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Question Paper Code: U5401

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Fifth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

21UEC501-DIGITAL SIGNAL PROCESSING

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

PART A - (5 x 1 = 5 Marks)

1. If x(n) is a real sequence and X(k) is its N-point DFT, then which of the following is true? CO1-U

   (a) X(N-k)=X(-k) (b) X(N-k)=X*(k) (c) X(-k)=X*(k) (d) All of the above

2. What is the circular convolution of the sequences $x_1(n)=\{2,1,2,1\}$ and $x_2(n)=\{1,2,3,4\}$? CO2-App

   (a) {14,14,16,16} (b) {16,16,14,14} (c) {2,3,6,4} (d) {14,16,14,16}

3. The poles of Butterworth transfer function symmetrically lies on a circle in s-plane with angular spacing, CO1- U

   (a) π/N (b) $\pi/2N$ (c) $2N/\pi$ (d) π/N^2

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

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

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= 15 Marks)

6. Compare the DIT and DIF radix-2 FFT. CO1 -U

7. Given that, H(s)=1 / (s+1). By impulse invariant method, obtain the digital filter transfer function. CO2 -App

8. Write the magnitude and phase function of FIR filter when impulse response is symmetric and N is odd. CO2 -App

9. What is meant by product quantization error? CO1 -U

10. What are the internal buses of TMS320C54x processors? CO1 -U

PART – C (5 x 16= 80 Marks)

11. (a) 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)

Or

(b) For the given sequences x(n) ={1,2,3,4} & h(n) ={1,3,5}, find the output sequence y(n) by using linear convolution and circular convolution. 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=0.1 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) Design a linear phase FIR High pass filter using rectangular window with cut off ωc =0.8π 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) 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). Determine the dead band of the system when x(n)=0.875 for n=0, 0 for n≠0. CO2- App (16)

Or

(b) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation $y(n) = 0.75y(n-1) + x(n)$. Assume b=5 (including sign bit).Determine the dead band of the filter. CO2- App (16)

15.	(a)	(i) Write an assembly language program using instruction of TMS320C6xx processors to multiply two numbers of unsigned 32-bit data. Assume that two data are available in memory. Save the 64-bit product in memory.	CO2- App	(8)
		(ii) List out various applications of DSP processors with real time examples.	CO1- U	(8)
		Or		
	(b)	(i) Write an assembly language program using instructions of TMS320C6xx processors to subtract two numbers of 64-bit data. Assume that the two data are available in memory. Store the result in memory.	CO2- App	(8)
		(ii) Draw the simplified architecture of TMS320C6xx processor	CO1- U	(8)