

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 Compute the DFT of the four point sequence $x(n)=\{0,1,2,3\}$
 - b Explain Quantization and effects of truncation and rounding.
 - c Compare IIR and FIR filters.
 - d Explain the concept of pipelining in DSP processor.
 - e Convert an analog filter with system function $H(s)$ into digital IIR filter using Impulse Invariance method. $H(s) = 10 / (S^2 + 7S + 10)$
- 2 a Obtain the DFT of the sequence $x(n)=\{1,1,1,1,1,1,0\}$ using DIT FFT [10]
 b Obtain the linear convolution of the following sequences using overlap add method. $x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ and $h(n) = \{1, 2, 3\}$ [10]
- 3 a Draw architectural block diagram of DSP processor and explain functions of each block. [10]
 b Design a Butterworth digital IIR low pass filter using BLT by assuming $T=1$ sec., to satisfy the following specifications [10]

$$0.707 \leq |H(e^{jw})| \leq 1.0; \quad 0 \leq w \leq 0.2\pi$$

$$|H(e^{jw})| \leq 0.08; \quad 0.4\pi \leq w \leq \pi$$
- 4 a Design a FIR filter with hamming window for the following specifications: [10]

$$H_d(w) = e^{-j3w} \quad -\pi/4 \leq w \leq \pi/4$$

$$= 0 \quad \pi/4 \leq w \leq \pi$$
 b Design Chebyshev analog filter with maximum pass band attenuation of 2.5dB at $\Omega_p = 20$ rad/sec and stop band attenuation of 30 dB at $\Omega_s = 50$ rad/sec. [10]
- 5 a Write a note on polyphase filters. [10]
 b Determine impulse response $h(n)$ of a filter having desired frequency response [10]

$$H_d(e^{j3w}) = e^{-j(M-1)(w/2)} \quad \text{for } 0 \leq w \leq \pi/2$$

$$= 0 \quad \text{for } \pi/2 \leq w \leq \pi$$

$M=7$, use frequency sampling approach.
- 6 a Write short note on: Application of DSP in speech processing. [10]
 b Write short note on Gibbs phenomenon. [10]

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