

Total No. of Questions : 10]

SEAT No. :

P3315

[Total No. of Pages : 3

[5353]-190

**T.E. (Computer Engineering) (Semester - II)**  
**DIGITAL SIGNAL PROCESSING APPLICATIONS**  
**(2012 Pattern)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

**Q1)** a) Classify DT systems as FIR and IIR systems. Express it by means of suitable mathematical form using convolution and difference equation. **[5]**

b) How DFT is different than Fourier Transform (FT)? How one can plot the magnitude spectrum of DFT? **[5]**

OR

**Q2)** a) State the sampling theorem and explain why the problem of aliasing observed during sampling process? **[5]**

b) Obtain the ZT of  $x(n) = \left(\frac{1}{2}\right)^n u(n)$  Sketch the ROC. **[5]**

**Q3)** a) Derive the first stage of Radix-2 DIT FFT algorithm. **[5]**

b) Determine the inverse Z-transform using partial fraction expansion method. **[5]**

$$H(Z) = \frac{1}{1 - 1.5Z^{-1} - 0.5Z^{-2}} \text{ if } \text{ROC} : |Z| > 1$$

OR

**Q4)** a) Compute 4 point Circular Convolution for DT signals **[5]**

$$x_1(n) = u(n) - u(n - 3) \quad x_2(n) = 2\delta(n) - \delta(n - 2)$$

**P.T.O**

- b) State & Prove the Time Shifting and Time Reversal properties of Fourier Transform. [5]

**Q5) a)** What are filter structures? How the Direct form and Cascade form of FIR filters are obtained and realized? [9]

- b) Realize the system described by following difference equation using direct form - I [9]

$$y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2)$$

OR

**Q6) a)** Obtain and realize Linear Phase FIR filter structure for a DT system [9]

$$y(n) = x(n) + \frac{1}{3}x(n-1) + \frac{1}{4}x(n-2) + \frac{1}{4}x(n-3) + \frac{1}{3}x(n-4) + x(n-5)$$

What are the advantages of this filter structure?

- b) Derive the Direct Form-II IIR filter structure from system function  $H(Z)$  and represent it using multipliers, adders and delay elements [9]

**Q7) a)** Explain the features of SHARC DSP processor. List the number of DAGs with its capabilities and memory pointer registers supported by DAG. [8]

- b) Explain applications of DSP with respect to following [8]

- i) Telecommunication
- ii) Biomedical

OR

**Q8) a)** Explain and compare following architectures with suitable block diagram. [8]

- i) Von Neumann Architecture
- ii) Harvard Architecture
- iii) Modified Harvard Architecture

- b) Draw and explain the SIMD (Single Instruction Multiple Data) architecture of SHARC DSP processor [8]

**Q9) a)** Draw and explain Human Speech Model in speech synthesis and recognition. [8]

b) How digital image is represented by means of digital computer? How gray scale image is different than color image? What is Histogram of an image? [8]

OR

**Q10)a)** What is Companding? What is its significance in audio processing? [8]  
What is the impact of data rate on sound quality?

b) With mathematical form, explain any two gray level transforms used for image enhancement [8]

