BiomedicalSignalProcessing03

Tuesday, March 31, 2020 4:05 PM

$$\boxed{X[z] = \sum_{n=-\infty}^{\infty} x[n] z^{-n}} \Longleftrightarrow \boxed{x[n] = \frac{1}{2\pi j} \oint X[z] z^{n-1}\, dz}$$

LINEARITY OF THE z-TRANSFORM

Like the Laplace transform, the z-transform is a linear operator. If

$$x_1[n] \Longleftrightarrow X_1[z] \quad \text{and} \quad x_2[n] \Longleftrightarrow X_2[z]$$

then

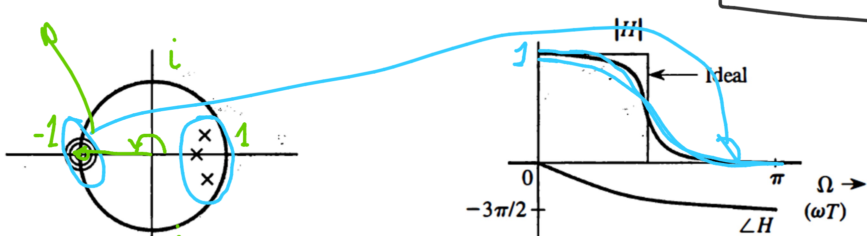
$$\underline{a_1 x_1[n] + a_2 x_2[n]} \Longleftrightarrow \underline{a_1 X_1[z] + a_2 X_2[z]}$$

No.	$x[n]$	$X[z]$
1	$\delta[n-k]$	z^{-k}
2	$u[n] \equiv$	$\dfrac{z}{z-1}$
3	$nu[n]$	$\dfrac{z}{(z-1)^2}$
4	$n^2u[n]$	$\dfrac{z(z+1)}{(z-1)^3}$
5	$n^3u[n]$	$\dfrac{z(z^2+4z+1)}{(z-1)^4}$
6	$\gamma^n u[n]$	$\dfrac{z}{z-\gamma}$

$$\boxed{y[n] = \sum_{k=0}^{100} b_k x[n-k]}$$

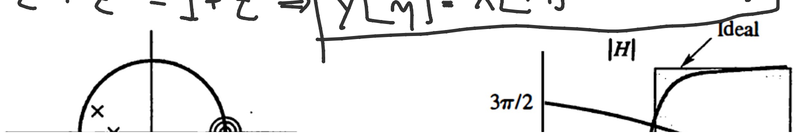
Χαμηλοπερατά - Υψηλοπερατά φίλτρα

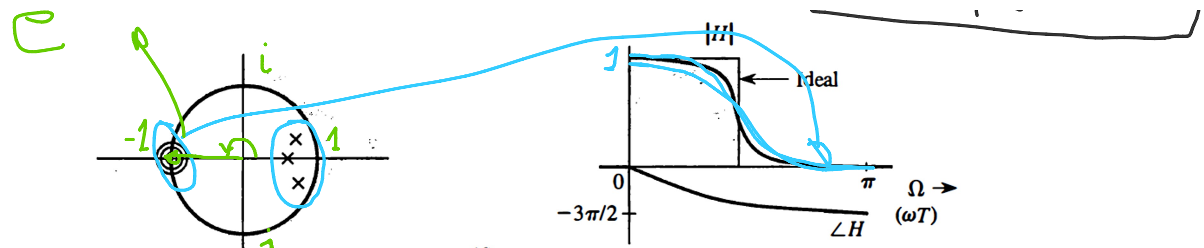
$e^{j\pi}$



(d)

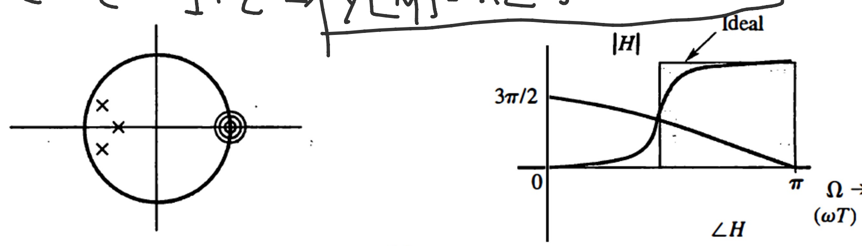
$$b(z) = z^{-0} + z^{-1} = 1 + z^{-1} \Rightarrow \boxed{y[n] = x[n] + x[n-1]}$$





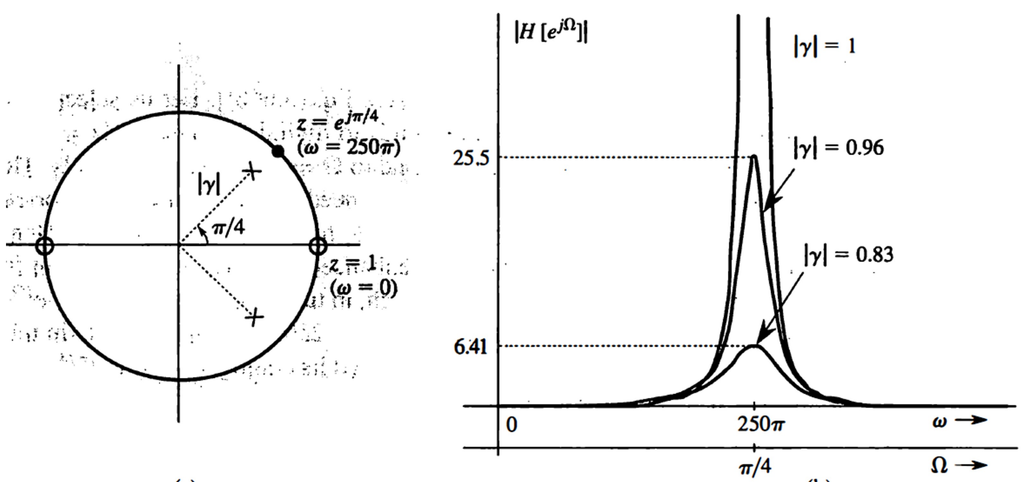
(d)

$$b(z) = z^{-0} + z^{-1} = 1 + z^{-1} \Rightarrow \boxed{y[n] = x[n] + x[n-1]}$$

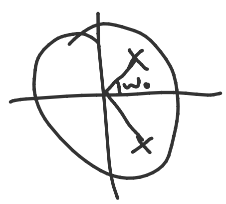


(e)

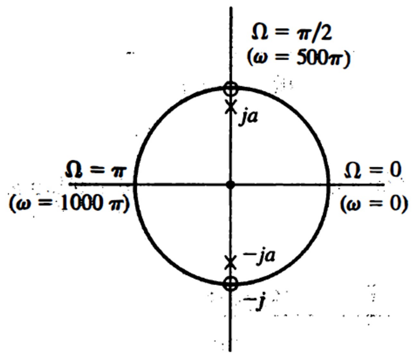
Ζωνοδιαβατά φίλτρα



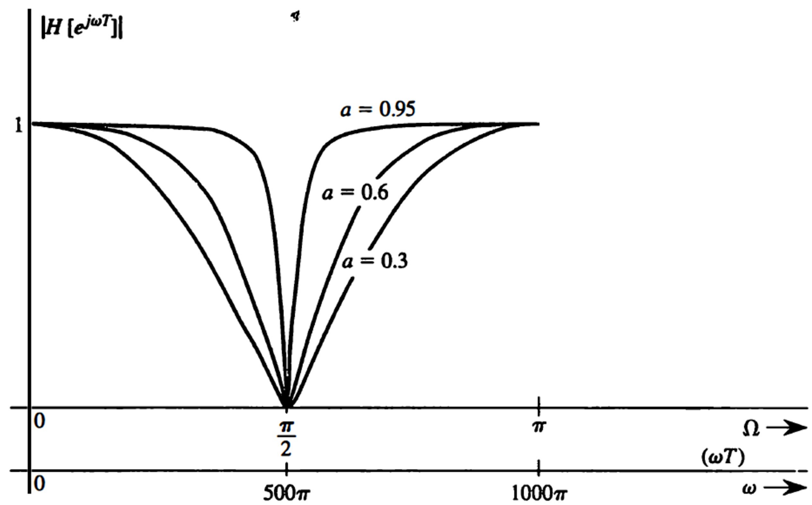
(a) (b)



Notch (BandStop) φίλτρα



(a)



Συνεχής μετασχηματισμός Fourier για διακριτά σήματα

ΣΥΝΕΧΗΣ

$$\boxed{X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt}$$

$t = 0, +\infty$

$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega) e^{j\omega t} d\omega$$

Διακριτός μετασχηματισμός Fourier για διακριτά σήματα

$X(w)$

$$\boxed{X[r] = \sum_{M=0}^{N_0-1} x[M] e^{-jr\frac{2\pi}{N_0}M}}$$

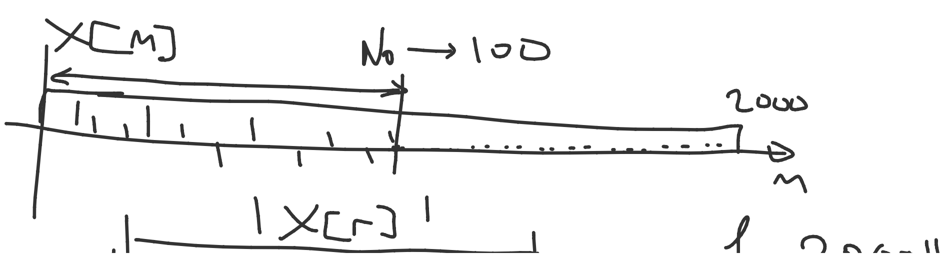
$r = 0, N_0-1$

$X[r] \in \mathbb{C}$

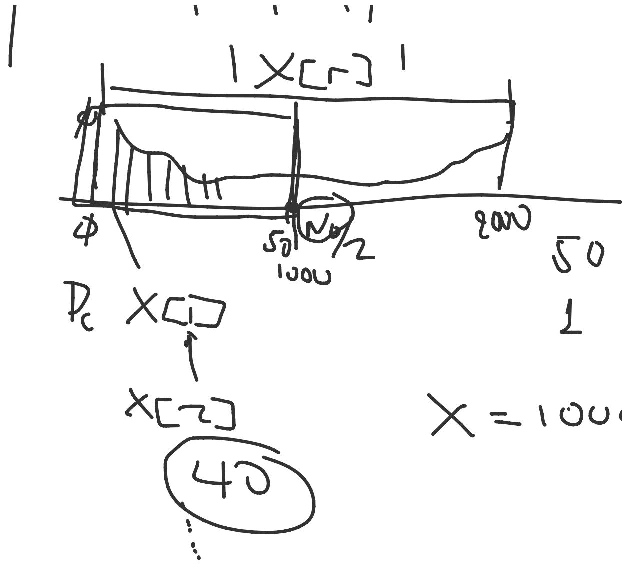
FFT

$$X_r = \sum_{n=0}^{N_0-1} x_n e^{-jr\Omega_0 n}$$

$$x_n = \frac{1}{N_0} \sum_{r=0}^{N_0-1} X_r e^{jr\Omega_0 n} \qquad \Omega_0 = \omega_0 T = \frac{2\pi}{N_0}$$



$f_s = 2000\,Hz$



$50 \rightarrow 1000$

$1 \rightarrow x$

$X = 1000 \cdot \frac{1}{50} = \underline{20 Hz}$