

9/26/24

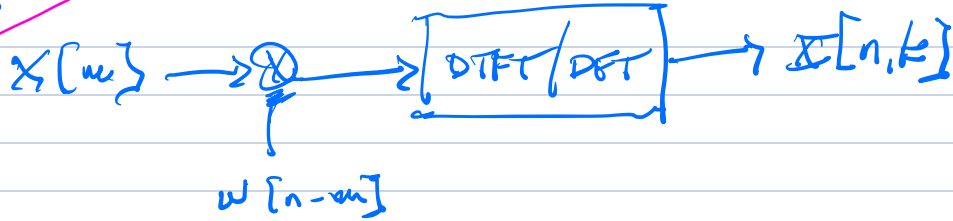
RECITATION 4, STFA

$$X[n, \omega] = \sum_{m=-\infty}^{\infty} x[m] w[n-m] e^{-j\omega m}$$

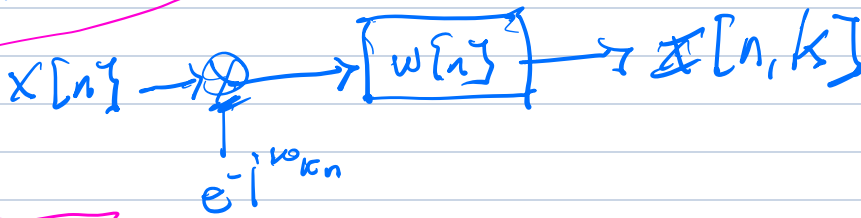
$$\omega_k = \frac{2\pi k}{N}$$

$$X[n, k] = \sum_{m=-\infty}^{\infty} x[m] w[n-m] e^{-j\omega_k m}$$

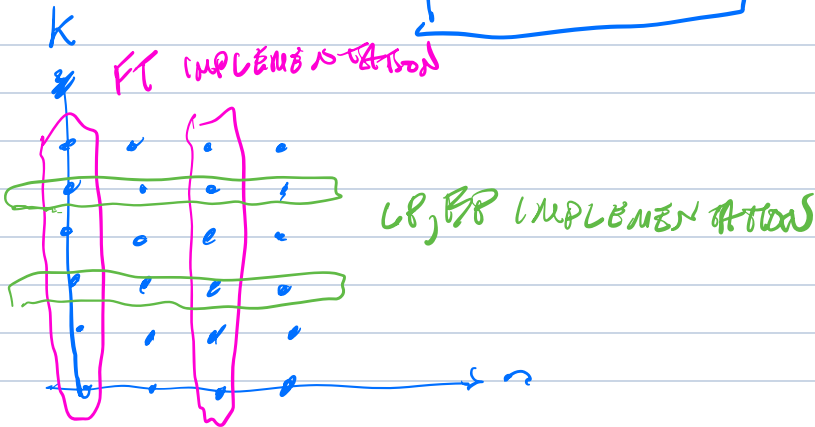
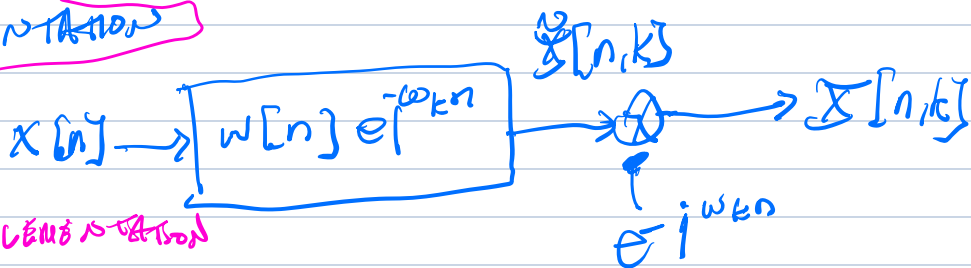
FT IMPLEMENTATION



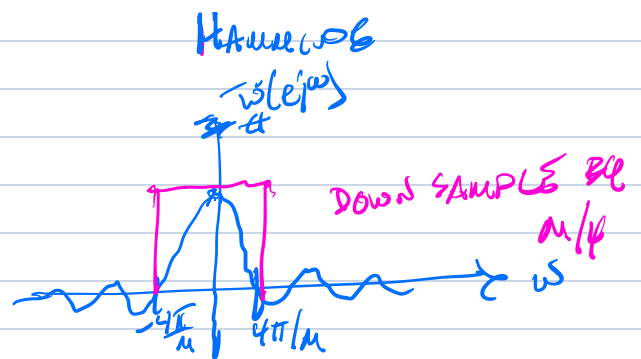
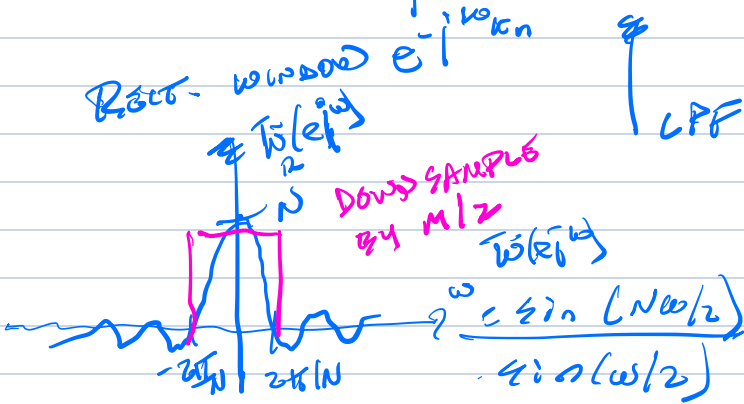
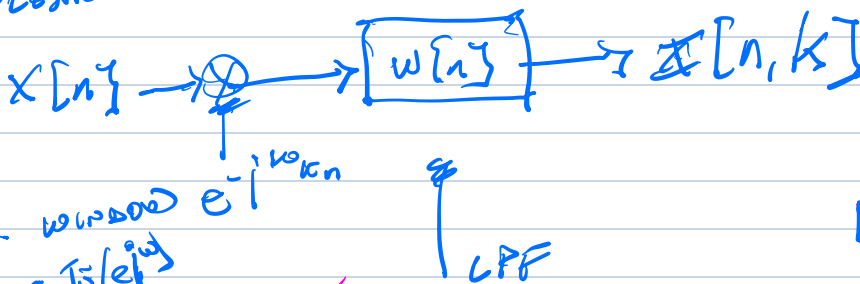
LPF IMPLEMENTATION



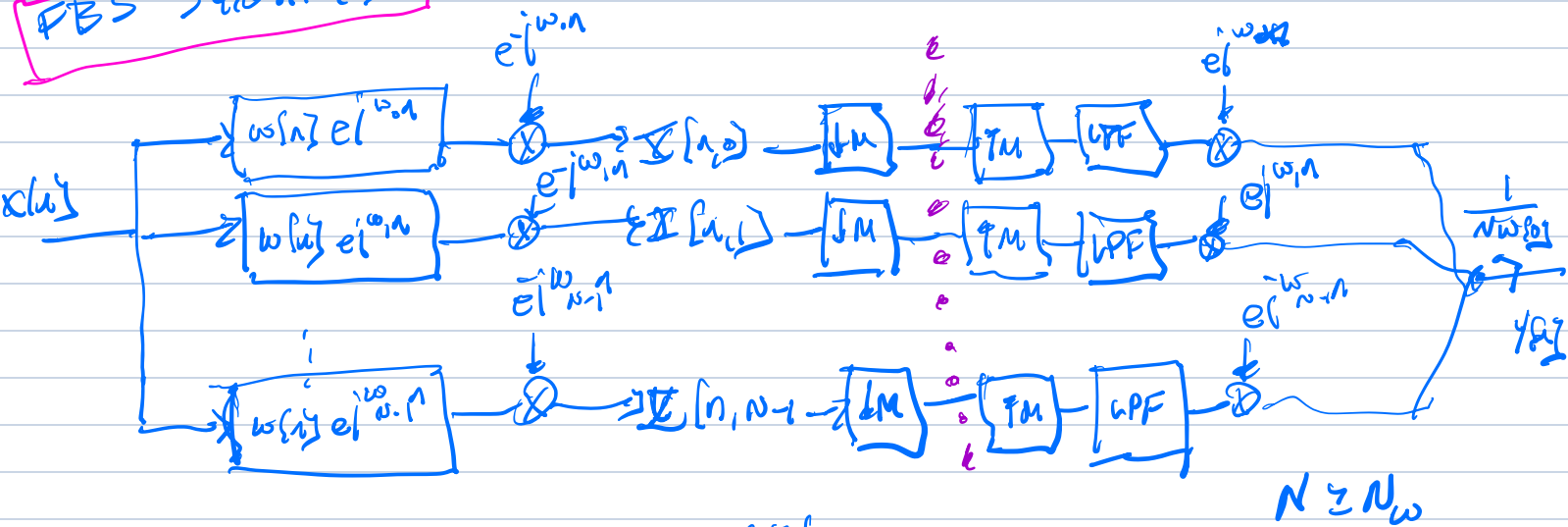
BPF IMPLEMENTATION



LP IMPLEMENTATION

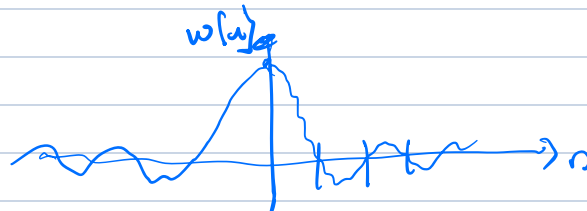


FBS SYNTHESIS



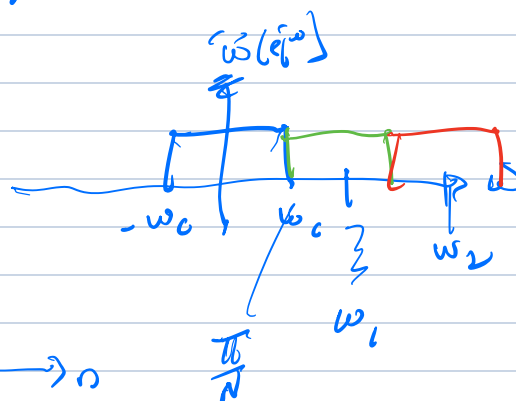
$$\gamma(n) = x(n) \iff \begin{matrix} \omega(n) \neq 0, & n=0 \\ \omega(n) = 0, & n=rN \end{matrix}$$

$$\mathcal{F}\{w[n]\} = \frac{\sin(\omega_c n)}{\pi n}$$



$$\omega_{cA} = K\pi$$

$$n = K \frac{\pi}{\omega_c}$$

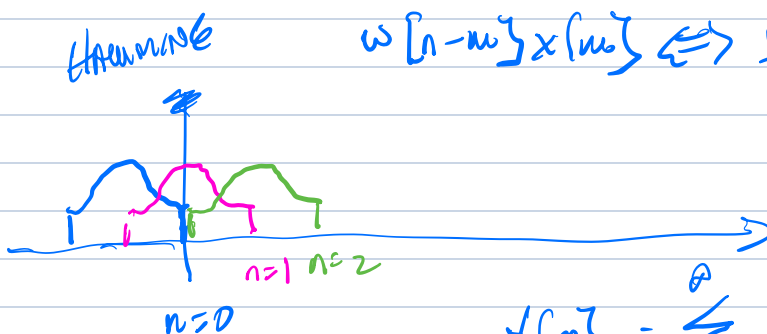


OLA SYNTHESIS

$$X[k] = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega_k n}$$

$$\omega[n-m]x[m] \Leftrightarrow x[n, t]$$

Def $n = rL$

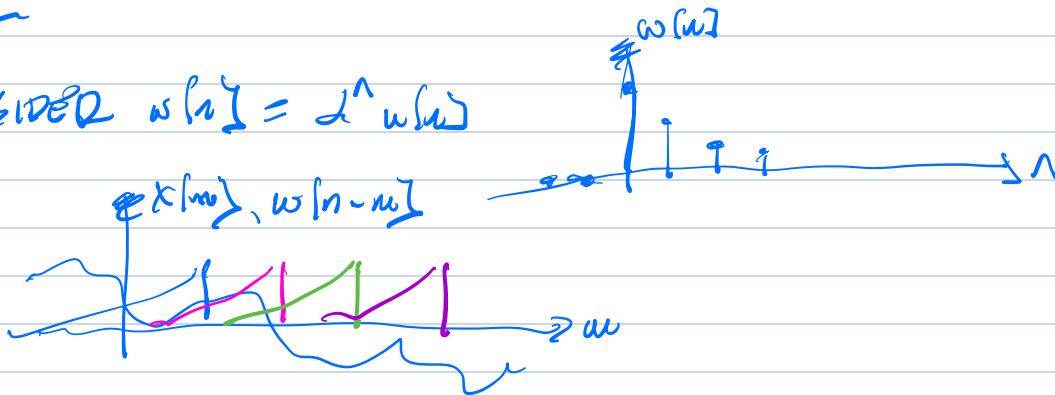


$$y(m) = \sum_{l=-\infty}^{\infty} x(l) w\{\sigma l - m\}$$

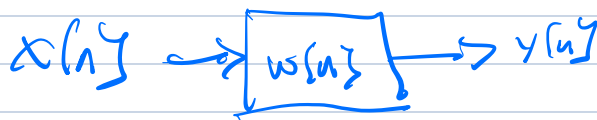
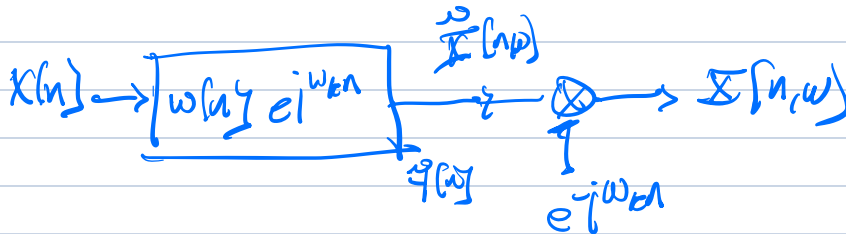
$$y[n] = x[n] \sum_{r=-\infty}^{\infty} w[r] \delta[n-r]$$

$$\approx w[r] \delta[n-r] \text{ BB const.}$$

CONSIDER $w[n] = \alpha^n w[n]$



BP IMPLEMENTATION w/ EXPONENTIAL WINDOWS



$$\text{ROC } |z| > |\alpha|$$

$$w[n] = \alpha^n u[n] \Leftrightarrow \tilde{w}(z) = \sum_{n=0}^{\infty} \alpha^n z^{-n} = \frac{1}{1 - \alpha z^{-1}}$$

$$\tilde{w}(z) = \frac{\tilde{y}(z)}{\tilde{x}(z)} = \frac{1}{1 - \alpha z^{-1}} \quad ; \quad \tilde{y}(z) - \alpha z^{-1} \tilde{y}(z) = \tilde{x}(z)$$

$$y[n] - \alpha y[n-1] = x[n]$$

$$y[n] = x[n] + \alpha y[n-1]$$

WITH BP IMPLEMENTATION

$$\text{IF } w[n] = \alpha^n u[n], \text{ BP } h[n] = \alpha^n e^{j\omega n} u[n] = (\alpha e^{j\omega})^n u[n]$$

$$\tilde{y}[n] = x[n] + (\alpha e^{j\omega}) \tilde{y}[n-1]$$