PVP 14

Code: EE6T1

III B.Tech - II Semester – Regular Examinations – May 2017

DIGITAL SIGNAL PROCESSING
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Explain LTI system with one example.
b) Determine if the system described by the input and output relation y(n) = x(n^2) is linear or nonlinear.
c) State and prove Parseval's theorem in DFT.
d) Find the 4-point DFT for the sequence

$$x(n) = \begin{cases} 1, & n = 0 \\ 0, & 1 \le n \le 3 \end{cases}$$

e) Compare Butterworth and Chebyshev approximations.
f) Write briefly about Bilinear Transformation.
g) What is Gibbs phenomenon?
h) Write about Hanning and Blackman window.
i) What are the factors that influence the choice of structure for realization of an LTI system?
j) What is Up sampling and Down sampling.
k) What is the Difference equation of an Accumulator?

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Test whether the following systems are linear, time-invariant, causal and stable or not.

(i) $y(n)=[x(n)]^5$ (ii) $y(n)=2x[-n+2]$ 8 M

b) Find the impulse response of the LTI system described by a difference equation: $y(n)=2x(n)+x(n-1)+4x(n-2)+3x(n-3)$

8 M

3. a) Perform the circular convolution of the following two sequences 8 M

$x_1(n)= \{1,2,1,2\}; [0 \leq n \leq 3]$

$x_2(n)= \{2,1,1,2\}; [0 \leq n \leq 3]$

b) Compute the eight-point DFT of the sequence

$x(n)=\{0.5,0.5,0.5,0.5,0,0,0,0\}$

using radix-2 decimation-in-time FFT algorithm. 8 M

4. a) The specifications of the desired low-pass filter are

$\frac{1}{\sqrt{2}} \leq |H(j\omega)| \leq 1.0$; $0 \leq \omega \leq 0.2\pi$

$|H(j\omega)| \leq 0.08$; $0.4\pi \leq \omega \leq \pi$

Design a Butterworth digital filter using Bilinear transformation method. 8 M

b) Convert the analog filter with system function $H_a(S) = \frac{S + 0.1}{(S + 0.1)^2 + 9}$ into a digital IIR filter by means of impulse invariance method. 8 M

5. a) Determine the Direct form I, Direct form II and cascade form realizations for the system described by difference equation $y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$. 8 M

b) Design an FIR Digital Low-pass filter with a cutoff frequency of 1KHz and a sampling rate of 4KHz using Hamming window with N=7. 8 M

6. a) Discuss the concept of decimation by a factor D and derive necessary equations. 8 M

b) With the help of a Block diagram, discuss the sampling rate conversion by a rational factor I/D. 8 M