Total No. of Questions : 10]

SEAT No. :

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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]**

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

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 respective 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) Hardvard Architecture

iii) Modified Hardvard Architecture

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

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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]**

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