Reg. No.												

Question Paper Code	11598

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

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)

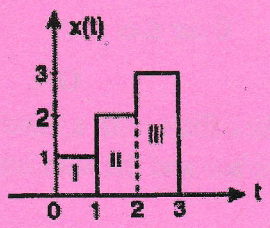
Answer ALL Questions

		Marks, K-Level,CO
1.	Plot the signal $x(n) = 2^{-n}$ for all n.	2,K2,CO1
2.	Identify whether the given DT system is memory less or not $y[n] = 2x[n]$.	2,K3,CO1
3.	What is the sufficient condition for the existence of DTFT of a sequence x(n)?	2,K2,CO2
4.	What is Dirichlets condition?	2,K1,CO2
5.	What are the applications of FFT algorithms?	2,K2,CO3
6.	Find the DFT of a sequence $x(n) = \delta(n)$	2,K3,CO3
7.	What is warping effect?	2,K1,CO4
8.	What are the necessary and sufficient conditions for the linear phase FIR filter?	2,K2,CO4
9.	What are the factors that influence selection of DSPs?	2,K1,CO5
10.	What is on-chip memory?	2,K1,CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) Test whether the given signal is energy or power signal $x(n) = (-0.5)^n u(n)$.	7,K3,CO1
		(ii) For $x(t)$ shown in figure, sketch the $x(3t+2)$.	6,K3,CO1



OR

b) (i) For the given systems $y(t) = at^2x(t) + btx(t-4)$ Show the classification of the systems as (a) linear or non linear (b) time variant or invariant. *6,K3,CO1*

(ii) Show the following systems are stable or not $y(t) = (t+5)u(t)$ *7,K3,CO1*

12. a) Find the inverse Z-transform of $X(Z) = \frac{Z}{(Z-1)(Z-2)(Z-3)}$, Using partial fraction method for *13,K3,CO2*

(i) ROC, $|Z| > 3$ (ii) ROC, $3 > |Z| > 2$ (iii)ROC, $|Z| < 1$

OR

b) For the given difference equation $y[n] - \frac{5}{6}y[n-1] + \frac{1}{6}y[n-2] = x[n]$ *13,K3,CO2*

(i) Find the impulse response h[n] of the system.

(ii) Find the output y[n] when the input $x[n] = \left(\frac{1}{4}\right)^n u[n]$

13. a) Solve 8- point DFT for $x(n) = \cos\left(\frac{\pi n}{4}\right)$ using radix-2 DIT –FFT algorithm. *13,K3,CO3*

OR

b) (i) Determine 6-point DFT of the following sequences x(n)={1,-1,2,0,3,0}. *7,K3,CO3*

(ii) Evaluate $\sum_{k=0}^{5} |X(k)|^2$, for the length -6 sequence x(n)={1,-2,3,0, -1,1}. *6,K3,CO*

14. a) Design a Butterworth filter for the following specification using Impulse Invariant method *13,K3,CO4*

$0.8 \le |H(e^{j\omega})| \le 1 \quad 0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \le 0.2 \quad 0.6\pi \le \omega \le \pi$

OR

b) Design a Chebyshev filter with a maximum pass band attenuation of -3dB at $\Omega_p = 2$ rad/sec and the stop band attenuation of 20dB at $\Omega_s = 4$ rad/sec. *13,K3,CO4*

15. a) (i) Discuss in detail about multiplier/adder unit in DSP processor. *7,K2,CO5*

(ii) Explain Von Neumann, Harvard architecture and modified Harvard architecture for the computer. *6,K2,CO5*

OR

b) (i) Define pipelining and list the pipelining stages in TMS320C5X processor. *7,K2,CO5*

(ii) Describe the architectural details and features of a DSP processor. *6,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Realize the given difference equation in direct form-I , direct form-II cascade and parallel system structure, *15,K4,CO4*

$$y[n] = x[n] + 0.5x[n-1] + 0.4x[n-1] - 0.6y[n-1] - 0.7y[n-2]$$

OR

b) Design a filter using hamming window with N=5 of a frequency response. *15,K3,CO4*

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & for \quad \frac{-\pi}{4} \le |\omega| \le \frac{\pi}{4} \\ 0 & for \quad \frac{\pi}{4} < |\omega| \le \pi \end{cases}$$