

Total No of Questions: [12]

SEAT NO. :

[Total No. of Pages : 2]

T.E. (Computer) 2008 Course
Digital Signal Processing

Time: 3 Hours

Max. Marks : 100

Instructions to the candidates:

- 1) **Answers to the two sections should be written in separate answer books.**
- 2) **Neat diagrams must be drawn wherever necessary.**
- 3) **Figures to the right side indicate full marks.**
- 4) **Use of Calculator is allowed.**
- 5) **Assume Suitable data if necessary**

SECTION I

- Q1)** a) State linearity and time invariant properties of a DT system and test it for $y(n) = x(n) \cos w_0 n$ [8]
b) With illustrations, explain shifting, folding and time scaling operations on discrete-time signals. [8]

OR

- Q2)** a) State and explain sampling theorem. [8]
b) Define linear convolution. Explain in brief different properties of convolution. [8]
- Q3)** a) Explain how DFT can be used for linear filtering. How N-pt. circular convolution can be used to obtain linear convolution? [12]
b) Define a Fourier Transform (FT). State any four properties of FT. [6]

OR

- Q4)** a) Find the FT and DFT of the sequence $x(n) = 0.5^n u(n) \quad 0 \leq n \leq 3$. [8]
b) Compare N point DFT with FT. What is the significance of N in DFT? Why it is necessary to have $N \geq L$ where L: length of a DT signal. [10]
- Q5)** a) Why z transform need to be specified only with ROC? What are the all possible ROCs for finite and infinite duration sequences? [8]
b) Compare DIT FFT and DIF FFT algorithm. [4]
c) Determine the z transform of following sequences: [4]
i) $x_1(n) = \delta(n-k)$
ii) $x_2(n) = \delta(n+k)$

OR

- Q6)** a) Determine the inverse z-transform of the following function [10]
$$X(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}} \quad \text{For following ROC,}$$

i) ROC: $|z| > 1$
ii) ROC: $|z| < 0.5$
iii) ROC: $0.5 < |z| < 1$
b) Draw the basic butterfly structure and obtain the computational complexity of DIT FFT algorithm. [6]

SECTION – II

- Q7) a)** Explain the Geometric Construction method to obtain the phase and frequency response of the system. [10]
- b)** Define and obtain system function $H(z)$ from N order general difference equation [6]
Express it for
- All zero system
 - All pole system

OR

- Q8) a)** An LTI system is given by $y(n) = y(n-1) + y(n-2) + x(n-1)$, [10]
- Find the system function $H(z)$
 - Draw a pole zero plot
 - Calculate $h(n)$ if possible.
- b)** Justify: All the poles of $H(z)$ of a causal and stable system are inside the unit circle. [6]
- Q9) a)** Explain Gibbs phenomenon observed in FIR filter design. What are the desirable features of window functions to improve frequency response? [8]
- b)** State the transformation formula used in BLT method to design IIR filter. Obtain the relation showing the frequency warping effect and show it graphically. [8]

OR

- Q10) a)** What is the use of windowing? Define different types of window function. Why Kaiser window is commonly used for FIR filter design? [10]
- b)** Compare: Analog filter and Digital filter [6]
- Q11) a)** List the important functions of the following: [6]
- Data Address Generators(DAGs)
 - Program sequencer
 - Barrel Shifter
- b)** A system is describe by $H(z)$ is given by [12]
- $$H(z) = 3 + \frac{4z}{z - \frac{1}{2}} - \frac{2}{z - \frac{1}{4}}$$
- Does $H(z)$ represent FIR or IIR filter, why?
 - Obtain and draw direct form –I, direct form-II of IIR filter

OR

- Q12) a)** Explain in brief different type of internal buses present in ADSP 21xx processor. [10]
- b)** Realize a linear phase FIR filter structure having impulse response, [8]
 $h(n) = \delta(n) + \frac{1}{2} \delta(n-1) - \frac{1}{4} \delta(n-2) + \frac{1}{2} \delta(n-3) + \delta(n-4)$.