Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70563

B.E./ B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fifth/ Eighth Semester

Electrical and Electronics Engineering

EE 8591 – DIGITAL SIGNAL PROCESSING

(Common to: Electronics and Instrumentation Engineering/ Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Quantization Error.

2. What do you mean by aliasing?

3. What are some uses for the Z-transform?

4. Give the relation between Z-transform and DTFT.

5. State and prove time shifting property of DFT.

6. Draw the basic butterfly diagram for DIF FFT algorithm.

7. Under what condition an FIR filter will exhibit linear phase response.

8. List any two Butterworth low pass filter properties.

9. What are the addressing modes of a DSP processor.

10. List any two DSP processors.

PART B — (5 × 13 = 65 marks)

(Restrict to a maximum of 2 subdivisions)

11. (a) (i) How are discrete time signals classified? Differentiate between them. (6)

(ii) Find the linear, invariance and causality of given system: $y(n) = x(n) - ax\ (n-1)$ (7)

Or

(b) Discuss the concept of stability and causality with examples. (13)

12. (a) Explain the properties of DTFT. (13)

Or

(b) Explain in detail the Frequency Response of Stable Systems. (13)

13. (a) Define DFT and then state and prove properties of DFT. (13)

Or

(b) Find the DFT of a sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using:

(i) DIT algorithm (7)

(ii) DIF algorithm (6)

14. (a) Design a FIR digital low-pass filter with a cutoff frequency of 1 kHz and a sampling rate of 4 kHz with 7 samples using Fourier series method. (13)

Or

(b) Design a digital second order Low-Pass Butterworth filter with cut-off frequency 2.2 kHz using Bilinear Transformation. Sampling rate 8 kHz. (13)

15. (a) Draw and explain the architecture of DSP processor and list out the Features. (13)

Or

(b) Explain the Functional modes of DSP processors with neat diagram. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Consider a second order IIR filter with. $H(Z)=1/(1-0.5z^{-1})(1-0.45z^{-1})$ Find the effect on quantization on pole locations of the given system function in direct form and in cascade form. Assume $b=3$ bits. (10)

(ii) Write the steps in the design of FIR filters. (5)

Or

(b) (i) For the analog transfer function $H(s)=2/\{(s+2)(s+3)\}$. Determine $H(z)$ using impulse invariance method. Assume $T=1$ sec. (10)

(ii) Justify the statement IIR filter is less stable and give reason for it. (5)