Reg. No.															

Question Paper Code	13241

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fifth Semester

Electronics and Communication Engineering

20ECPW501 - DISCRETE TIME SIGNAL PROCESSING WITH LABORATORY

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The ability to determine the frequency component of the signal is using (a) DFT (b) AFT (c) DST (d) CFT	1	K1	CO1
2.	In DIF-FFT radix- 2 _____domain sequence is decimated. (a) Frequency (b) Time (c) Both (d) Phase	1	K2	CO1
3.	The number of complex multiplications computed for N= 512 using Radix-2 FFT is_____. (a) 4608 (b) 2304 (c) 1152 (d) 1304	1	K2	CO1
4.	The poles of the Chebyshev filter lie on a _____. (a) Circle (b) Ellipse (c) Parabola (d) Straight Line	1	K1	CO2
5.	Mention the main advantage of using IIR filters over FIR filters? (a) Linear phase response (b) Easier implementation in hardware (c) Simpler design process (d) Potentially lower computational complexity	1	K2	CO2
6.	The Butterworth polynomial of order 1? (a) S+1 (b) S-1 (c) S (d) S(S+ 2)	1	K2	CO2
7.	Following methods are used to convert analog filter into digital filter? Approximation of derivatives (b) Bilinear transformation Impulse invariance (d) All of the mentioned	1	K1	CO3
8.	Find the equation for normalized frequency? (a) F/F_s (b) $F.F_s$ (c) F_s/F (d) None	1	K2	CO3
9.	The window method is used in FIR filter design to: (a) Increase computational complexity (b) Reduce spectral leakage (c) Create non-linear phase response (d) Increase the filter order	1	K1	CO3
10.	In order to examine the linear and nonlinear phase characteristics, two delay functions are defined and they are _____. (a) impulse delay and non impulse delay (b) magnitude delay and group delay (c) phase delay and magnitude delay (d) phase delay and group delay	1	K2	CO4
11.	Among the following not suitable either as low pass or a high pass filters? (a) h(n) symmetric and M odd (b) h(n) symmetric and M even (c) h(n) anti-symmetric and M odd (d) h(n) anti-symmetric and M even	1	K1	CO4
12.	FIR filter structure is more memory efficient in? (a) Direct Form I (b) Parallel structure (c) Cascade structure (d) Direct Form II	1	K2	CO4
13.	Among the following, which is true in fixed point binary representation? (a) Only positive numbers can be represented (b) Integers cannot be represented. (c) Tho position of binary point of fixed. (d) None of the above.	1	K1	CO5
14.	The finite word length effects are due to (a) Quantization of input. (b) Quantization of coefficients. (c) Quantization of Product. (d) All of the above	1	K1	CO5
15.	Limit cycles in the recursive are directly attributable to which of the following? (a) Round-off errors in multiplication (b) Overflow errors in addition (c) Both of the mentioned (d) None of the mentioned	1	K2	CO5

16. Which of the following are true with respect to quantization of filter coefficients? *1 K1 CO5*
(a) Shift in location of poles and zeros. (b) Deviation of impulse response.
(c) Deviation of frequency response. (d) All of the above.

17. The following operation is used to prevent overflow_____. *1 K3 CO6*
(a) addition (b) multiplication (c) scaling (d) All of the mentioned

18. How many address buses are present in the DSP processor? *1 K2 CO6*
(a) 1 (b) 2 (c) 3 (d) 4

19. The following is used for interfacing a DSK board with the host computer? *1 K3 CO6*
(a) parallel port (b) serial port (c) lower port (d) upper port

20. The software _____ is used for downloading the user program to the DSK. *1 K2 CO6*
(a) Program Composer Studio (b) Code Composer Studio
(c) Data Composer Studio (d) Address Composer Studio

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. Draw the basic butterfly of DIF-FFT structure. *2 K1 CO1*
22. Distinguish overlap-save and overlap-add methods. *2 K2 CO1*
23. Compare Butterworth with Chebyshev filters. *2 K1 CO2*
24. Define the Prewarping effect. *2 K2 CO2*
25. Develop the Direct Form II representation of a Second order IIR system. *2 K2 CO3*
26. Write the bilinear transform equation between s-plane and z-plane. *2 K2 CO3*
27. Define Gibbs phenomenon. *2 K1 CO4*
28. State the desirable characteristics of the window function. *2 K2 CO4*
29. Define truncation. *2 K2 CO5*
30. List out the addressing modes supported by C5X processors. *2 K2 CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) 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. *10 K3 CO1*

OR

b) Utilize the 8-point DFT of the given sequence x(n) = {1,1,1,1,1,1,1,1}using DIT radix-2 FFT algorithm. *10 K2 CO1*

32. a) Explain the procedure for designing analog filters using the Butterworth approximations. *10 K2 CO2*

OR

b) Design a Chebyshev filter with a maximum pass band attenuation of 2.5dB; at Ωp=20rad/sec and the stop band attenuation of 30dB at Ωs=50 rad/sec. *10 K2 CO2*

33. a) An Analog filter has a transfer function H(s) = 10 /s^2 + 7s + 10. Construct a digital filter equivalent to this using impulse invariant method for $T = 0.2sec$. *10 K2 CO3*

OR

b) Design a Butterworth digital filter using impulse invariant transformation by taking T=1sec to satisfy the following specifications. *10 K2 CO3*

$0.9 \le |H(e^{j\omega})| \le 1$, for $0 \le \omega \le 0.35\pi$

$|H(e^{j\omega})| \le 0.275$, for $0.7\pi \le \omega \le \pi$

34.	a)	Explain the principle and procedure for designing FIR filter using rectangular window.	*10*	*K2*	*CO4*
		OR			
	b)	Simplify the coefficient h(n) of a linear phase FIR filter of length N=15 with a symmetric unit sample response and frequency that satisfies the condition. H(2πk/15)={1 for K=0,1,2,3 0.4 for K=4 0 for K=5,6,7}	*10*	*K2*	*CO4*
35.	a)	Explain the characteristics of limit cycle oscillation with respect to the system described by the difference equation : y(n) = 0.95 y(n-1) + x (n) ; x(n)= 0 and y(n-1)= 13. Estimate the dead range of the system.	*10*	*K2*	*CO5*
		OR			
	b)	Define quantization noise. Estimate the expression for quantization noise power.	*10*	*K2*	*CO5*
36.	a)	Draw the schematic block diagram of the architecture of TMS320C5X Processor and explain the major block diagram of the same.	*10*	*K3*	*CO6*
		OR			
	b)	Explain in detail the various addressing modes of Digital signal processors.	*10*	*K3*	*CO6*