

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

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- 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 Comanding? 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]

