

Total No. of Questions : 10]

SEAT No. :

P2614

[5153]-590

[Total No. of Pages : 2

**T. E. (Computer Engineering)**  
**DIGITAL SIGNAL PROCESSING APPLICATIONS**  
**(2012 Course) (Semester-II) (End Sem.) (310253)**

Time : 2½ Hours]

[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) State the sampling theorem and explain in brief the coding process of ADC. [5]
- b) Obtain the Z Transform(ZT) of a DT signal  
 $x(n) = a^n u(-n-1)$  Sketch the ROC. [5]

OR

- Q2) a) A CT signal having frequency 50 Hz is sampled at a rate of 1200 samples/sec. Obtain
- i) Number of samples per cycle.
  - ii) Digital/Discrete frequency  $f$  and  $\omega$ .
  - iii) Minimum sampling rate to avoid aliasing effect.
  - iv) Period of a DT signal. [5]
- b) State and prove the time shifting property of Fourier Transform(F.T). Define it for DFT. [5]

- Q3) a) Compare Linear Convolution with Circular Convolution. [5]
- b) Define N point DFT by means of twiddle factor and obtain the twiddle factors for 4 point DFT. [5]

OR

- Q4) a) Obtain the computational complexity of Radix-2 DIF FFT Algorithm. [5]
- b) Define the system, function and obtain it for the given system described as-
- $$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) - \frac{1}{2}x(n-1) \quad [5]$$

P.T.O.

**Q5) a)** Derive the Direct Form-II IIR filter structure from the system function  $H(Z)$  and realize it using multipliers, adders and delay elements. [9]

**b)** Obtain and realize linear phase FIR filter structure having impulse response

$$h(n) = \delta(n) + \frac{1}{2}\delta(n-1) - \frac{1}{4}\delta(n-2) + \frac{1}{2}\delta(n-3) + \delta(n-4) \quad [9]$$

OR

**Q6) a)** Obtain and draw the cascade form realization for IIR filter having transfer function  $H(Z) = \frac{5Z(Z+0.4)}{(Z-0.2)(Z-0.6)}$  [9]

**b)** Represent the mathematical form of Nth order FIR filter by means of system function  $H(Z)$ . Draw the Direct Form filter structure and determine the number of multipliers, adders and delay elements required to realize the filter. [9]

**Q7) a)** Compare conventional Microprocessor with DSP Processor architecture. Draw and explain basic building blocks of DSP processor. [8]

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

OR

**Q8) 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)** What is OMAP? Explain the features and applications of OMAP in brief. [8]

**Q9) a)** What is Companding? What is its significance in audio processing? What is the impact of data rate on sound quality? [8]

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

OR

**Q10) 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 colour image? What is Histogram of an image? [8]

