C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U5401

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fifth Semester

Electronics and Communication Engineering

21UEC501 - DIGITAL SIGNAL PROCESSING

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. If x(n) and X(k) are an N-point DFT pair, then X(k+N)=? CO1-U

   (a) X(-k) (b) -X(k) (c) X(k) (d) None of the above

2. The poles of Butterworth filter lies _____ in s-plane CO1-U

   (a) Sphere (b) Circle (c) Ellipse (d) Parabola

3. What is the value of α if the number of samples N=15 CO2-App

   (a) 15 (b) 15/2 (c) 14 (d) 7

4. With n-bit binary the possible binary codes are, CO1-U

   (a) 2^{n-1} (b) 2^{n+1} (c) 2^{n} (d) $2^{n/2}$

5. The MMRs of TMS320C5x processor can be directly addressed by, CO1-U

   (a) 7-bit address (b) 8-bit address (c) 9-bit address (d) 11-bit address

PART – B (5 x 3= 15Marks)

6. Draw the basic butterfly structure for radix-2 DIT algorithm? CO1 -U

7. What is prewarping? Why is it employed? CO1 -U

8. How is the constant group delay and phase delay achieved in linear phase FIR filters? CO1-U

9. Compare fixed point and floating point number representation. CO1-U

10. How is fast computation achieved in DSPs? CO1-U

PART – C (5 x 16= 80Marks)

11. (a) Compute 8-point DFT of the discrete time signal, x(n) ={2,2,2,2,1,1,1,1} using Radix-2 DIT FFT. CO2-App (16)

Or

	(b)	Compute 8-point DFT of the discrete time signal, x(n) ={1,2,1,2,1,3,1,3} using Radix-2 DIF FFT.	CO2-App	(16)
12.	(a)	Use the Bilinear transformation to convert the analog filter with system function H(S) = s+0.1/(s+0.1)2+9 into a digital IIR filters. Select T=0.1s and compare the location of the zeros in H(Z) with the locations of the zeros obtained by applying the impulse invariant method in the conversion.	CO4-App	(16)
		Or		
	(b)	Design a Chebyshev filter with a maximum pass band attenuation of 2.5db at Ωp=20 rad/sec and stop band attenuation of 30db at Ωs=50rad/sec. (Analog Type-1 filter)	CO4-App	(16)
13.	(a)	Compute a linear phase FIR High pass filter using rectangular window with cut off ωc =0.8 π rad/sample by taking N=7 samples	CO2-App	(16)
		Or		
	(b)	Design a linear phase FIR Band pass filter using a hamming window with cut off ωc =0.4π to 0.6π rad/sample by taking N=9 samples.	CO2-App	(16)
14.	(a)	For second-order IIR filter, $H(z) = 1/(1-0.5z^{-1})(1-0.45z^{-1})$. Study the effect of shift in pole location with 3 bit Co-efficient representation in direct and cascade form.	CO2-App	(16)
		Or		
	(b)	Find the output round off noise power for the following transfer function where $H(z) = H_1(z)H_2(z)$ $H_1(z) = \frac{1}{1-a_1z^{-1}}$ and $H_2(z) = \frac{1}{1-a_2z^{-1}}$ a_1=0.5 and a_2=0.6	CO2-App	(16)
15.	(a)	With a neat functional block diagram, outline the architecture of TMS320C5X processor in detail.	CO1-U	(16)
		Or		
	(b)	List the addressing modes of TMS320C5X processor with relevant examples.	CO1-U	(16)