PVP 14

Code: EC5T6

III B.Tech - I Semester – Regular/Supplementary Examinations
October 2019

DIGITAL SIGNAL PROCESSING
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

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

11x 2 = 22 M

1. a) Test time-invariance of the system with equation y[n]=x[n]+n.x[n-3]
   b) Define Region of convergence and write any two properties of Region of convergence in Z Transform.
   c) What are the Drawbacks of N-point DFT as N increases?
   d) Compare linear convolution and circular convolution.
   e) Explain Gibb's phenomenon.
   f) What is the need for multirate signal processing?
   g) Write some examples of multirate digital systems.
   h) Explain wrapping effect in IIR Filters.
   i) What is the drawback of the impulse invariant mapping technique?
   j) What are the advantages of Kaiser window?
   k) What conditions are to be satisfied by the impulse response of an FIR system in order to have a linear phase?

PART – B

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

3 x 16 = 48 M

2. a) Test for the causality, stability, linearity and time-invariance of the system represented by 8 M

i) $T(x[n]) = ax[n]+b$ ii) $T(x[n]) = e^{x[n]}$

b) Apply the Z Transform property & find out the Z Transform of the following function:

$$x[n] = n\left(\frac{1}{2}\right)^n u[n]$$ 8 M

3. a) Determine the Linear convolution of $x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{1, 1, 2, -1\}$ using circular convolution. 8 M

b) Explain DIT- FFT Algorithm using signal flow graph for N=8. Hence Compute DFT of the following sequence x[n] = [-1, -1, 1, 1, 1, 1, 1, -1] using DIT-FFT algorithm. 8 M

4. a) Determine the transfer function of a digital filter corresponding to an ideal low pass filter with transfer function $H_a(s)=\frac{1}{(s+1)(s^2+s+1)}$ with T = 1 mSec using Bilinear transformation method. 8 M

b) Obtain the impulse response of digital filter corresponding to an analog filter with impulse response $h_a(t) = 0.5\, e^{-2t}\, u(t)$ and with a sampling rate of 1 kHz using Impulse Invariant method. 8 M

5. a) Compare FIR and IIR filters. 8 M

b) What is Hamming Window function? Obtain its frequency domain characteristics. 8 M

6. a) Draw the block diagram of a multistage interpolator and explain it. 8 M

b) With necessary derivation explain the operation of sampling rate conversion by a rational number. 8 M