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Total number of printed pages – 3

B. Tech
PCEC 4304(New)

Sixth Semester (Back) Examination – 2013

DIGITAL SIGNAL PROCESSING

BRANCH : EEE, MECH

QUESTION CODE : B 247

Full Marks – 70

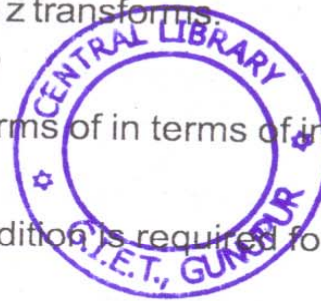
Time : 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.*

1. Answer the following :

2×10

- Find the Niquist rate of sampling of the mixed signal given below :
 $\sin(2000\pi t) + \cos(5000t)$
- State the time reversal property of the z transform.
- Why FIR filters are inherently stable ?
- Express Unit step function $U(n)$ in terms of in terms of impulse functions $\delta(n)$.
- How many real multiplication and additions are required for computation of N-point DFT ?
- Draw the basic structure of 1st order digital FIR filter.
- Sketch the signal $x(-n+4)$ When $X(n) = (1, 1, 0, 1)$.
- Give the mapping of S-plane to Z-plane using bilinear transformation technique.
- Find the impulse response of the system which is described by the difference equation
 $Y(n) = 0.5x(n-1) + 2x(n)$
- What is circular convolution ?



P.T.O.

2. (a) Determine the stability region of the casual system 4
- $$X(z) = \frac{1}{1 - az^{-1} + bz^{-2}}$$
- (b) Determine the transient and steady state response of the system described by $x(n) = y(n - 1) + 2y(n - 2)$
When an unit step function is applied to the system. 6
3. (a) Determine eight point DFT of the following signal : 5
 $X(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$
- (b) Find inverse Z-transform of : 5
 $X(z) = \log(1 - az^{-1})$
4. Determine the order and poles of a low pass Butterworth filter that has 3-dB bandwidth is 500 Hz and attenuation of 40 dB at 1000 Hz. Sketch the poles of proposed filter transfer functions. 10
5. (a) Consider the casual system 4
 $y(n) = 0.9y(n - 1) - 0.08y(n - 2) + x(n) + 0.3x(n - 1)$
Obtain parallel structure of the system
- (b) Explain the Design of linear phase FIR filter using frequency sampling method. 6
- 6 (a) Explain the design procedure for IIR filter using impulse invariance method. 5
- (b) Design a single pole low pass digital filter with 3-dB bandwidth of 0.2π , using bilinear transformation applied to the analog filter 5
- $$H(s) = \frac{\Omega}{s + \Omega}$$
- where Ω is the 3-dB bandwidth of an analog filter.
- 7 (a) Explain Decimation in time FFT algorithm. 5
- (b) Find 4-pont IDFT of the signal, $X(k) = \{1, 1, 0, 1\}$ and sketch magnitude response. 5

8 Write short Notes on any **two** of the following :

- (a) Channel Equalization
- (b) Linear-Phase FIR Filters using windows
- (c) Circular convolution
- (d) Use of DFT in linear filtering.