Reg. No.												

Question Paper Code	12475

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 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

		Marks, K-Level, CO
1.	Express the sampling techniques.	*2,K1,CO1*
2.	List few applications of Digital Signal Processing.	*2,K1,CO1*
3.	Prove time reversal property of Z transform.	*2,K2,CO2*
4.	Solve and obtain the DTFT of the sequence x (n) = {1, 1, 0, 0}.	*2,K2,CO2*
5.	What is Twiddle factor and Express its magnitude and phase angle.	*2,K1,CO3*
6.	Draw the basic butterfly diagram for Radix 2 DIF FFT.	*2,K2,CO3*
7.	Define warping effect.	*2,K1,CO4*
8.	Define linear phase response of a filter?	*2,K1,CO4*
9.	Name some fixed point processor and floating point processor.	*2,K1,CO5*
10.	List the various types of addressing modes of DSP processor.	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Question

11. a) A discrete time systems can be *13,K2,CO1*
(i) Static or dynamic (ii) Linear or non Linear
(iii) Time invariant or time varying (iv) Stable or unstable
(v) Causal or non causal. Analyze the following system with respect to the properties above : y(n)=x(n^2) (2) y(n)=x^2 (n) (3) y(n)= cos(x(n)).

OR

b) Find the energy and power signal *13,K2,CO1*
(i) $x(n) = \left(\frac{1}{3}\right)^n$ u(n)
(ii) $x(n) = sin\frac{\pi}{4}$n

12. a) Find the linear convolution of two sequences *13,K2,CO2*
$x(n)$ = {1, 2, 3, 4} and h (n) = {2, 4, 6, 8}.

OR

b) (i) Find inverse Z-Transform X (Z) using Residue method *7,K2,CO2*

$$X(Z) = \frac{Z^2}{(Z-a)^2(Z-b)}$$

(ii) State and prove Final Value Theorem. *6,K2,CO2*

13. a) Find the DFT of a sequence. x(n) = {2,1,2,1,1,2,1,2} Plot its magnitude and phase response. *13,K2,CO3*

OR

b) Compute the FFT of the sequence x(n)=n^2+1 for 0≤ n ≤ N-1, where N=8 using DIF algorithm. *13,K2,CO3*

14. a) The specification of LPF is given by *13,K3,CO4*

$$0.8 \le |H(\omega)| \le 1 \; ; \qquad 0 \le \omega \le 0.2\pi$$

$$|H(\omega)| \le 0.2; \qquad 0.32\pi \le \omega \le \pi$$

Design Chebyshev filter using IIT.

OR

b) Design a low pass filter using rectangular window by taking 9 samples of w(n) and with a cutoff frequency of 1.2 radians/sec. *13,K3,CO4*

15. a) Explain the architecture of TMS 320C54X processor. *13,K2,CO5*

OR

b) Explain Von Neumann, Harvard architecture and modified Harvard architecture in detail. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Find the IDFT of the sequence X(K) ={5,0,1-j,0,1,0,1+j,0}. *15,K3,CO3*

OR

b) Design a digital Butterworth filter satisfying the constraints *15,K3,CO4*

$$0.707 \le |H(e^{jw})| \le 1.0 \; ; for \; 0 \le w \le 0.3\pi$$

$$|H(e^{jw})| \le 0.2 \; ; for \; 0.75\pi \le w \le \pi$$

With T=1sec and use impulse invariant transformation.