Reg. No.															

Question Paper Code	13543

B.E. / B.Tech. - DEGREE EXAMINATIONS, APR / MAY 2025

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 (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What are the important block(s) required to process an input analog signal to get an output analog signal? (a) A/D converter (b) Digital signal processor (c) D/A converter (d) All of the mentioned	1	K1	CO1
2.	A real valued signal x(n) is called as anti-symmetric if _____ (a) x(n)=x(-n) (b) x(n)=-x(-n) (c) x(n)=-x(n) (d) none of the mentioned	1	K1	CO1
3.	What is the z-transform of the following finite duration signal? $x(n) = \{2,4,5,7,0,1\}$ (a) $2 + 4z + 5z^2 + 7z^3 + z^4$ (b) $2 + 4z + 5z^2 + 7z^3 + z^5$ (c) $2 + 4z^{-1} + 5z^{-2} + 7z^{-3} + z^{-5}$ (d) $2z^2 + 4z + 5 + 7z^{-1} + z^{-3}$	1	K1	CO2
4.	What is the set of all values of z for which X(z) attains a finite value? (a) Radius of convergence (b) Radius of divergence (c) Feasible solution (d) None of the mentioned	1	K1	CO2
5.	Find the complex multiplications required for 16 direct computations of DFT. (a) 256 (b) 64 (c) 216 (d) 1024	1	K1	CO3
6.	IDFT of the sequence {1, 0, 1, 0} is: (a) {1, 0, 0, 1} (b) {0.5, 0, 0.5, 0} (c) {0.5, 1, 0.5, 0} (d) None of the above	1	K1	CO3
7.	Which of the following substitution is done in Bilinear transformations? (a) $s = \frac{2}{T}\left[\frac{1+Z^{-1}}{1-Z^{-1}}\right]$ (b) $s = \frac{2}{T}\left[\frac{1-Z^{-1}}{1+Z^{-1}}\right]$ (c) $s = \frac{2}{T}\left[\frac{1+Z^{-1}}{1+Z^{-1}}\right]$ (d) $s = \frac{2}{T}\left[\frac{1-Z^{-1}}{1-Z^{-1}}\right]$	1	K1	CO4
8.	FIR filters are preferred for applications that require: (a) Minimum phase characteristics (b) Non-linear phase characteristics (c) Linear phase characteristics (d) Maximum phase characteristics	1	K1	CO4
9.	Digital filters are _____ (a) Programmable (b) Highly expensive (c) Consumers very less power (d) Cannot handle low-frequency signals	1	K1	CO5
10.	The digital signal processing can be used in _____ (a) Image and video processing (b) Speech and audio processing (c) Military and space applications (d) All of above	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Write the few applications of Digital Signal Processing.	2	K1	CO1
12.	Check the stability of the signal $y(n)=a^n u(n)$.	2	K2	CO1
13.	Define the term Nyquist rate.	2	K1	CO1
14.	List the methods to find inverse Z transform.	2	K1	CO2
15.	Determine ROC of a signal $x(n)=a^{-n} u(-n-1)$.	2	K2	CO2
16.	Calculate the inverse Z – transform of $X(Z) = \frac{Z}{Z-1}$.	2	K2	CO2
17.	Define the term Twiddle factor and Write its magnitude and phase angle.	2	K1	CO3
18.	Differentiate DIT radix-2 FFT and DIF radix-2 FFT.	2	K2	CO3
19.	Define warping effect.	2	K1	CO4

20.		Express the term linear phase response of a filter.	2	K2	CO4
21.		What are the different stages in pipelining?	2	K1	CO5
22.		Name the different buses used in DSP processor.	2	K1	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	A discrete time systems can be (i) Static or dynamic (ii) Linear or non Linear (iii) Time invariant or time varying (iv) Stable or unstable (v) Causal or non causal Check the following systems with respect to the properties above y(n)=x(n)+x(n-1) .	11	K2	CO1
		OR			
	b)	Check whether the system is periodic and also determine the fundamental period. $$x(n) = 2\cos\frac{5\pi}{3}n + 3e^{\frac{j3\pi n}{4}}$$	11	K2	CO1
24.	a)	Find Fourier Transform of the signal x(n)=$\left(\frac{1}{3}\right)$ for 0≤n≤2 x(n)=0,otherwise. Find the Magnitude and phase for the signal and plot the response.	11	K2	CO2
		OR			
	b)	Determine the circular convolution of the sequence $x_1(n)$= {1,2,-3,4,-5} and $x_2(n)$={-2,4,6}.	11	K2	CO2
25.	a)	Compute the DFT of a sequence. x(n) = {1,2,1,2,2,1,2,1}.	11	K3	CO3
		OR			
	b)	Compute 8 point FFT of the given sequence using DIT algorithm x(n)={2,2,2,2,1,1,1,1}.	11	K3	CO3
26.	a)	Apply the bilinear transformation for the following: $H_a(S)= \frac{2}{(s+1)(s+2)}$ with T=1 sec find out H(Z).	11	K3	CO4
		OR			
	b)	The specification of LPF is given by $0.8 \le \lvert H(\omega)\rvert \le 1 ; \quad 0 \le \omega \le 0.2\pi$ $\lvert H(\omega)\rvert \le 0.2; \quad 0.32\pi \le \omega \le \pi$ Design Chebyshev filter using IIT.	11	K3	CO4
27.	a)	Explain Von Neumann, Harvard architecture and modified Harvard architecture for the computer.	11	K2	CO5
		OR			
	b)	Explain the various types of addressing modes of digital signal processor with suitable example.	11	K2	CO5
28.	a) (i)	Obtain the direct form-I realization for the given difference equation y(n)=0.5y(n-1)-0.25y(n-2)+x(n)+0.4x(n-1).	6	K2	CO4
	(ii)	Draw the architecture of a DSP processor for implementing a DSP algorithm. Explain its features.	5	K2	CO5
		OR			
	b) (i)	Explain the design of lowpass digital butterworth filter.	6	K2	CO4
	(ii)	Explain the architecture of TMS 320C54X with a neat diagram.	5	K2	CO5