Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II (Old course)• REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1720702 **Date:13/05/2015**

Subject Name: Digital Signal Processing

Time: 02:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** A discrete-time signal x(n) is defined as, x(n) = $(1,\underset{\uparrow}{1},1,1,\frac{1}{2},\frac{1}{2})$ **07**

(i) Sketch the signal x(n)

(ii) Sketch the signals that result if we:

(1) First fold x(n) and then delay the resulting signal by four samples.

(2) First delay x(n) by two samples and then fold the resulting signal.

(b) (i) The system given by y(n)=x(n)-x(n-1)is time variant or time invariant? Justify **07**

(ii) The system described by y(n) =$x(n^2)$ is linear or nonlinear? Justify.

(iii) The system described by y(n)= a*x(n) is causal or non causal? Justify.

(iv) Consider finite duration input sequence x(n)={ 2, 4, 0,3} with x(0)=4. Represent the input sequence as sum of weighted impulse sequences.

Q.2 **(a)** Consider the system **07**

$$H(Z) = \frac{0.44Z^{-1} + 0.362Z^{-2} + 0.02Z^{-3}}{1+0.4Z^{-1} + 0.18Z^{-2} - 0.2Z^{-3}}$$

Draw and explain the realization of this system using direct form II structure.

(b) Find the Z transform & ROC of each of the following sequences: **07**

(i) x(n) = 2^n u(n) (ii) x(n) = cos(x_0n)u(n)

OR

(b) Explain region of convergence in Z-transform. Explain and prove following properties of Z Transform. **07**

(i) Scaling in Z-domain

(ii) Time shifting

Q.3 **(a)** Find linear convolution for sequence **07**

h[n]= { $\underset{\uparrow}{1}$, 1, 1}; x[n]= {$\underset{\uparrow}{1}$, 1, 1 }

(b) Explain DFT. Find the DFT of a four point sequence x(n) = {0,1,2,3} **07**

OR

Q.3 **(a)** Find circular convolution of x_1(n) = {$\underset{\uparrow}{2}$,1,2,1} and x_2(n) = { $\underset{\uparrow}{1}$,2,3,4} **07**

(b) Find inverse Z transform of **07**

X(z)= $\frac{5Z^{-1}}{(1-2Z^{-1})(3-Z^{-1})}$ for all possibilities.

Q.4 **(a)** List various kind of windows used for filter design. Explain any one window in detail with example. **07**

(b) Draw and explain the lattice structure for an all-pole Infinite Impulse Response (IIR) system. **07**

OR

Q.4 **(a)** Explain IIR filter design based on Bilinear Transformation. **07**

(b) Write short note on multi rate digital signal processing. **07**

Q.5	**(a)**	Discuss the notch filter, give pole-zero diagram and explain how the notch bandwidth can be reduced.	**07**
	(b)	Discuss the problems and issues related with estimation of the power density spectrum of a signal from the observation of the signal over a finite time interval.	**07**

OR

Q.5	**(a)**	Explain the application of DSP in voice processing.	**07**
	(b)	Explain the Harward architecture and Pipelining for DSP processor.	**07**

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