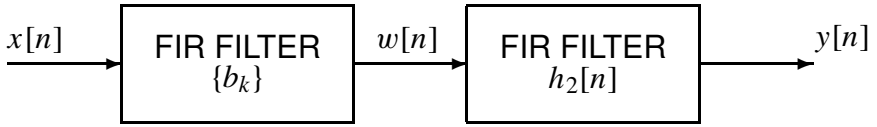
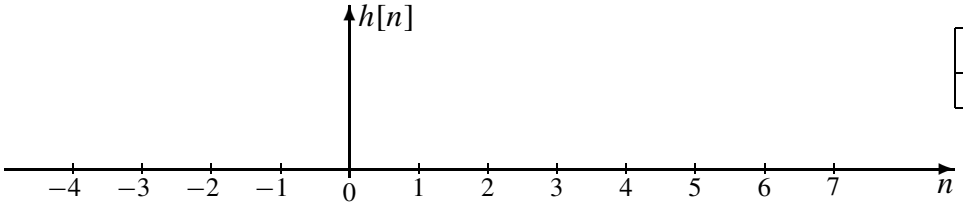
PROBLEM:



(a) If the filter coefficients of the first FIR filter are $\{b_k\} = \{0, 1, 1, 1\}$, and the impulse response of the second FIR filter is $h_2[n] = \delta[n] + 2\delta[n-2] - \delta[n-3]$, use convolution to determine the impulse response of the overall system, $h[n]$. Give your answer as a plot below.



Label Carefully

Plot zero values also

(b) Suppose that the overall frequency response of the cascade system (using different FIR filters from those in part (a)) is

$$\mathcal{H}(\hat{\omega}) = (2 - 2\cos(\hat{\omega}))e^{-j\hat{\omega}}$$

If the input signal is $x[n] = 30 + 30\cos(0.5\pi n + 0.3\pi)$ for $-\infty < n < \infty$, determine a simple mathematical expression for the overall output signal $y[n]$.

$y[n] =$