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3. Filter A : $f \leq 8$ Hz

Filter B : $4 \text{Hz} < f \leq 12,5$ Hz

$F_s = 25$ Hz

a. $\omega_{cA} = \frac{8}{25}\pi = 0,32\pi$

$$H_A(e^{j\omega}) = \begin{cases} e^{-j\omega}, & 0 \leq \omega \leq 0,32\pi \\ 0, & 0,32\pi < \omega \leq \pi \end{cases}$$

$\omega_{cB1} = \frac{4}{25}\pi = 0,16\pi$

$\omega_{cB2} = \frac{12,5}{25}\pi = 0,5\pi$

$$H_B(e^{j\omega}) = \begin{cases} 0, & 0 \leq \omega \leq 0,16\pi \\ e^{-j\omega}, & 0,16\pi < \omega \leq 0,5\pi \\ 0, & 0,5\pi < \omega \leq \pi \end{cases}$$

$\Delta\omega = \frac{6,2\pi}{M+1}$

$0,5 \cdot 2\pi = \frac{6,2\pi}{M+1}$

$M = \frac{6,2\pi}{0,5 \cdot 2\pi} - 1 = \lfloor 5,2 \rfloor = 5$

$M = 2\alpha + 1$

$5 = 2\alpha + 1$

$\alpha = 2$

$$H_A(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & 0 \le \omega \le 0{,}32\pi \\ 0, & 0{,}32\pi < \omega \le \pi \end{cases}$$

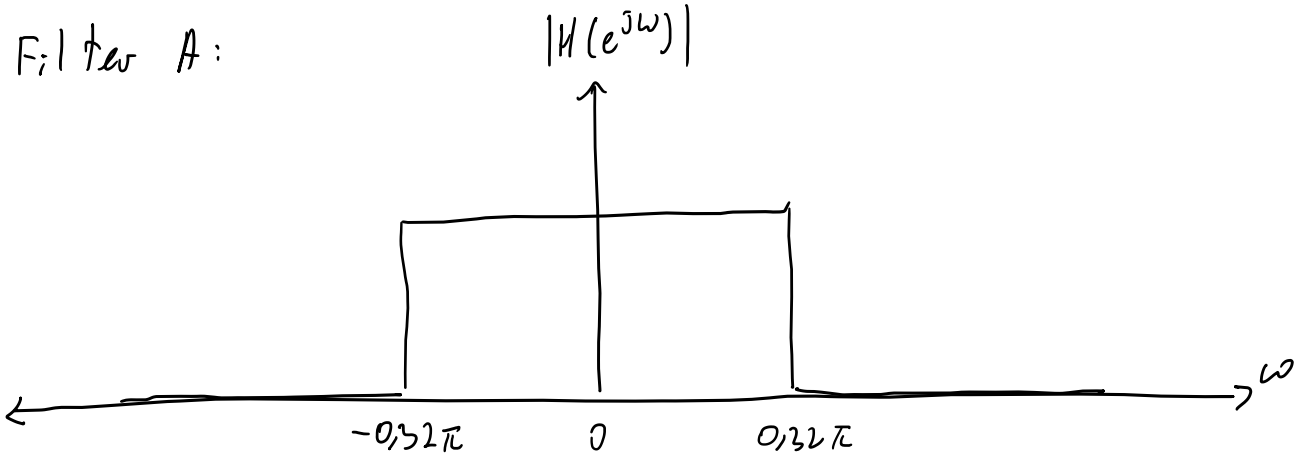
$$H_B(e^{j\omega}) = \begin{cases} 0, & 0 \le \omega \le 0{,}16\pi \\ e^{-j2\omega}, & 0{,}16\pi < \omega \le 0{,}5\pi \\ 0, & 0{,}5\pi < \omega \le \pi \end{cases}$$

b. $$h_A[n] = \frac{\sin[\omega_c(n-\alpha)]}{\pi(n-\alpha)} = \frac{\sin[0{,}32\pi\,(n-2)]}{\pi(n-2)}$$

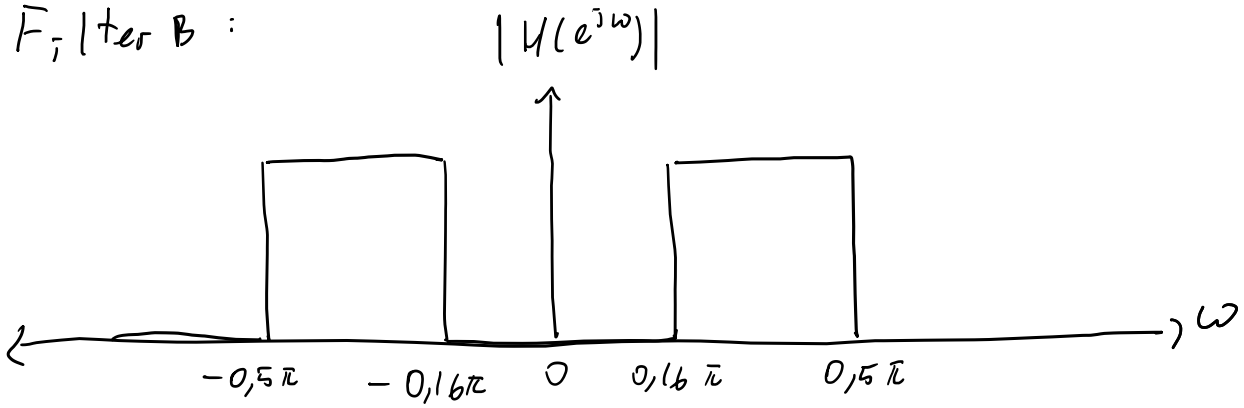
$$h_B[n] = \frac{\sin[\omega_{c_2}(n-\alpha)] - \sin[\omega_{c_1}(n-\alpha)]}{\pi(n-\alpha)}$$

$$= \frac{\sin[0{,}5\pi(n-2)] - \sin[0{,}16\pi(n-2)]}{\pi(n-2)}$$

c. Filter A:



Filter B:



d. Window Hanning

e. M = 5