Reg. No.												

Question Paper Code	12474

B.E./B.Tech - DEGREE EXAMINATIONS, NOV / DEC 2023

Fifth Semester

Electronics 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 the relation between the DTFT and DFT.	*2,K1,CO1*
2.	How many numbers of additions and multiplications are performed in 64-point FFT?	*2,K2,CO1*
3.	What are the different types of filters based on impulse response?	*2,K2,CO2*
4.	List out the difference between Analog and Digital Filter.	*2,K2,CO2*
5.	Define frequency warping.	*2,K1,CO3*
6.	List out the advantages of Direct form-II realization over Direct form-I realization.	*2,K1,CO3*
7.	Why the concept of Gibbs phenomenon evolved, what are the steps to be taken to avoid such circumstances?	*2,K1,CO4*
8.	State the basic characteristics of the window function.	*2,K2,CO4*
9.	Interpret why rounding is preferred to truncation in realizing digital filter.	*2,K2,CO5*
10.	Define product quantization error.	*2,K2,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Compute the 8-point DFT using the DIT-FFT algorithm x(n)={1,2,1,2,1,2,1,2}.	*13,K3,CO1*
		OR	
	b)	Determine the output y(n) of a filter whose impulse response h(n) = {1,2} and x(n) = {1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1} using overlap save method and overlap add method.	*13,K2,CO1*
12.	a)	Design an analog Chebyshev filter for the following specification, Pass band attenuation=0.89 dB Stop band attenuation = 0.2 dB Pass band edge frequency=30 Hz Stop band edge frequency=75 Hz	*13,K3,CO2*

OR

b) Design a Analog Butterworth Low Pass Filter satisfying the following constraints. *13,K3,CO2*

$$\sqrt{1/2} \le \left|H\left(e^{j\omega}\right)\right| \le 1 \; ; \; 0 \le \omega \le \frac{\pi}{2}$$

$$\left|H\left(e^{j\omega}\right)\right| \le 0.2 \; ; \; \frac{3\pi}{4} \le \omega \le \pi$$

13. a) Convert the analog filter with system function $H(S) = \dfrac{S+0.3}{(S+0.3)^2+16}$ into a digital filter using Bilinear Transformation method and Impulse Invariant Method. *13,K3,CO3*

OR

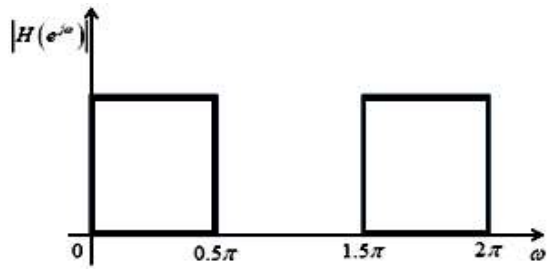
b) Compare the two different concept of conversion of analog filter into a digital filter in detail with necessary equations. *13,K3,CO3*

14. a) Design a linear phase FIR high pass filter using Hamming Window for N=7. *13,K3,CO4*

$$H_d\left(e^{j\omega}\right) = \begin{cases} e^{-j\alpha\omega} \; ; \; |\omega| \ge 0.8\pi \\ 0 \; ; \quad elsewhere \end{cases}$$

OR

b) Design a linear phase FIR low pass filter with a cut off frequency of 0.5π rad/seconds by taking 11 samples of ideal frequency response by frequency sampling technique. *13,K3,CO4*



15. a) An LTI system is characterized by the difference equation, y(n) = 0.87y(n-1) + x(n). Determine the limit cycle behavior and the deadband of the system when x(n) = 0 and y(-1) = 0.61. Assume that the product is quantized to 4-bits by rounding (including the sign bit).Also, determine the dead band of the filter. *13,K2,CO5*

OR

b) For a second order digital filter $H(Z) = \dfrac{1}{1-2r\cos\theta Z^{-1}+r^2Z^{-2}}$, draw the direct form-II realization and find the scale factor S_o to avoid the overflow. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) (i) Explain and elaborate with neat block diagram about the architecture of Digital Signal Processor. *10,K3,CO6*

(ii) Discuss about the Barrel Shifters. *5,K3,CO6*

OR

b) (i) Write a program to generate triangular wave using processor. *8,K3,CO6*

(ii) List out the various applications of digital signal processors in real time scenario. *7,K3,CO6*