8 Digital Filters

Multiple Choice Questions

Q.1 Let $3 + j4$ be a zero of a fourth order linear phase FIR filter. The complex number which is NOT a zero of this filter is

(a) $3 - j4$ (b) $\frac{3}{25} + \frac{4}{25}j$

(c) $\frac{3}{25} - \frac{4}{25}j$ (d) $\frac{1}{3} - \frac{1}{4}j$

Q.2 The signal $x[n] = \frac{\sin\frac{\pi}{6}n}{\pi n}$ is processed through a linear filter with the impulse response $h[n] = \frac{\sin\omega_c n}{\pi n}$ where $\omega_c > \frac{\pi}{6}$. The output of the filter is

(a) $\frac{\sin 2\omega_c n}{\pi n}$ (b) $\frac{\sin\frac{\pi}{3}n}{\pi n}$

(c) $\left[\frac{\sin\frac{\pi}{6}n}{\pi n}\right]^2$ (d) $\frac{\sin\frac{\pi}{6}n}{\pi n}$

Q.3 A system with transfer function $H(z)$ is given by

$$H(z) = 1 + 2z^{-1} + 2z^{-2} + z^{-3}$$

The system is

(a) Linear phase FIR filter
(b) Linear phase IIR filter
(c) Non-linear phase
(d) None linear IIR filter

Q.4 If the frequency response of a discrete time LTI system is given by $H(e^{j\omega}) = e^{-j4\omega}$ the order of filter will be

(a) 4 (b) 8
(c) 7 (d) 9

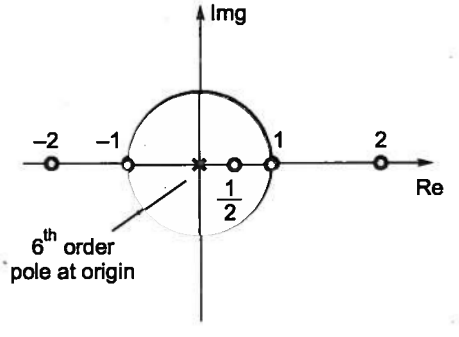
Q.5 A 4^{th} order FIR filter has following two pairs of complex conjugate zero:

$$z_1, z_2 = 0.5\, e^{\pm j\pi/6}$$
$$z_3, z_4 = 2\, e^{\pm j\pi/6}$$

The filter is

(a) Linear phase (b) Non-linear phase
(c) IIR filter (d) None of these

Q.6 Shown below is the pole-zero plot of a digital filter



Which one of the following statements is true?

(a) This is a LPF (b) This is a HPF
(c) This is a IIR filter (d) This is a FIR filter

Common Data for Questions (7 to 9):

Consider the filter having difference equation

$y[n] = -0.9\, y[n-1] + b_0\, x[n]$

Q.7 The filter is

(a) LPF (b) HPF

(c) BPF (d) All pass filter

Q.8 Value of b_0 so that $|H(\pi)| = 1$.

(a) 1 (b) 0.1

(c) 0.01 (d) 0.5

Q.9 The 3 dB cut-off frequency of filter will be approximately

(a) 3 rad/sec (b) 5 rad/sec

(c) 1.5 rad/sec (d) 10 rad/sec

Q.10 A high pass digital filter has one pole and one zero. The pole at a distance 0.9 from the origin of the z-plane. DC signal do not pass through the filter. Transfer function of filter should be

(a) $H(\tau) = \dfrac{b_0(1+z^{-1})}{1+0.9z^{-1}}$

(b) $H(\tau) = \dfrac{b_0(1-z^{-1})}{1+0.9^{z-1}}$

(c) $H(\tau) = \dfrac{b_0(1+z^{-1})}{1-0.9^{z-1}}$

(d) $H(\tau) = \dfrac{b_0(1-z^{-1})}{1-0.9^{z-1}}$

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