Total No. of Questions : 12]

SEAT No. :

P825

[Total No. of Pages : 3

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T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING
(2008 Pattern) (Sem. - I)

Time :3 Hours]

[Max. Marks :100

Instructions to the candidates:

1) *Answer any three questions from each section.*

2) *Answers to the two sections should be written in separate answer books.*

3) *Figures to the right indicate full marks.*

4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Define linear convolution. Explain different steps to calculate linear convolution with example. [6]

b) Define the impulse response of the DT system. Show that $h(n) = 0$ for $n < 0$, for a causal system. [6]

c) Explain quantization process in ADC. [4]

OR

Q2) a) Test the system $y(n) = x(n) + n\,x(n + 1)$ for causality, linearity and time invariance. [6]

b) State and explain the sampling theorem. [6]

c) Define the terms: natural & forced response for a causal system. [4]

Q3) a) Explain how N-point DFT and IDFT can be obtained by means of linear transformation matrix. [8]

b) State and prove differentiation property of F.T. [6]

c) Find $x((n + 2))_5$ and $x((-n))_5$ for the sequence $x(n) = \{1, 2, 3, 4\}$ [4]

OR

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Q4) a) Find the fourier transform of $x(n) = -a^n\, u(-n-1)$, where a is real. **[6]**

b) What is the significance of N in DFT? Why it is necessary to have $N \geq L$ where L is length of DT signal. **[6]**

c) Determine 2-point and 4-point DFT of a sequence $x(n) = u(n) - u(n-2)$. Compare the result. **[6]**

Q5) a) Draw a signal flow diagram for 8-point DFT using Decimation in Frequency (DIF) FFT algorithm. Obtain its computational complexity. **[8]**

b) Why z-transform need to be specified only with ROC? What are the all possible ROCs for finite and infinite duration sequences? **[8]**

OR

Q6) a) Using residue method, obtain inverse Z transform from

$$X(z) = \frac{1}{(z-1)(z-3)}$$

[6]

b) State and prove time reversal property of Z-transform. **[6]**

c) Write a short note on bit reversal in FFT **[4]**

SECTION - II

Q7) a) With example, explain the method of simple geometric construction to obtain the phase and frequency of DT system. **[10]**

b) An LTI system is represented by difference equation $y(n) = 0.7\, y(n-1) - 0.1y(n-2) + 2x(n) - x(n-2)$. **[6]**

    i) Find System function

    ii) Draw pole zero plot and check stability

OR

Q8) a) Find the frequency response of a system described by difference equation $y(n) - \frac{1}{2}\, y(n-1) = x(n) - \frac{1}{4}\, x(n-1)$. Plot magnitude of a frequency response. **[10]**

b) Define a unilateral z-transform. What are the different characteristics of it? State time delay and time advanced property of unilateral z transform. **[6]**

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Q9) a) Explain the design steps of IIR filter by using impulse invariance method and then find out H(z) from $H(s) = \dfrac{2}{(s+1)(s+2)}$ with Fs = 5 Hz. **[10]**

b) State the characteristics of ideal filter. What are the advantages and disadvantages of digital filter over analog filter? **[8]**

OR

Q10) a) What are the two different methods to design FIR filter? Explain the design steps of each method. **[8]**

b) Compare: FIR and IIR filter. **[6]**

c) Write a short note on: Effect of finite word length. **[4]**

Q11) a) Draw and explain functional Block diagram of barrel shifter. **[8]**

b) Obtain parallel form realization for IIR filter having:

$$H(z) = \dfrac{3(2z^2 + 5z^2 + 8)}{(2z+1)(z+2)}$$ **[8]**

OR

Q12) a) Explain the application of DSP in speech processing. **[8]**

b) Draw and explain in brief the cascade form of FIR filter structure. **[8]**

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