DSP 5 - FIR

1) $f_s = 8$ kHz, $f_c = 1$ kHz (???), $|H(e^{j\omega})| = 0$ dB, $|H(e^{jT\cdot 2\pi\cdot 750})| \geq -1$ dB, $|H(e^{jT\cdot 2\pi\cdot 1500})| \leq -10$ dB.

$T = \frac{1}{8\text{kHz}} = 0.125$ ms

750 Hz: $\omega_p = 0.125\text{ ms} \cdot 750\text{ Hz} = 0.09375$

1500 Hz: $\omega_{stop} = 0.125\text{ ms} \cdot 1500\text{ Hz} = 0.1875$

1 kHz: $\omega_c = 0.125\text{ ms} \cdot 1\text{ kHz} = 0.125$

$$H_d(e^{j\omega}) = \begin{cases} e^{-j\omega M/2} & |\omega| < \omega_c \\ 0 & \omega_c < |\omega| \leq \pi \end{cases}$$

$$h_d[n] = \frac{1}{2\pi}\int_{-\omega_c}^{\omega_c} e^{-j\omega M/2} e^{j\omega n}\, d\omega = \frac{\sin(\omega_c(n-M/2))}{\pi(n-M/2)}$$

$$w[n] = \begin{cases} 1 & 0 \leq n \leq M \\ 0 & \text{ellers} \end{cases};$$

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$$H(e^{j\omega}) = \left\{ h[M/2] + 2\sum_{k=1}^{M/2} h[M/2+k]\cos(\omega k) \right\} e^{-j\omega M/2}$$

Choose some values for M, plot $|H(e^{j\omega})|$ and check if requirements are met. Repeat until the chosen M-value yields a result which complies with the reqs.