13/11/2024 EXTC SEM-V C SCHEME DTSP QP CODE: 10064493

Duration: 3hrs **[Max Marks: 80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any **FOUR** [20]

a Given signal x (n) = {2, 2, 4, 1} has a 4-point DFT X (k). Without performing DFT or IDFT, find out sequence $x_1(n)$ which would have a 4 point DFT X (k-1) [5]

b [5]

Obtain linear phase realization of

$$H(Z) = 2 + \frac{z^{-1}}{4} + \frac{z^{-2}}{4} + 2z^{-3}$$

c Perform 4 bit quantization using truncation of the decimal number 0.484375. [5]

d Differentiate between FIR and IIR filter [5]

e Explain concept of frequency warping in bilinear tranformation. [5]

2 a Desired response of a low pass filter is [10]

$$H_d(e^{jw}) = e^{-j3w} \quad \frac{-3\pi}{4} \ll w \ll \frac{3\pi}{4}$$

$$= 0 \quad \frac{3\pi}{4} < w \leq \pi$$

Determine $H(e^{jw})$ for M = 7 using Hamming window.

b Draw the structure of cascade and parallel realization of [10]

$$H(z) = \frac{(1 - z^{-1})^3}{(1 - \frac{1}{2}z^{-1})(1 - \frac{1}{8}z^{-1})}$$

3 a A FIR digital filter has the unit impulse response sequence h(n)={2, 2, 1}. [10]
Determine the output sequence in response to the input sequence x(n) = {3, 0, -2, 0, 2, 1, 0, -2, -1, 0} using overlap-add and overlap-save method

b A second order IIR filter has a transfer function $(z) = \frac{1}{(1-0.3z^{-1})(1-0.35z^{-1})}$. Find the effect of quantization on the location of poles of this filter and Cascade form. Use 3 bits after the decimal point. [10]

4 a Given x (n) = n+1 and N = 8, Find DFT X (k) using DIF FFT. [10]

b For analog transfer function $H(s) = \frac{3}{(s+2)(s+3)}$, determine the H (z) using impulse invariance method and bilinear transformation. Assume T = 0.1sec. [10]

5 a FIR filter have impulse responses as given below. Classify them as minimum phase or maximum phase or mixed phase. [10]

i) $h_1(n) = \{1, 0.707, 0.25\}$
ii) $h_2(n) = \{1, 1.414, 1\}$
iii) $h_3(n) = \{1, -5, 6\}$

b Obtain the analog transfer function of Butterworth low pass filter with the following specification [10]

Pass band Edge Frequency (Ω_p) = 250 red/sec

Pass band Attenuation $\leq$ 0.1 db

Stop band Edge Frequency (Ω_s) = 2000red/sec

Stop band Attenuation $\geq$ 60 db

6 a Explain application of DSP for Echo cancellation. [6]

b Write a short note on speech noise reduction and two band digital crossovers. [7]

c Explain the concept of phase and group delay. [7]

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