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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Instrumentation & Control Engg.) (Sem.-6)

DIGITAL SIGNAL PROCESSING

Subject Code : EC-310

M.Code : 58034

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Answer briefly :**

- a. What is meant by impulse response?
- b. Define LTI system.
- c. Compare linear convolution and circular convolution.
- d. Define Region of convergence.
- e. List the various properties z-transform.
- f. Distinguish DFT and DTFT.
- g. Define Twiddle Factor or phase factor.
- h. Outline the Direct form I structure of the FIR filter.
- i. Summarize the properties of FIR filters.
- j. What do you understand by digital signal processor?

SECTION-B

2. The analog signal $x(t)$ is band-limited to 40 Hz. Suppose the signal is sampled at the rate of 100 samples per second and that at this rate 200 samples are collected. Then 200 zeros are appended to the 200 samples to form a 400-point vector. Then the 400-point DFT of this vector is computed to get $X(k)$ for $0 < k < 399$.
 - a. Which DFT coefficients are free of aliasing?
 - b. The DFT coefficient $X(50)$ represents the spectrum of the analog signal at what frequency f ? (Give your answer in Hz).
3. Explain in detail the input quantization error and coefficient quantization error and its effect on digital filter design, with an example.
4. Explain the filtering methods :
 - a. based on DFT.
 - b. based on FFT.
5. How linear filtering is done using IFF? What is zero padding? What are its uses?
6. Discuss advantages of bilinear transformation with a suitable example.

SECTION-C

7. A MR digital filter has the transfer function $H(z) = (1 - z^{-1})^3 (1 + z^{-1})^3$
 - a. Sketch the pole-zero diagram of this system.
 - b. Sketch $|H_t(\omega)|$.
 - c. Briefly explain how one can identify the type of the filter (low-pass, high-pass, band-pass, or band-stop filter).
8. Verify Parseval's theorem of the sequence $x(n) = \frac{1^n}{4} u(n)$.
9. Write a short note on any one :
 - a. Architecture of TMS/ADSP
 - b. Quantization

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.