Exam.Code:0929
Sub. Code: 6594

2063

B.E. (Electronics and Communication Engineering)

Fifth Semester

EC-502: Digital Signal Processing

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

1. (a) Determine the impulse response of the system

$$y[n] = 0.6y[n-1] - 0.08y[n-2] + x[n]$$

(b) Find the inverse Z-transform of a stable system

$$H(z) = \frac{z^{-1}}{\left(z - \frac{1}{2}\right)\left(1 + \frac{1}{2}z^{-1}\right)}$$

(c) Differentiate FIR and IIR filters.

(d) Describe application of correlation in RADAR.

(e) Discuss Finite word-length effects in digital filters.

(5×2=10)

Section-A

2. (a) Find whether the following systems are Memoryless, Time- Invariant, Linear, Causal, and Stable. Justify your answer. (5)

i. $y[n] = \sum_{k=n-1}^{\infty} x[k]$

ii. $y[n] = \log_{10}(|x[n]|)$

(b) Determine the response of the system with impulse response $h(n) = (a)^n u(n)$ to the input signal $x(n) = u(n) - u(n-8)$. (5)

3. (a) Describe Discrete Wavelet transform. How does it provide multi-resolution analysis? (5)

(b) Determine the Fourier transform of the signal: (5)

$$x[n] = (-a)^n u[n]$$

4. (a) Describe the Divide and Conquer approach for calculation of DFT. Discuss radix-2 DIT FFT algorithm with the help of butterfly diagram. (5)

P.T.O.

(b) Derive the mathematical expression of Forward and inverse DCT. How is it orthogonal transform? (5)

Section-B

5. (a) A LPF is to be designed with the following desired response (5)

$$H_d(\omega) = \begin{cases} e^{-j4\omega} & 0 \le \omega \le \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \le \omega \le \pi \end{cases}$$

Determine the filter coefficients h(n) for M=9 using frequency sampling technique.

(b) Derive the expression for frequency domain representation of Interpolation and Decimation. (5)

6. Design a digital Chebyshev filter to satisfy the criterion

$$0.86 \le H(\omega) \le 1, \qquad 0 \le \omega \le 0.2\pi$$
$$H(\omega) \le 0.195, \qquad 0.42\pi \le \omega \le \pi$$

Using impulse invariant transformation. (10)

7. (a) Determine all the FIR filters which are specified by the lattice parameters, $K_1 = 0.6$, $K_2 = 0.72$, $K_3 = 0.4$. (5)

(b) Describe the architecture of TMS320C6X processor with the help of block diagram. Discuss memory structure of this processor. (5)

x-x-x