OR

Determine the cascade and parallel of IIR structure for the following system:

$$y(n)=\frac{3}{4}y(n-1)-\frac{1}{8}y(n-2)+x(n)+\frac{1}{3}x(n-1)$$

UNIT - V

5. a) Differentiate between an IIR and FIR systems.

   b) What are advantages and disadvantages of FIR filter?

   c) What is window and why it is necessary?

   d) Obtain direct form and cascade form realization for the transfer function of FIR system given by:

$$H(z)=\left(1-\frac{1}{4}z^{-1}+\frac{3}{8}z^{-2}\right)\left(1-\frac{1}{8}z^{-1}-\frac{1}{2}z^{-2}\right)$$

OR

Explain FIR filter design using windows.

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Roll No .....

EX - 703

B.E. VII Semester

Examination, December 2015

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

UNIT - I

1. a) Define and classify systems?

   b) Consider the analog signal $x_a(t)=3\cos(100\pi t)$. Supposed the signal is sampled at the rate $f_s=200$ Hz. What is the discrete time signal obtained after sampling?

   c) Write the various properties of the convolution of the LTI system.

   d) Consider the difference equation

$$y(n)-\frac{5}{6}y(n-1)+\frac{1}{6}y(n-2)=\frac{1}{3}x(n-1)$$ .What are the impulse response, frequency response and step response for the causal LTI system satisfying this difference equation?

OR

Determine the DTFT of following signals:

i) $x(n) = \delta(n)$
ii) $x(n) = u(n)$

iii) $x(n) = a^n u(n)$

UNIT - II

2. a) Define z-transform and region of convergence for the z-transform.

b) How do we represent a discrete time signal as an infinite power series of a complex variable Z.

c) State and prove the following property of Z-Transform:

i) Linear

ii) Time shifting

d) A causal LTI system has impulse response $h(n)$ for which z-transform is:

$$H(z) = \frac{1+z^{-1}}{(1-\frac{1}{2}z^{-1})(1+\frac{1}{4}z^{-1})}$$

i) What is the region of convergence of H(z)?

ii) Is the system stable? Explain.

OR

Determine all possible signals $x(n)$ whose z-transforms are given by:

$$X(z) = \frac{5z^{-1}}{(1-2z^{-1})(3-z^{-1})}$$

UNIT - III

3. a) Compute the N-point DFT of unit impulse function.

b) Explain Discrete Fourier Series (DFS). What is the relationship between DFT and DFS?

c) Determine the circular convolution of the following sequences:

$x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$
$\uparrow$ $\uparrow$

d) Draw the flow graph for decimation-in-time FFT algorithm for N=8 using radix-2. Show various steps for decimation.

OR

State and prove the following properties of DFT:

i) Linearity
ii) Periodicity
iii) Symmetry Property

UNIT - IV

4. a) Define digital filter. Write the advantages and disadvantages of digital filter.

b) How analog poles are mapped to digital poles in the impulse invariant transformation.

c) What are the advantages and disadvantages of bilinear transformation?

d) Determine the direct form I, direct form II of IIR structure for the following system:

$$y(n) = \frac{1}{2}y(n-1) + \frac{1}{4}y(n-2) + x(n) + x(n-1)$$