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Reg. No. : | | | | | | | | | | |

Question Paper Code: 95401

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fifth Semester

Electronics and Communication Engineering

19UEC501 - Digital Signal Processing

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. In an N point DFT of a finite duration sequence x(n) of length, the value of N should be such that_____ CO1- U

   (a) N> L (b) N≥ L (c) N<L (d) N≤L

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

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

3. The frequency response of a digital filter is periodic in the range CO1- U

   (a) $0 < \omega < 2\pi$ (b) $-\pi < \omega < \pi$

   (c) $0 < \omega < \pi$ (d) $0 < \omega < 2\pi$ or $-\pi < \omega < \pi$

4. The Finite word length effects are due to, CO1- U

   (a) Quantization of input (b) Quantization of coefficients

   (c) Quantization of product (d) All the above

5. The total memory space of TMS320C5x family of processors is CO1- U

   (a) 224k-words (b) 224k-bytes (c) 192k-words (d) 192k-bytes

PART – B (5 x 3= 15 Marks)

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

7. Determine the order of the butter worth analog filter for the given specification CO2 App

   $\alpha p = 5$, $\alpha s = 20$, $\Omega p = 1000$ rad/sec and $\Omega s = 500$ rad/sec

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

9. What is meant by finite word length effects in digital filters? CO1 U

10. List any two instructions set of TMS320C54x Digital Signal Processors. CO1 U

PART – C (5 x 16= 80 Marks)

11. (a) By means of the DFT and IDFT , determine the response of FIR filter with impulse response h(n) ={1,2,3} to the input sequence x(n)={1,2,2,1}. CO2- App (16)

Or

(b) Compute 8-point DFT of the discrete time signal, CO2- App (16)

x(n) ={1,2,1,2,1,3,1,3}

using Radix-2 DIF FFT.

12. (a) Design a Butter worth digital IIR low pass filter using bilinear transformation by taking T=0.1 sec, to satisfy the following specification. CO2- App (16)

$$\mathbf{0.6 \leq \ | H(e^{j\omega})| \ \leq 1.0; \text{ for } 0 \leq \omega \leq 0.35\pi}$$

$$\mathbf{| H(e^{j\omega})| \ \leq 0.1; \text{ for } 0.75\pi \leq \omega \leq \pi}$$

Or

(b) Design a Chebyshev digital IIR low pass filter using impulse invariant transformation by taking T= 1 sec, to satisfy the following specification. CO2- App (16)

$$\mathbf{0.87 \leq \ | H(e^{j\omega})| \ \leq 1.0; \text{ for } 0 \leq \omega \leq 0.25\pi}$$

$$\mathbf{| H(e^{j\omega})| \ \leq 0.35; \text{ for } 0.375\pi \leq \omega \leq \pi}$$

13. (a) Design a linear phase FIR BPF to pass frequency in the range 0.35π to 0.48π rad/sample using rectangular window, by taking 5 samples of window sequence. Analyze the above with Hamming window and comment about the result. CO3- Ana (16)

Or

(b) Design a bandpass filter using frequency sampling method for the specifications, CO3- Ana (16)

Sampling frequency F= 8000Hz

Cutoff frequency fc_1 =1000 Hz

fc_2=3000 Hz

Determine the filter coefficients for N=7. If N=5 what will be the filter coefficients?

14. (a) For second-order IIR filter, $\mathbf{H(z) = 1 /(1-0.5z^{-1})(1-0.45z^{-1}).}$ Study the effect of shift in pole location with 3bit coefficient representation in direct and cascade form. CO2- App (16)

Or

(b) In the IIR system given below the products are rounded to 4-bits (including sign bit). $\mathbf{H(z) = 1 / (1-0.35z^{-1}) (1-0.62z^{-1}).}$ Find the output round off noise power in a)direct form realization b)cascade realization.. CO2- App (16)

15. (a) With a neat functional block diagram, explain the architecture of TMS320C5X processor and explain CO1- U (16)

Or

(b) List the addressing modes of TMS320C5X processor with relevant examples. CO1- U (16)

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