Assigment-2

Q1 Write 10 diffrances between FIR and IIR Filters.

Q2 Use Impulse invariance method to convert Analog Filter into Digital IIR Filter

(a) $H(S) = \frac{1}{S+2}$ (b) $H(S) = \frac{1}{S^2+16}$ (c) $H(S) = \frac{1}{(S+0.1)^2+9}$

If $T = 1$ sec

Q3 Convert analog filter into digital filter by using impulse invariance method.

(a) $H(S) = \frac{S+0.2}{(S+0.2)^2+9}$ (b) $H(S) = \frac{1}{(S+1)(S+2)}$

(c) $H(S) = \frac{1}{(S+0.5)(S^2+0.5S+2)}$

Q4 Convert analog filter into digital filter by using bilinear transformation method

(a) $H(S) = \frac{S+0.1}{(S+0.1)^2+9}$ (b) $H(S) = \frac{1}{(S+1)(S+3)}$

(c) $H(S) = \frac{1}{(S+1)^2}$

If $W_r = \frac{\pi}{4}$ = digital resonant frequency

Q5 Design digital butterworth Filter that satisfy following constraint using bilinear transformation

Assume $T=1$

$0.9 \leq |H(e^{j\omega})| \leq 1 \qquad 0 \leq \omega \leq \pi/2$

$|H(e^{j\omega})| \leq 0.2 \qquad \frac{3\pi}{4} \leq \omega < \pi$

Q6 Design a digital chebyscher filter to satisfy the constraints $0.707 \leq |H(e^{j\omega})| \leq 1$; $0 \leq \omega \leq 0.2\pi$

$|H(e^{j\omega})| \leq 0.1$, $0.5\pi \leq \omega \leq \pi$

use bilinear transformation method $T = 1s$.

Q7 A prototype LPF has system response $H(s) = \frac{1}{s^2+2s+1}$. Obtain a band pass filter with $\Omega'' = 2 rad/sec$ & $Q = 10$

$\Omega_0^2 = \Omega_1 \Omega_2$ and $Q = \frac{\Omega_0}{\Omega_2 - \Omega_1}$

Q8 Design an analog BPF to satisfy following specifications

(i) 3 dB upper & lower cutoff freq are 100Hz and 3.8 KHZ

(ii) Stop Band attanuation of 20 dB at 20HZ and 8 KHZ

(iii) No ripple with both passband and stopband

Q9 Explain all characteristic of FIR filter with suitable Mathamatical equations

Q10 Diffrantiate IIR and FIR filters and their applications.

Q11 The following transfer function characteristics an FIR filter (M=11). determine Magnitude response and show that phase and group delay are constant.

$$H(z) = \sum_{n=0}^{M-1} h(n) z^{-n}$$

Q12 A LPF is to be designed with following desired frequency response $H_d(e^{j\omega}) = \begin{cases} e^{-2j\omega}, & -\frac{\pi}{4} \le \omega \le \frac{\pi}{4} \\ 0 & \text{otherwise} \end{cases}$

Determine filter coefficient $h_d(n)$ if window function is defined as $\omega(n) = \begin{cases} 1; & 0 \le n \le 4 \\ 0; & \text{otherwise} \end{cases}$. Also determine freq response $H(e^{j\omega})$ of designed filter

Q13 A LPF should have freq. response given below. Find Filter coefficients $h_d(n)$. Also determine τ so that $h_d(n) = h_d(-n)$

$H_d(e^{j\omega}) = e^{-j\omega\tau}, -\omega_c \le \omega \le \omega_c$; 0 otherwise

Q14 The desired response of a LPF is $H_d(e^{j\omega}) = e^{-3j\omega}$, $-\frac{3\pi}{4} \le \omega \le \frac{3\pi}{4}$; 0 otherwise. determine $H(e^{j\omega})$ for $M=7$ using Hamming window.