

Total No. of Questions : 10]

SEAT No. :

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[Total No. of Pages :3

T.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING APPLICATIONS

(2012 Pattern) (310253) (Semester - II) (End - Sem.)

Time : 3Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Define two standard signals $u(n)$ and $\delta(n)$. Show that $u(n) = \sum_{k=0}^{\infty} \delta(n-k)$ by means of convolution operation. **[5]**

b) State Periodicity and Symmetry property of DFT. How can we compute N point Circular Convolution using DFT and IDFT? **[5]**

OR

Q2) a) Perform following circular shifting operations on a given DT signal **[5]**
 $x(n) = \{1, 2, 3, 4\}$ with $N = 5$ and $N = 6$

i) $x((n-3))N$

ii) $x((n+2))N$

b) Discuss the form of an Nth order difference equation used to describe a DT system. How can it be expressed as an FIR and IIR system? **[5]**

Q3) a) Derive the first stage of DIT FFT algorithm. How the computational efficiency is improved in FFT algorithm? **[5]**

b) Obtain the Z Transform of sequence $x(n) = a^n u(-n-1)$ and sketch the ROC. **[5]**

OR

Q4) a) How can we compute Linear Convolution using N point Circular Convolution? **[5]**

b) Define system function $H(Z)$. Obtain it from the Nth order difference equation and express it for All Pole and All Zero System. **[5]**

P.T.O.

- Q5) a)** What are filter structures? Explain how the Direct and Cascade form of FIR filters are obtained and realized from the system function $H(Z)$. [9]
- b) A DT System described by means of system function $H(Z)$ is given by- [9]

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

Obtain and Draw Direct Form - I and Direct Form - II IIR filter structure.

OR

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

$$H(Z) = \left(1 + \frac{1}{2}Z^{-1} + Z^{-2} \right) \left(1 + \frac{1}{4}Z^{-1} + Z^{-2} \right)$$

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)** Draw the block diagram of basic DSP processor. What are the common features of DSP processor? [8]
- b) Explain how SHARC DSP processor supports the multiprocessing capabilities. Give details about different types of ports used for multiprocessing. [8]

OR

- Q8) a)** What is OMAP? Explain the Hardware architecture of OMAP in brief. [8]
- b) Compare between Harvard and Super Harvard Architecture of DSP Processor. List the number of DAGs and supporting memory pointer registers of SHARC DSP Processor. [8]

- Q9) a)** Explain the following terms associated with audio processing: [8]
- i) Timbre
 - ii) Loudness
 - iii) Pitch
- b) What is image enhancement in digital image processing? Explain any two gray level transforms used for image enhancement. [8]

OR

- Q10)a)** What do you mean by Speech Synthesis and Recognition? Draw and explain Human Speech Model in brief. [8]
- b) Explain the operation of CCD (Charge Coupled Device) used in electronic cameras. [8]

