

Review Questions for Chapter 4

Q1. The z -transform transfer function of an FIR filter is given by:

$$H(z) = 1 + 2z^{-1} + z^{-2}$$

Find the frequency response of the filter.

Q2. The impulse response of an FIR filter is given by:

$$h(n) = a_1\delta(n) + a_2\delta(n-1) + a_3\delta(n-2) + a_4\delta(n-3) + a_5\delta(n-4)$$

For what values of the impulse response samples will its frequency response have a linear phase?

Q3. The frequency response of a length-4 FIR filter with a real and symmetric impulse response has the following specific values:

$$H(e^{j0}) = 6, \text{ and } H(e^{j\frac{\pi}{2}}) = -1 - j$$

Determine $H(z)$.

Q4. Determine the filter length for following FIR filters.

- Passband edge: 1 kHz, Stopband edge: 1.5 KHz, passband ripple is less than 0.01, and minimum stopband attenuation is 40dB. The sampling frequency is 5 KHz.
- Passband edge : $0.1f_s$, Stopband edge: $0.12f_s$, passband ripple is less than 0.001, and minimum stopband attenuation is 40dB.
- The normalized passband and stopband edges are at 0.3 and 0.301, respectively. The passband and stopband ripple are 0.1 dB and -80dB, respectively.