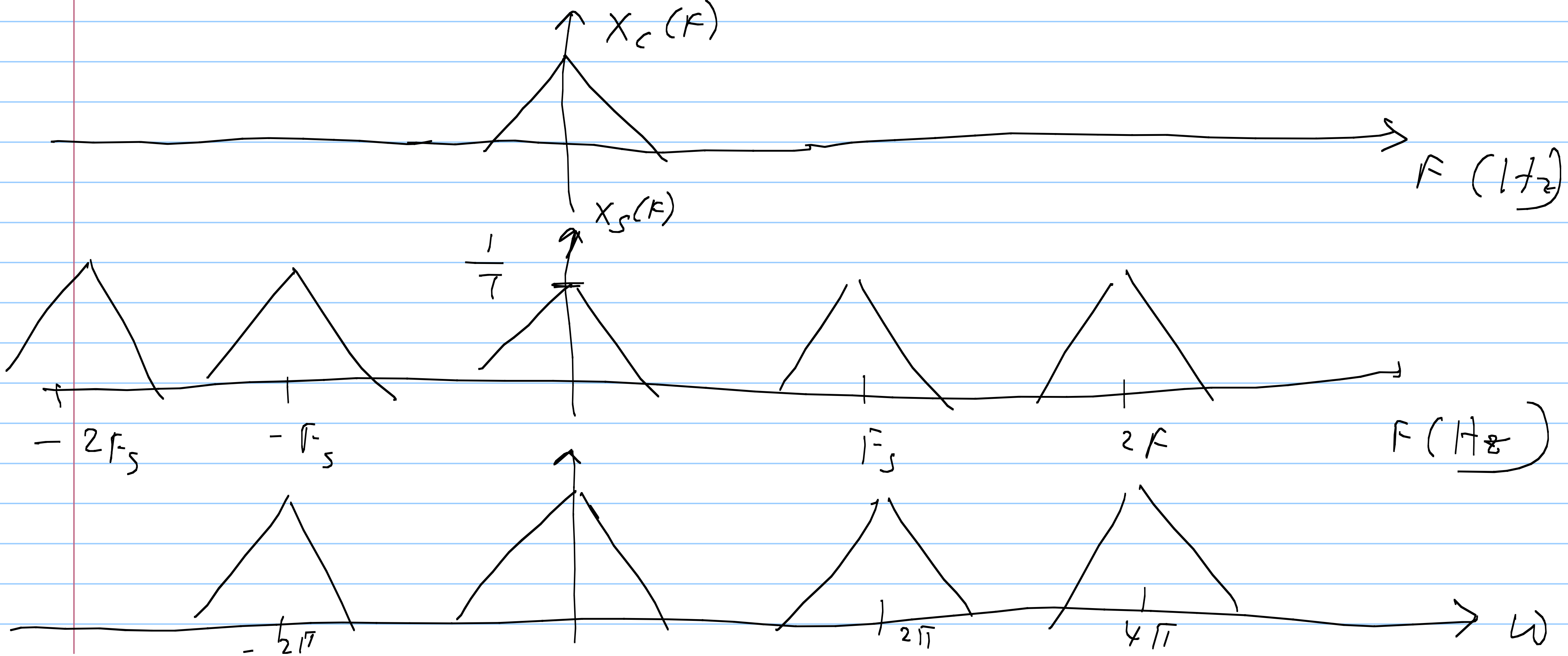
$$P(F) = \frac{1}{T} \sum_{k=-\infty}^{\infty} \delta(F - kF_s)$$

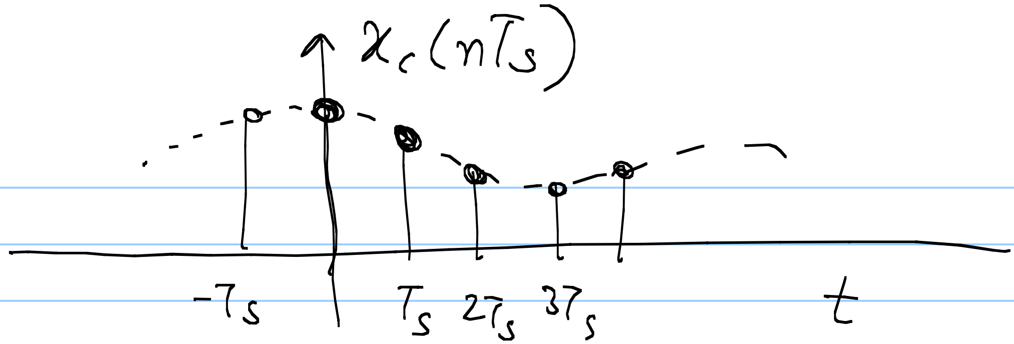
$$X_s(F) = X_c(F) * P(F)$$

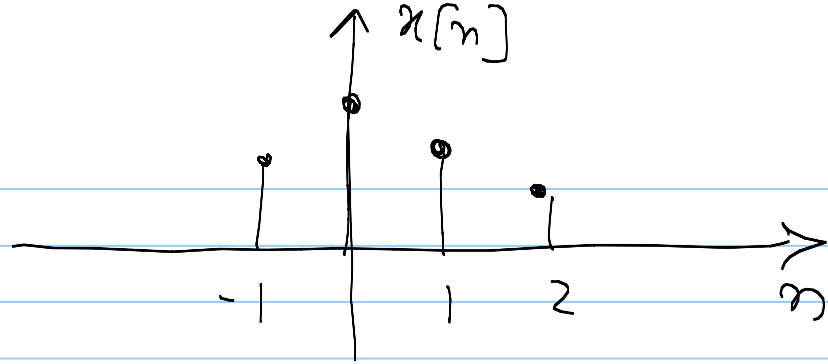
$$= \frac{1}{T} \sum_{k=-\infty}^{\infty} \delta(F - kF_s) * X_c(F)$$

$$= \frac{1}{T} \sum_{k=-\infty}^{\infty} X_c(F - kF_s)$$

$$X_s(F) = \sum_{n=-\infty}^{\infty} x_c(nT_s)\, e^{-j 2\pi \frac{F}{F_s} n}$$







$$x[n] = x_c(nT_s)$$

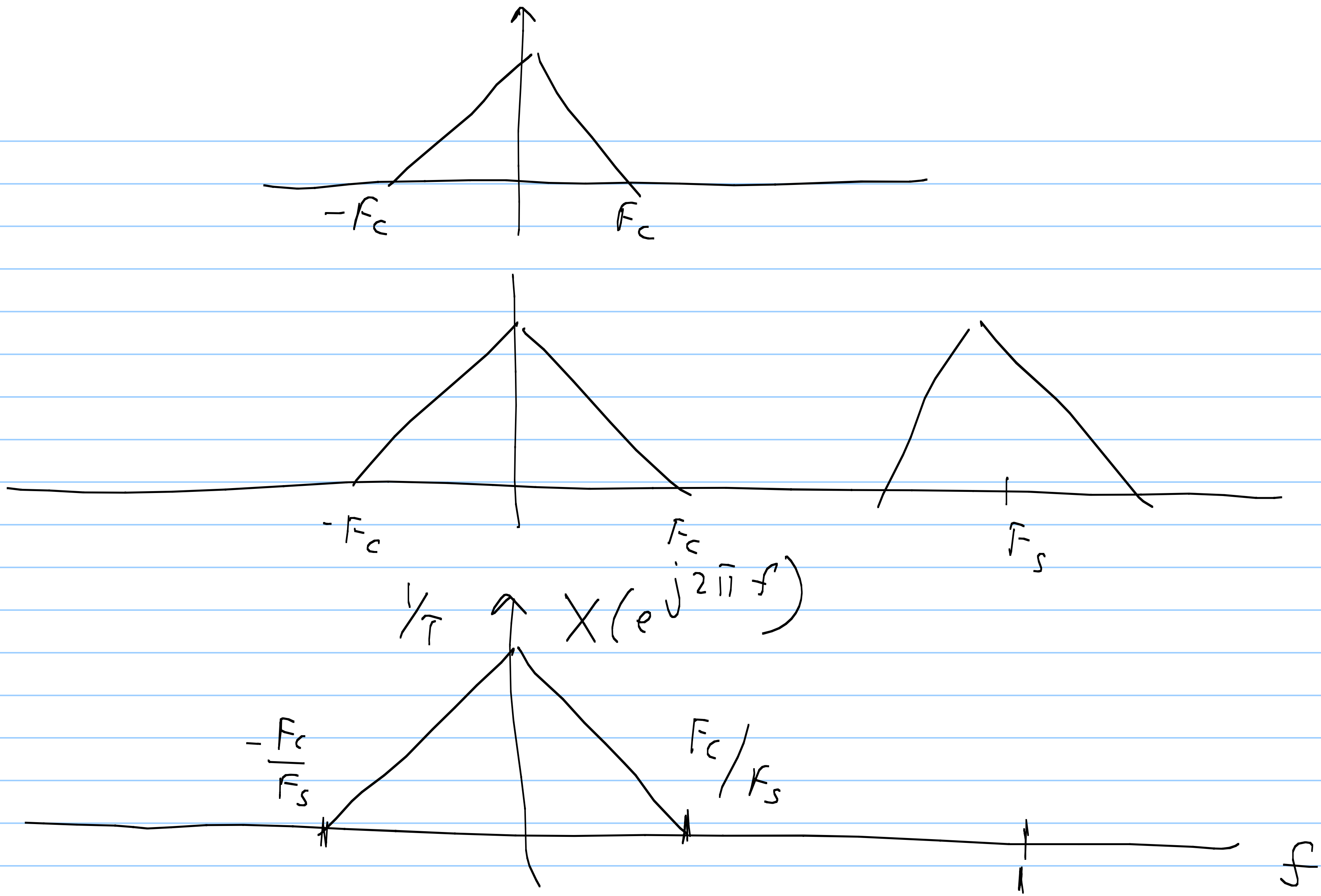
$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n]\, e^{-j\omega n}$$

$$X_s(F) = \sum_{n=-\infty}^{\infty} \underbrace{x_c(nT_s)}_{x[n]}\, e^{-j2\pi \frac{F}{F_s} n}$$

$$\frac{F}{F_s} = f \qquad \omega = 2\pi f$$

$$F \longrightarrow \frac{\omega}{2\pi T_s}$$

$$2\pi \frac{F}{F_s} n \longrightarrow 2\pi \frac{\omega}{2\pi T_s} \frac{1}{F_s} n = \omega n$$



-Fc
Fc
-Fc
Fc
Fs
1/T
X(e^{j2πf})
-Fc/Fs
Fc/Fs
f

$X(e^{j2\pi f})$ or $X(e^{j\omega})$