Exam.Code:969
Sub. Code: 7398

1129

M.E. (Electronics and Communication Engineering)
First Semester
ECE-1101: Advanced 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 all possible signals having z-transform

$$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$

(b) Obtain the 4-band polyphase decomposition of IIR function:

$$H(z) = \frac{1 + 0.5z^{-1}}{1 - 0.8z^{-1}}$$

(c) In brief, describe finite word length effects in digital filters.
(d) Differentiate fixed point and floating point numbers.
(e) Discuss limitations of LMS algorithm.

(5×2=10)

Section-A

2. (a) Derive the expressions for Forward and Inverse DCT. Discuss DCT as orthogonal transform. (5)

(b) Describe time-frequency representation using wavelet transform. What is multi-resolution analysis? (5)

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

$$H_d(\omega) = \begin{cases} e^{-j4\omega} & 0 \le \omega \le \frac{\pi}{3} \\ 0 & \frac{\pi}{3} \le \omega \le \pi \end{cases}$$

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

(b) Derive the expression for frequency domain representation of Decimator. Discuss filter requirements for the decimator. (5)

4. Design a digital Butterworth filter to satisfy the criterion (10)

$$0.86 \le H(\omega) \le 1, \quad 0 \le \omega \le 0.26\pi$$
$$H(\omega) \le 0.2, \quad 0.52\pi \le \omega \le \pi$$

Using impulse invariant transformation.

P.T.O.

Section-B

5. (a) Describe forward linear prediction filter with the help of equations and lattice structure. Determine all the FIR filters which are specified by the lattice parameters, $K_1 = 0.4$, $K_2 = 0.55$, $K_3 = 0.33$. (5)

   (b) Derive Wiener-Hopf equation for Adaptive filter. Discuss one application of adaptive filters. (5)

6. (a) Describe the architecture of TMS320C6X processor and discuss memory structure and addressing modes. (5)

   (b) Discuss the Bartlett method and Welch method for power spectrum estimation. (5)

7. Describe the following:
   a. Active noise control
   b. Wiener filters
   c. Burg method

   (4, 3, 3)

x-x-x