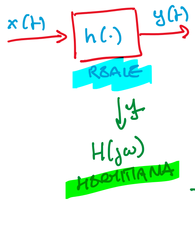
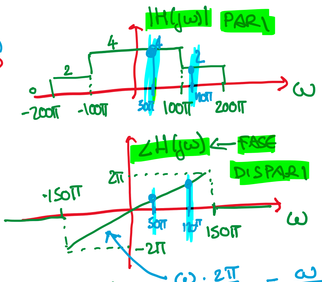
Le20

Thursday, 24 April 2025 08:45

ES 1





$\omega \cdot \frac{2\pi}{150\pi} = \frac{\omega}{75}$

$x(t) = \cos(50\pi t) + 5\cos(120\pi t)$

1) $y(t) = ?$

2) IL FILTRO DISTORCE IL SEGNALE? SI

↳ FILTRO NON DISTORCENTE SE $y(t) = A\,x(t-t_0)$

$$y(t) = |H(j50\pi)|\cos\left(50\pi t + \angle H\left(j\tfrac{50\pi}{75}\right)\right) + 5|H(j120\pi)|\cos\left(120\pi t + \angle H\left(j\tfrac{120\pi}{75}\right)\right)$$

($|H(j50\pi)| = 4$, $|H(j120\pi)| = 2$)

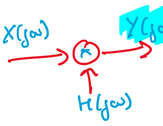
$$= 4\cos\left(50\pi\left(t+\tfrac{1}{75}\right)\right) + 10\cos\left(120\pi\left(t+\tfrac{1}{75}\right)\right)$$

ES 2

$x(t) = \text{triangle}(t/3)$

$y(t) = \text{triangle}\left(\frac{t+2}{3}\right) + 2\,\text{triangle}(t/3) + 4\,\text{triangle}\left(\frac{t-1}{3}\right)$

1) $H(j\omega) = ?$
2) $h(t) = ?$
3) BIBO STABILE?
4) USCITA PER $x(t) = 1(t)$

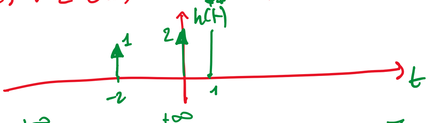


$H(j\omega) = \frac{Y(j\omega)}{X(j\omega)}$ DECONVOLUZIONE

$$H(j\omega) = \frac{3\,\text{sinc}^2\left(\frac{3\omega}{2\pi}\right)e^{-j\omega\cdot(-2)} + 2\cdot 3\,\text{sinc}^2\left(\frac{3\omega}{2\pi}\right) + 4\cdot 3\,\text{sinc}^2\left(\frac{3\omega}{2\pi}\right)e^{-j\omega\cdot 1}}{3\,\text{sinc}^2\left(\frac{\omega\cdot 3}{2\pi}\right)}$$

$$= e^{j2\omega} + 2 + 4e^{-j\omega}$$

$h(t) = \delta(t+2) + 2\cdot\delta(t) + 4\,\delta(t-1)$



$$\int_{-\infty}^{+\infty}|h(t)|\,dt = \int_{-\infty}^{+\infty}h(t)\,dt = 1+2+4 = 7 < \infty$$

BIBO STABILE!

ES 3 TROVARE $S(e^{j\theta})$ PER $s(n) = \delta(n)$

$$S(e^{j\theta}) = \sum_{n=-\infty}^{+\infty}\delta(n)\,e^{-j\theta n} = e^{-j\theta n}\Big|_{n=0} = 1$$

ES 4 PROVIAMO CON $s(n) = \delta(n-n_0)$

$$S(e^{j\theta}) = \sum_{n=-\infty}^{+\infty}\delta(n-n_0)\,e^{-j\theta n} = e^{-j\theta n}\Big|_{n=n_0} = e^{-j\theta n_0}$$

ES 5 PROVIAMO CON $s(n) = 1$

$$S(e^{j\theta}) = \sum_{n=-\infty}^{+\infty}1\cdot e^{-j\theta n} = ?$$

TENTIAMO CON $S(e^{j\theta}) = 2\pi\cdot\text{comb}_{2\pi}(\theta)$

$$s(n) = \frac{1}{2\pi}\int_{-\pi}^{\pi}2\pi\cdot\underbrace{\text{comb}_{2\pi}(\theta)}_{\delta(\theta)}\,e^{j\theta n}\,d\theta = e^{j\theta n}\Big|_{\theta=0} = 1$$