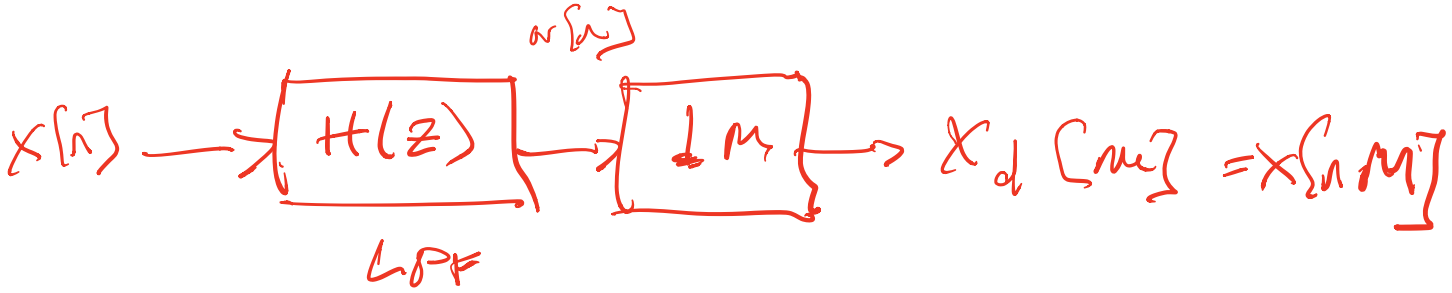
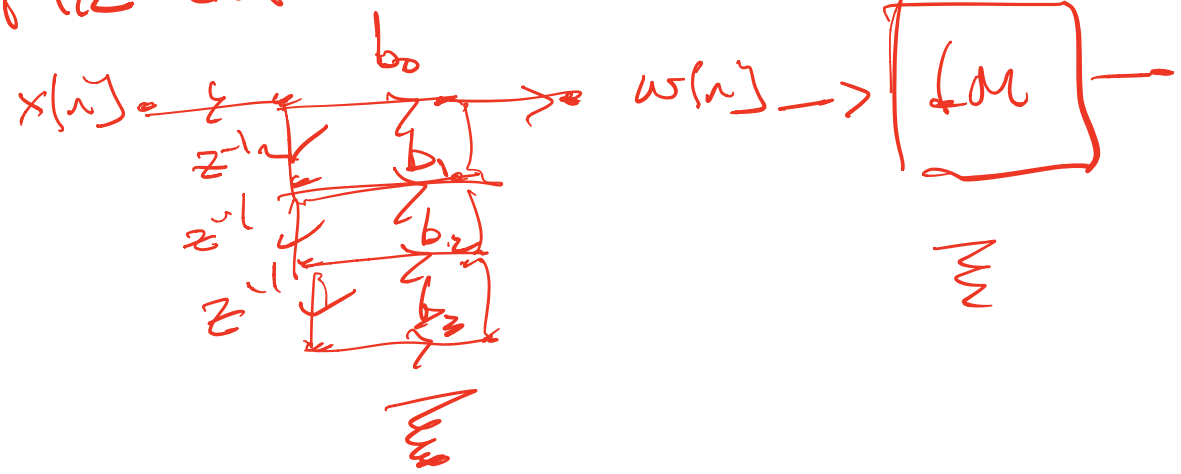
IIR FILTER DESIGN

DOWNSAMPLING

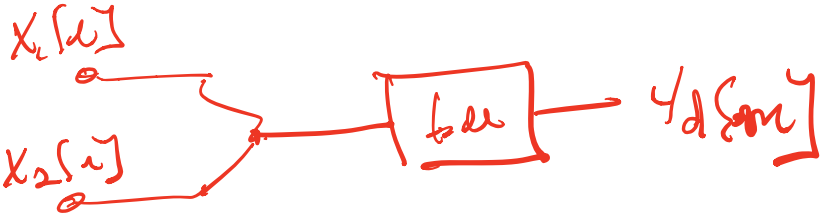


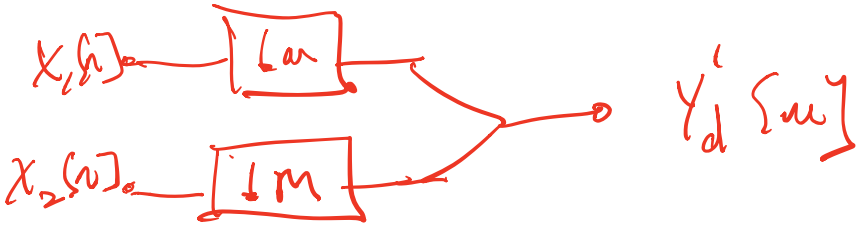
FIR LPF



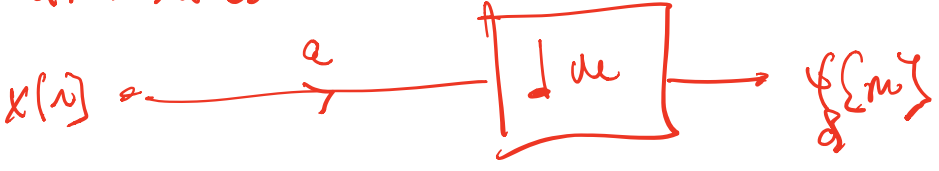
INTERCHANGING DOWNSAMPLING & COMPUTATION

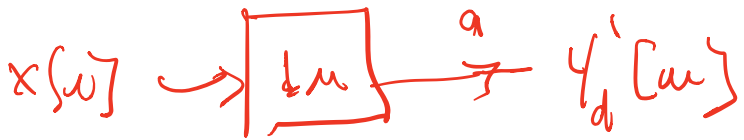
ADDITION



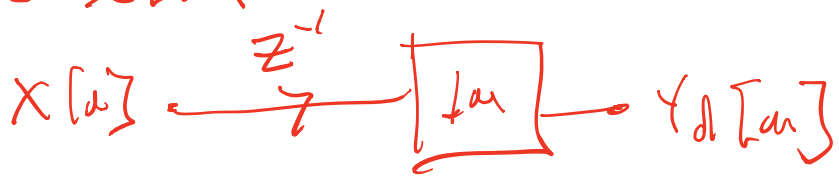


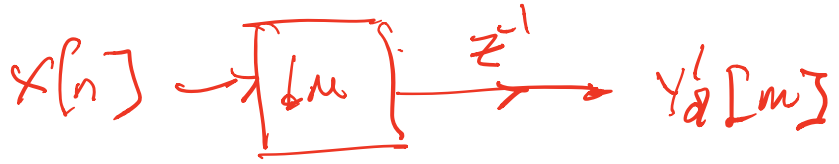
MULTIPLICATION





TIME DELAY





$M = 3$

$x[0], x[1], x[2], x[3], \ldots$

$x[-1], x[0], x[1], x[2]$

$y_d[n] = x[0], x[3], x[6] \ldots$

$y'_d[n] = x[-1], x[2], x[5]$

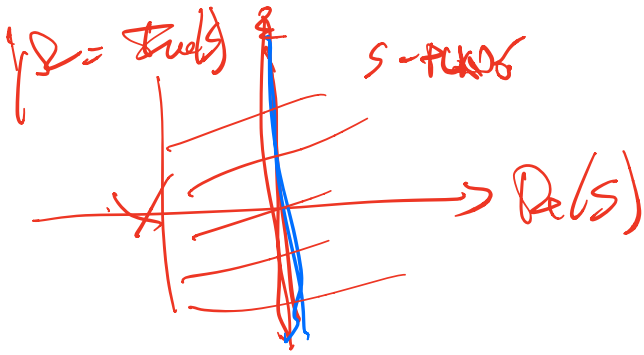
OSB 7.26

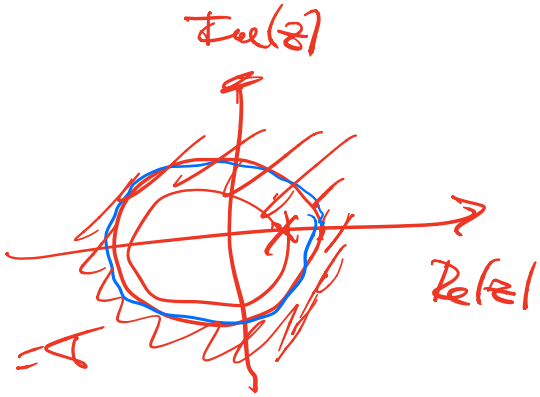
IMP. INV. V. BLT

IMPULSE INV. $h(n) = T h_a(nT)$

Pole @ $s = -a$

$\Rightarrow$ Pole @ $z = e^{aT}$





$H(j\Omega) \Rightarrow H(e^{j\omega})$ $\quad \omega = \Omega T$

$H(e^{j\omega}) = \sum_{k=-\infty}^{\infty} H\left(j\Omega - \frac{2\pi k}{T}\right)$

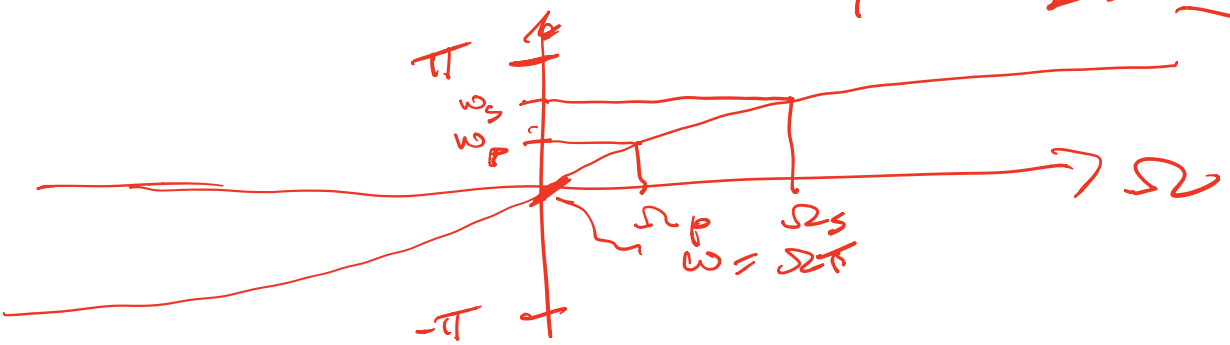
$k = -\infty$

BILINEAR TRANSFORM

$$s = \frac{2}{T}\frac{1 - z^{-1}}{1 + z^{-1}}$$

$$\omega = 2\tan^{-1}\left(\frac{\Omega T}{2}\right)$$

$$\Omega = \frac{2}{T}\tan\left(\frac{\omega}{2}\right) \quad \text{(*)}$$



PROBLEM 10.3

$\omega_p = .2\pi$

$\omega_s = .5\pi$

$\delta_p = -3\,dB$

$\delta_s = -25\,dB$

$$N = \frac{1}{2}\frac{\log\left(k_2/k_1\right)}{\log\left(\Omega_s/\Omega_p\right)}$$

$$s = \frac{2}{T}\cdot\frac{1 + z^{-1}}{1 - z^{-1}}$$