Reg. No.												

Question Paper Code	11918

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

Fifth Semester

Electronics and Communication Engineering

(Common to Sixth Semester - Computer and Communication Engineering)

20ECPW501 - DISCRETE TIME SIGNAL PROCESSING WITH LABORATORY

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	State DFT pair equations.	2,K1,CO1
2.	Obtain the circular convolution of the following sequences x(n) = {1,2,1}, h(n) = {1, -2, 2} using Matrix method.	2,K2,CO1
3.	List the properties of Chebyshev type-1 filters.	2,K1,CO2
4.	Why analog approximation is required to design a digital filter?	2,K2,CO2
5.	State the desirable characteristics of the window function.	2,K1,CO4
6.	Why FIR filters are called linear phase filters?	2,K2,CO4
7.	Why rounding is preferred over truncation in realizing digital filter?	2,K2,CO5
8.	Express the number 7_{10} in floating point format with five bits for mantissa and three bits for exponent.	2,K2,CO5
9.	What are the four phases available in pipeline technique?	2,K1,CO6
10.	Write a short note on the MAC unit in Digital Signal Processors.	2,K2,CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) Compute the 8 point DFT of the following sequence using DIF-FFT algorithm. *13,K3,CO1*

x(n) = {1,1,1,1,1,1,1,1}

OR

b) Perform the linear filtering of finite duration sequences h(n)={1, 2} and x(n) = {1, 2, -1, 2, 3, -3, -2, -1, 1, 2, -1} by overlap save method. *13,K3,CO1*

12. a) Apply Butterworth approximation procedure to design an analog low pass filter with the following specifications. *13,K3,CO2*

Pass band attenuation: 2dB.

Stop band attenuation: 14dB.

Pass band frequency : 6627.42 rad/sec.

Stop band frequency : 16000 rad/sec.

OR

b) Obtain an analog Chebyshev filter transfer function that satisfies the constraints. 13,K3,CO2

$$\frac{1}{\sqrt{2}} \leq |H(j\Omega)| \leq 1; 0 \leq \Omega \leq 2$$

$|H(j\Omega)| < 0.1; \Omega \geq 4$

13. a) Design a FIR low pass filter having the following specifications using Hanning window. 13,K3,CO4

$$H_d(e^{jw}) = \begin{cases} 1 & -\frac{\pi}{6} \leq |\omega| \leq \frac{\pi}{6} \\ 0 & Otherwise \end{cases}$$

With N=7 and plot the frequency response.

OR

b) Determine the coefficients of a linear phase FIR filter length M=15 which has a symmetric unit sample response and a frequency response that satisfies the conditions. 13,K3,CO4

$$H\left(\frac{2\pi k}{15}\right) = \begin{cases} 1 & for \quad k = 0.1.2.3 \\ 0 & for \quad k = 4,5,6,7 \end{cases}$$

14. a) The output of an A/D converter is applied to a digital filter with the system function; $H(z) = \frac{0.5Z}{Z-0.5}$ 13,K2,CO5

Estimate the output noise power.

OR

b) Explain the characteristics of a limit cycle oscillation with respect to the system described by the equation 13,K2,CO5

$y(n) = 0.95\, y(n - 1) + x(n)$,

when the product is quantized to 5-bits by rounding (including the sign bit). The system is excited by an input $x(n) = 0.75$ for $n = 0$ and $x(n) = 0$; otherwise.

Also, determine the dead band of the filter.

15. a) Draw the schematic block diagram of the architecture of TMS320C5X Processor and explain the major block diagram of the same. 13,K3,CO6

OR

b) Explain the direct addressing of TMS320C5X processor and write a program to understand the direct addressing mode of DSPs with an example. 13,K3,CO6

PART - C (1 × 15 = 15 Marks)

16. a) Design a Chebyshev filter for the following specifications using Impulse Invariance mapping method. *15,K3,CO3*

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

$|H(e^{j\omega})| \leq 0.2$ for $0.6\pi \leq \omega \leq \pi$

Use suitable structure to realize the filter.

OR

b) Build the direct form II, cascade and parallel forms for the system given by $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-1)$. *15,K3,CO3*