(Please write your Exam Roll No.) Exam Roll No. 60225602814

END TERM EXAMINATION

SIXTH SEMESTER [B.TECH] MAY-JUNE 2017

Paper Code: ETEC-306 **Subject: Digital Signal Processing**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit.

Q1 Attempt all the questions of the following: **(3x5=15)**

(a) Compare the computation cost of DFT and radix 2 DIF FFT for computing 16 point DFT.

(b) What is Warping effect? Explain pre-warping filter.

(c) Write the necessary condition for Toeplitz Matrix and Hermitian Matrix.

(d) $x(n) = \{1, 2, 1, 2, 2, 3, 2, 4, 1, 4, 5\}$ Perform (i) decimation by 2, and (ii) interpolation by 3 on the above signal $x(n)$.

(e) Determine the poles of the 2nd order Butterworth filter.

Unit-I

Q2 (a) Compute radix 2 DIF FFT of the following signal $x(n) = \{1, 2, 1, 2, 0, 0, 0, 0\}$. **(8)**

(b) Perform the circular convolution of the following signals $x1(n) = \{1, 2, 3, 1\}$, $x2(n) = \{1, 0, 2, 1, 5\}$. **(7)**

Q3 (a) Compute 8 pt. DFT of the following signal using twiddle factor property $x(n) = \{1, 1, 0, 0, 1, 0, 1, 0\}$. **(10)**

(b) Compute linear convolution of the following sequences using overlap add method $x1(n) = \{1, 2, 3, 4\}$, $x2(n) = \{1, 2, 0, 1\}$. **(5)**

Unit-II

Q4 (a) Design a Butterworth digital IIR LPF using bilinear transformation by taking T = 0.1 second, to satisfy the following specification

$0.6 \leq |H(e^{j\omega})| \leq 1.0$; for $0 \leq \omega \leq 0.35\pi$

$|H(e^{j\omega})| \leq 0.1$; for $0.7\pi \leq \omega \leq \pi$ **(10)**

(b) Explain the characteristics of ideal window for FIR filter design. **(5)**

Q5 (a) Draw the canonical structure and transpose structure for the following transfer function $H(z) = \frac{2+3z^{-1}+4z^{-2}}{1+5z^{-1}+9z^{-2}}$. **(7)**

(b) Determine H(z) for the following transfer function using impulse invariance method if (i) T = 0.1 sec, (ii) T = 1 sec.

$H(s) = 2/(s^2 + 3s + 2)$ **(8)**

Unit-III

Q6 (a) Find the Direct form coefficients from the Lattice coefficients K1 = 1/4, K2 = 1/2, K3 = 1/3. Write an application of Lattice Structure. **(7)**

(b) Explain Levinson Durbin Algorithm in detail. **(8)**

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Q7 (a) Explain linear forward and backward prediction in detail. **(8)**

(b) Compute the Lattice coefficients from the Direct form Coefficients $\alpha_3(3) = 1/3, \alpha_3(2) = 5/8, \alpha_3(1) = 13/24$ and draw the Lattice structure. **(7)**

Unit-IV

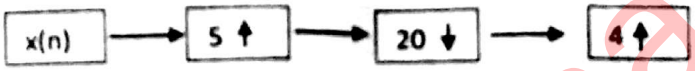
Q8 What do you understand by Polyphase decomposition? Compute section 2 and section 4 Polyphase decomposition of the following transfer functions

(a) $H(z) = 0.2 + 0.7\,z^{-1} + 0.8\,z^{-2} + 0.5\,z^{-3} + 0.1\,z^{-4} + 0.2\,z^{-5} + 0.1\,z^{-6} + 0.6\,z^{-7} + 0.7\,z^{-8}$ **(15)**

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

Q9 (a) Write short note on (i) Limit Cycle Oscillations (ii) Coefficient Quantization. **(8)**

(b) Find o/p of the following system with i/p $x(n) = \{1, 2, 3, 1, 2, 3, 0, 0, 1\}$. **(7)**



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