

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 term linear phase and state its importance in digital filters.
- 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** Explain the application of DSP in speech processing [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** 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.
- 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** Design a FIR filter with hamming window for the following specifications: [10]
- $$H_d(w) = e^{-j3w} \quad -\pi/4 \leq w \leq \pi/4$$
- $$= 0 \quad \pi/4 \leq w \leq \pi$$
- 6 a** Obtain the DFT of the sequence  $x(n)=\{1,1,1,1,1,1,0\}$  using DIT FFT algorithm. [10]
- b** Write short note on Gibbs phenomenon. [10]

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