Enrolment No.

Date: 03-06-2014

**Total Marks: 70** 

# **GUJARAT TECHNOLOGICAL UNIVERSITY** PDDC - SEMESTER-VI • EXAMINATION - SUMMER • 2014

Subject Code: X 61103

Subject Name: Digital Signal Processing

Time: 10:30 am - 01:00 pm

**Instructions:** 

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 0.1 (a) Draw the basic block diagram of digital signal processing. Also classify the 07 signals and systems with suitable illustrations.
  - Define the z transform. Enlist the properties of ROC for z transform with 07 **(b)** necessary illustration.
- 0.2 **(a)** State and Prove the time shifting and convolution property of z transform. 07 07
  - (b) Check the following system for time invariance and linearity **2)**  $y(n) = x(n) \cos(n\pi/4)$ **1**)  $y(n) = n[x(n)]^2$

### OR

- (b) State the sampling theorem and Define the nyquist rate. What is the Nyquist rate 07 for signal  $x(t) = 3 \cos (50\pi t) + 10 \sin (300\pi t) - \cos (100\pi t)$ ?
- Q.3 (a) Enlist the properties of Fourier Transform. Determine and sketch the frequency 07 spectrum for  $x_1(n) = a^n u(n)$  and  $x_2(n) = \delta(n-5)$ . 07
  - Solve the followings: **(b)** 1) Obtain the z transform for  $x(n) = a^n u(n)$  and  $h(n) = -a^n u(-n-1)$  indicate ROC. 2) Determine the system function and the unit sample response of the system described by the difference equation: y(n) = (1/2) y(n-1) + 2 x(n)

## OR

Define DTFT. Using DTFT find the impulse response of a LTI system describe 0.3 07 **(a)** by the difference equation: y(n) - (1/2) y(n-1) = x(n) - (1/4) x(n-1). 07

### Solve the followings: **(b)**

- 1) Determine the inverse z transform of  $X(z) = 1/(1 1.5z^{-1} + 0.5z^{-2})$  for all Possible sequences.
- 2) Determine the signal x(n) for  $X(z) = 1/(1 a z^{-1})$  for z < a using power series expansion.
- For the given system  $H(z) = (1 + 0.25z^{-1}) / [(1 + 0.5z^{-1})(1 + 0.5z^{-1} + 0.25z^{-2})].$ **Q.4** 07 (a) Draw the cascade and parallel form of realizations.
  - **(b)** Explain IIR filter design by bilinear transformation method. 07

## OR

Write a brief note on decimation in time FFT algorithm. 07 **O.4 (a)** Define circular and linear convolution. For given two sequences 07 **(b)**  $x(n) = \{0,1,3,3,2\}$  and  $h(n) = \{1,2,1,2,3\}$  find the linear and circular convolution.

#### (a) Find 4 point DFT of given $x(n) = \cos(n\pi/2)$ using DIF FFT algorithm. 07 Q.5 (b) Explain Goertzel Algorithm in brief. 07

OR

- With the help of block diagram explain architecture of TMS320C6XXX **Q.5 (a)** 07 processor.
  - (b) Compare FIR and IIR Filters.

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