Wednesday, November 25, 2020 6:05 PM

ΑΡΧΙΖΟΥΜΕ 18:15

ΜΕΤΑΣΧΗΜΑΤΙΣΜΟΣ FOURIER
ΓΙΑ ΔΙΑΚΡΙΤΑ ΣΗΜΑΤΑ

$x[n]$, $n = \emptyset, N \xrightarrow{MF} \sum_{k=-\infty}^{+\infty} x[k] e^{-j\omega k}$

$-\pi \leq \omega < \pi$

$0 \leq \omega < 2\pi$

$x[n] = A\cos(\omega n + \varphi)$ $n \in \mathbb{Z}$

$x[n] \xrightarrow{MF} X(\omega)$

$h[n] \xrightarrow{MF} H(\omega)$

$\Rightarrow \boxed{Y(\omega) = H(\omega) \cdot X(\omega)}$

$\downarrow$ A.M.F

$\boxed{y[n]}$

$y[n] = h \circledast x$

MF $\downarrow$

$Y(\omega)$

$\boxed{\text{FF.T}}$

$$\underbrace{|Y(\omega)|}_{\emptyset} = \underbrace{|H(\omega)|}_{\emptyset} \cdot \underbrace{|X(\omega)|}_{\alpha}$$

ϕ ϕ α

$|H(\omega_q)| > 1$

$$20\log_{10}|Y(\omega)| = 20\log_{10}|H(\omega)| + 20\log_{10}|H(\omega)|$$

$$x(t) \longrightarrow \boxed{ADC} \longrightarrow \boxed{x[n]}$$

$t = n\boxed{T}$

$T,\ f$ $\qquad f = \frac{1}{T}$

2KHz

$$x[n] = [1, 0, 2, 3]; \quad \downarrow \text{M.F.}$$

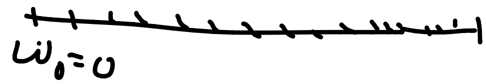
$$X(\omega) = 1 + 0\cdot e^{-j\omega} + 2e^{-2j\omega} + 3e^{-3j\omega}$$

$$20\log_{10}|X(\omega)| = 20\log_{10}\left|1 + 2e^{-2j\omega} + 3e^{-j\omega}\right|$$

$\Downarrow$ dB

$$0 \leq \omega \leq \pi$$

$$20\log_{10}(1) = \phi$$



$$x[n] = \sum_{k=0}^{N} \alpha_k \cos(\omega_k + \varphi_k)$$

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

FIR

$$y[n] = \sum_{k=0}^{M} \boxed{h[k]} \, x[n-k]$$

$$20 \log_{10}(2) = 6\,\mathrm{dB}$$

$$20 \log_{10}(10) = 20\,\mathrm{dB}$$

$$20 \log_{10}(100) = 40\,\mathrm{dB}$$

$$(1000) = 60\,\mathrm{dB}$$

$\vdots$

$$\boxed{x[n] = \cos(2\pi\, 0.1\, n)}$$

$$\frac{1 - 10.000}{1 - 100}$$

ΑΡΧΙΖΟΥΜΕ $\underline{19:30}$

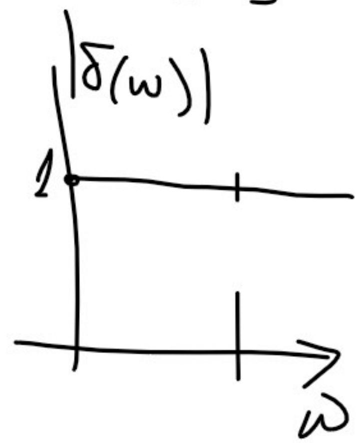
$$X(\omega) = \sum_{n=-\infty}^{+\infty} x[n]\, e^{-j\omega n}$$

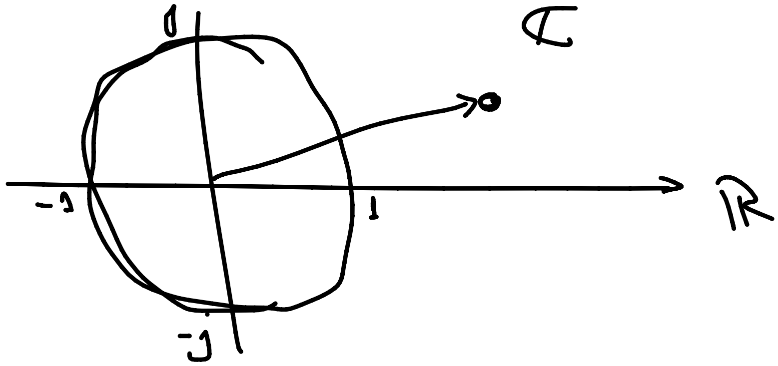
ΜΕΤΑΣΧΗΜ. $\underline{Z}$

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

$$x[n] = [1] = [1\ 0\ 0\ 0\ 0] \quad \delta[n]$$

$$\boxed{\delta(t) = \begin{cases} \int_{-\infty}^{+\infty} \delta(t)\, dt = 1 \\ 0, \quad t \neq 0 \end{cases}} \Longrightarrow$$





ω

$z = e^{j\omega}$

$|e^{j\omega}| = 1$

$x[n] \Rightarrow n = 1, N$

M.Z.

$$\boxed{x[n] = \left\{ \begin{array}{cccc} 1, & 2, & -1, & 1 \\ n=0 & 1 & 2 & 3 \end{array} \right\}} \Rightarrow \boxed{1z^{0} + 2z^{-1} - z^{-2} + z^{-3}}$$

$$= 1\delta[n-0] + 2\delta[n-1] - \delta[n-2] + 3\delta[n-3]$$

$f(z_k) = 0$

$$f(z) = \sum_{k=0}^{M} \alpha_k z^{-k} = \prod_{k=0}^{M} (z^{-1} - z_k)$$

$\sum^{N} \quad \sum^{M}$

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

$\Downarrow$

$$\sum_{k=0}^{N} a_k \boxed{Y(z)} z^{-k} = \sum_{k=0}^{M} b_k \boxed{X(z)} z^{-k} \Rightarrow$$

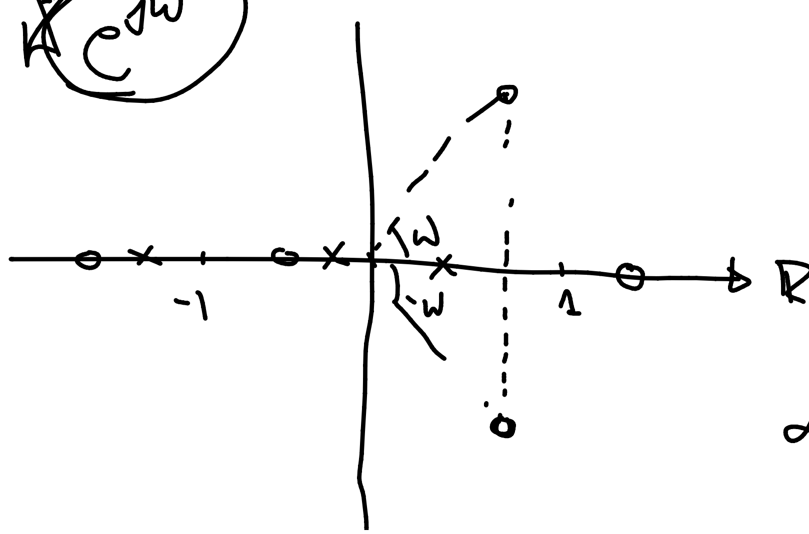
$$\frac{Y(z)}{X(z)} = \frac{\sum_{k=0}^{M} b_k z^{-k}}{\boxed{\sum_{k=0}^{N} a_k z^{-k}}} = \qquad z^{-1} = q$$

$$= \frac{\prod_{k=0}^{M} (z^{-1} - p_k)}{\prod_{k=0}^{N} (z^{-1} - q_k)} = \frac{(z^{-1}-p_1) \cdots (z^{-1}-p_k)(z^{-1}-p_k^*)}{(z^{-1}-q_1) \cdots (z^{-1}-q_k)(z^{-1}-q_k^*)}$$

0 ΜΗΔΕΝΙΚΑ

ΠΟΛΟΙ

e^{jw}



$\times$ $\circ$

$\alpha + \beta j \quad re^{jw}$

$\alpha+\beta j \quad re^{j\omega}$
$\alpha-\beta j \quad re^{-j\omega}$

$y^2[n]$

$$\boxed{y[n] = 2y[n-1] + x[n]}$$

$x[n]=\delta[n] \longrightarrow h[n]$

$\overset{1}{\delta[0]} + 2\overset{\phi}{y[-1]} = y[\phi] = 1$

$\cancel{\delta[1]} + 2y[\phi] = y[1] = 2$

$\cancel{\delta[2]} + 2y[1] = y[2] = 4$

$\cancel{\delta[3]} + 2y[2] = y[3] = 8$

$$\boxed{h[n] = 2^n} \quad n=0,N$$

$$\text{Ενέργεια} = \sum_{n=-\infty}^{+\infty} x^2[n]$$

$$\ldots = \sum_{n=-\infty} x[n]$$

$$-1+ \qquad = \sum_{n=-\infty}^{+\infty} \delta^2[n] = 1^2 = 1$$

$$\sum_{n=0}^{+\infty} y^2[n] = \sum_{n=0}^{+\infty} h^2[n] = \sum_{n=0}^{+\infty} 2^n = +\infty \quad 2^{+\infty} = +\infty$$

FIR

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

ΟΛΑ ΤΑ FIR ΕΙΝΑΙ ΕΥΣΤΑΘΗ.

IIR

$$y[n] = \sum_{k=0}^{N} b_k x[n-k] + \sum_{k=1}^{M} a_k y[n-k]$$

FIR

$N = 0$ $\qquad M = 1$

$$y[n] = x[n] + 2y[n-1]$$

$b_0 = 1$ $\alpha_1 = 2$