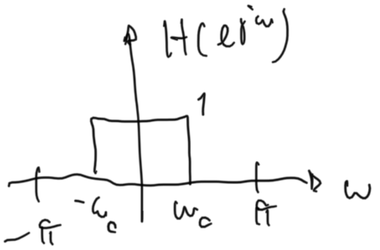
PDSI11MAR2021

Lecture # 9



$$h[n] = \frac{1}{2\pi}\int_{-\pi}^{\pi} H(e^{j\omega})\, e^{j\omega n}\, d\omega$$

$$= \frac{1}{2\pi}\int_{-\omega_c}^{\omega_c} e^{j\omega n}\, d\omega$$

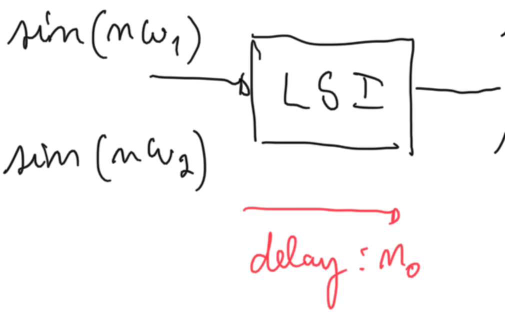
$$= \frac{1}{2\pi} \left.\frac{e^{j\omega n}}{jn}\right]_{-\omega_c}^{\omega_c} = \frac{1}{2\pi}\,\frac{e^{j\omega_c n} - e^{-j\omega_c n}}{jn}$$

$$= \frac{1}{\cancel{2}\pi}\,\frac{\cancel{2}\cancel{j}\sin \omega_c n}{\cancel{j} n} = \frac{\sin \omega_c n}{\pi n} \cdot \frac{\omega_c}{\omega_c}$$

$$= \frac{\omega_c}{\pi}\,\frac{\sin n\omega_c}{n\omega_c}$$

if $\omega_c = \pi \Rightarrow h[n] = \delta[n]$

$\boxed{\text{LINEAR PHASE}}$ and GROUP DELAY



$\sin(n-n_0)\omega_1 = \sin(n\omega_1 - n_0\omega_1)$ $\quad \phi_1$

$\sin(n-n_0)\omega_2 = \sin(n\omega_2 - n_0\omega_2)$ $\quad \phi_2$

$\sin n\omega_A$ -------- $|H(e^{j\omega_A})| \sin(n\omega_A + \angle H(e^{j\omega_A}))$

$$\angle H(e^{j\omega}) = -n_0 \omega$$

GROUP DELAY $\rightarrow$ $\tau(\omega) = -\frac{d}{d\omega} \angle H(e^{j\omega}) = n_0$