PVP 14

Code: EE6T1

III B.Tech- II Semester - Regular / Supplementary Examinations -March 2019

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) What is stability and causality condition for an LTI system?
b) Show that $\delta(n) = u(n) - u(n-1)$.
c) Compute the inverse Z-transform of $2+3z^{-1}+4z$.
d) Mention the number of complex multiplications and additions in FFT.
e) If the DFT of x(n)=X(k), obtain the DFT of x(N-n).
f) Mention the properties of Chebyshev filter.
g) Why impulse invariant transformation is not considered to be one to one?
h) What are the advantages of FIR filters?
i) Distinguish between recursive and non-recursive systems.
j) Determine the decimated version of a signal x(n) = {2,4,6,8,10,12,14,16} for D=3 and D=4.
k) What is the need for sampling rate conversion?

PART – B

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

3 x 16 = 48 M

2. a) If a system is represented by the following difference equation

$y(n) = 3y(n-1)-n\,x(n) + 4x(n-1) – 2\,x(n+1)$ for $n \geq 0$

i) Is the system linear?

ii) Is the system shift invariant?

iii) Is the system causal? 8 M

b) Find the Z-transform and ROC of the sequence

$x(n) = (1/2)^n\,u(-n) – 2^n\,u(-n-1)$. 8 M

3. a) Determine the eight point DFT of the signal $x(n) = \{1,1,1,1,1,0,0,0\}$ and sketch its magnitude and phase spectrum. 8 M

b) Find the inverse DFT of $X(K) = \{1,2,3,4,5,6,7,8\}$ using FFT algorithm. 8 M

4. a) Design a Chebyshev IIR LPF using Bilinear Transformation for T=1sec to satisfy the following specifications:

$$0.87 \leq \left|H(e^{j\omega})\right| \leq 1.0, \quad 0 \leq \omega \leq 0.25\pi$$

$$\left|H(e^{j\omega})\right| \leq 0.35, \quad 0.375\,\pi \leq \omega \leq \pi$$ 8 M

b) Discuss the location of poles for Butterworth filter if the order is 6, Sketch them and explain. 8 M

5. a) Explain the linear phase response and frequency response properties of Finite Impulse Response filters. 8 M

b) Realize the following system using minimum number of multipliers. 8 M

$$H(Z) = (0.3 + \frac{1}{9}Z^{-1} + 0.3Z^{-2})(0.5 - \frac{1}{7}Z^{-1} + 0.5Z^{-2})$$

6. a) Explain the Interpolation process in time domain and frequency domain. 8 M

b) Consider the signal

$$x(n) = a^{n}u(n), \mid a \mid < 1$$

Determine the spectrum X(ω). The signal x(n) is applied to a decimator that reduces the rate by a factor of 2. Determine the output spectrum. 8 M