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

Question Paper Code:1065092

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV/ DEC 2024
Fifth Semester
Electronics and Communication Engineering
U20EC502 – DIGITAL SIGNAL PROCESSING
(Regulation 2020)

Time: Three Hours | Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Recall the analysis and synthesis equation of DFT.

2. Compare overlap save method and overlap add method.

3. State Gibbs phenomenon.

4. Specify how the ISR filter can be designed?

5. Label the quantization noise model for a first order system.

6. Infer the dead band of the filter.

7. State the basic operations of Multirate signal processing.

8. Point out the need for anti imaging filter after up sampling a signal?

9. Brief the features of MAC unit.

10. Recall the applications of Digital Signal Processor.

PART – B (5 x 16 = 80 Marks)

11.(a) (i) State and Prove the following properties of DFT. (6)
(1)Time reversal (2) Parsavel's Theorem
(ii)Compute the 8-Point DFT of the sequence x(n)={1,2,3,4,4,3,2,1} using radix-2 DIT FFT Algorithm. (10)

(OR)

(b) Find the output y(n) of a filter, the input is given by
x(n) = {3, –1, 0, 1, 3, 2, 0, 1, 2, 1} and h(n) = {1, 1, 1} using overlap save method and overlap add method. (16)

12.(a) (i)The desired frequency response of a digital filter is. (12)

$$H_d(e^{j\omega}) = e^{-j3\omega} \; ; \quad -\pi/4 \le \omega \le \pi/4$$
$$0 \; ; \quad \pi/4 \le \omega \le \pi$$

Determine the filter co-efficient if the window function is

$$\omega(n) = 1 \; ; \; 0 \le \omega \le 5$$
$$0 \; ; \text{ otherwise}$$

(ii) Draw the direct form realization of $H(Z)=1+2z^{-1}-3z^{-2}-4z^{-3}+5z^{-4}$ (4)

(OR)

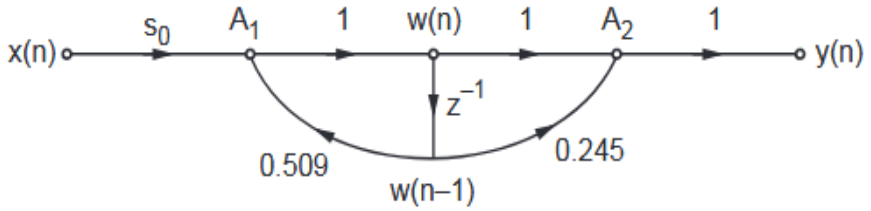
(b) Design a digital butterworth LPF which satisfies the constraints using bilinear transformation with T=1 sec. (16)

$$0.707 \le |H(\omega)| \le 1.0 \; ; \quad 0 \le \omega \le \pi/2$$
$$|H(\omega)| \le 0.2 \; ; \; 3\pi/4 \le \omega \le \pi$$

13.(a) i) Derive the expression for Quantization noise power. (6)
ii) Find the steady state variance of the noise in the output due to quantization of input for the first order filter y (n) =ay (n-1) +x (n). (10)

(OR)

(b) For the digital network shown in figure Find H (z) and Scaling factor. (16)



14.(a) i) Show that up sampler and down sampler are time variant systems.
ii) Consider the signal x(n)=nu(n)
1) Determine the spectrum of the signal. (4)
2) The signal is applied to a decimator that reduces the sampling rate by a factor 3. (12)

(OR)

(b) i)Describe and derive sampling rate conversion by a rational factor I/D in Multirate signal processing. (10)
ii) Outline the concept of Multistage implementation of sampling rate conversion. (6)

15.(a) i) Enumerate the various features of Von Neumann and Harvard architectures. (8)
ii) Illustrate about different stages of pipelining and specify its importance. (8)

(OR)

(b) With relevant diagrams, determine the detail about the basic architecture of fixed point processors TMS320C5X. (16)

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