

[4]

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.

\*\*\*\*\*

Total No. of Questions :5]

[Total No. of Printed Pages :4

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:

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

$\uparrow \qquad \qquad \qquad \uparrow$

- 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:

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