**M.Tech. 1st Semester (ECE) CBCS Scheme**

**Examination, December–2017**

**ADVANCED DIGITAL SIGNAL PROCESSING**

**Paper-MTECE 21C4**

*Time allowed : 3 hours]* *[Maximum marks : 100*

***Note :*** ***Question No. 1 is compulsory.*** *Apart from this, attempt* ***one*** *question from each section.*

1. (a) Distinguish static systems from dynamic systems. 4

   (b) Differentiate between DFT, FFT and Z-transform. 4

   (c) Write down properties of circular convoluation. 4

   (d) Differentiate between analog and digital filters. 5

   (e) Write down the different tools for DSP. 3

**Section-I**

2. (a) Explain causality and stability of linear time invariant system. 12

   (b) Discuss the classification of system with examples. 8

3. (a) Find the Fourier transform of the Gaussian pulse 10

$$f(t) = e^{-a^2t^2}$$

(b) State and prove convolution theorem in related to Fourier transform. 10

**Section-II**

4. (a) Determine the Z-transform of the sequence : 12

$$x(n)=\begin{cases} 2^n & \text{for} \quad n<0 \\ \left(\frac{1}{3}\right)^n & \text{for} \quad n=0,2,4,6... \\ \left(\frac{1}{5}\right)^n & \text{for} \quad n=1,3,5,7,.. \end{cases}$$

(b) Evaluate the inverse Z-transform of : 8

$$X(z)=\frac{1}{1-az^{-1}}, \quad |z|>|a|$$

5. (a) Compute 8 point DFT of the sequence $x(n)=\{0,1,0,1,1,1,0,1\}$. 10

(b) List out the applications of DFT. 8

**Section-III**

6. (a) Design an IIR digital filter using impulse invariant method. 10

(b) Check the stability of filter : 10

$$H(z)=\frac{z^2-2z+3}{z^2-z+1/4}$$





7. (a) Design an FIR linear phase filter using Kaiser window to meet the following specifications : 15

$$0.97 \le \left|H\left(e^{jw}\right)\right| \le 2.01 \text{ for } 0 \le |w| \le 0.19\pi$$

$$\left|H\left(e^{jw}\right)\right| \le 0.02 \text{ for } 0.21\pi \le |w| \le \pi$$

(b) Write a short note on phase equalizer. 5

**Section-IV**

8. (a) Draw the structures of cascade and parallel realization of :  10

$$H(z)=\frac{\left(1-z^{-1}\right)^3}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{6}z^{-1}\right)}$$

(b) Discuss the effects of finite word length in digital filters. 10

9. (a) Determine the direct form I and II for the second order filter by : 14

$$y(n) = 26\cos\omega_o\, y(n-1) - b^2 y(n-2) + x(n) - b\cos\omega_o\, x(n-1)$$

(b) Discuss the concept of transfer function. 6