

15 JUN 2023

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Question Paper Code 11892

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Fifth Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20EIPC503 – DIGITAL SIGNAL PROCESSING

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. Write the Various classifications of Discrete-Time systems. | <i>2,K1,CO1</i> |
| 2. What is aliasing effect? | <i>2,K1,CO1</i> |
| 3. State the condition for a discrete time LTI system to be causal and stable. | <i>2,K2,CO2</i> |
| 4. State Initial and final value theorem of Z-transform. | <i>2,K2,CO2</i> |
| 5. State the difference between DFT and DTFT. | <i>2,K2,CO3</i> |
| 6. Calculate the number of multiplications needed in the calculation of DFT using FFT algorithm with 32-point sequence. | <i>2,K2,CO3</i> |
| 7. Distinguish between Butterworth and Chebyshev filters. | <i>2,K2,CO4</i> |
| 8. What is a Gibbs phenomenon? | <i>2,K1,CO4</i> |
| 9. Compare Von-Neumann and Harvard architecture | <i>2,K2,CO5</i> |
| 10. What is the role of pipelining in digital signal processors? | <i>2,K1,CO5</i> |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Explain the classification of continuous time signals with its mathematical representation. *13, K2,CO1*

OR

- b) Examine in detail about the three-quantization error with relevant mathematical expressions. *13, K2,CO1*

12. a) State and prove any five properties of Z-transform. *13, K3,CO2*

OR

- b) Find the output of the system whose input-output is related by the difference equation: $y(n) - (5/6)y(n-1) + (1/6)y(n-2) = x(n) - (1/2)x(n-1)$ for the step input. *13, K3,CO2*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

11892

13. a) Compute the DFT of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ Using radix 2 DIF FFT *13, K3, CO3* algorithm.

OR

- b) Find the linear convolution of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ $h(n) = \{-1, 1\}$ using *13, K3, CO3* over lap-add method.

14. a) Design a filter with *13, K3, CO4*

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\ 0, & \text{otherwise} \end{cases}$$

using a Hamming window with $N=11$.

OR

- b) Design a chebyshev filter for the following specification using BLT *13, K3, CO4*

$$0.707 \leq |H(e^{j\omega})| \leq 1, \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.1, \quad 0.5\pi \leq \omega \leq \pi$$

15. a) Illustrate in detailed about architecture of digital signal processors with *13, K2, CO5* a neat diagram.

OR

- b) What is Addressing mode and explain the types of Addressing modes *13, K2, CO5* of DSP processor.

PART - C (1 × 15 = 15 Marks)

16. a) Construct the direct form-I, direct form-II, cascade and parallel form *15, K3, CO4* realization for the system $y(n) = -0.1 y(n-1) + 0.2 y(n-2) + 3 x(n) + 3.6 x(n-1) + 0.6 x(n-2)$.

OR

- b) Find $x(n]$ using the DIT algorithm. *15, K3, CO3*
 $X(K) = (20, -5.828 - j2.414, 0, -0.172 - j0.414, 0, -0.172 + j0.414, 0, -5.828 + j2.414)$.