Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1720702 **Date: 18-06-2014**

Subject Name: Digital Signal Processing

Time: 02:30 pm - 05:00 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)** Explain following terms of discrete time system with example: **07**

(1) FIR and IIR system
(2) Recursive and Non recursive system
(3) Causal and Anti-causal system

(b) Determine impulse response of the system characterized by differential equation, y(n)-3y(n-1)-4y(n-2) = x(n)+2x(n-1). Obtain direct Form-II realization of the system. **07**

Q.2 **(a)** (i) The system described by y(n)= $x(n^2)$ is causal or non causal? Justify. **07**

(ii) The system described by y(n) =x^2(n) is linear or nonlinear? Justify.
(iii)The system given by y(n)=x(-n) is time variant or time invariant? 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.

(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
(iii)frequency shifting

OR

(b) Obtain Z transform of the following signal and specify possible ROC. **07**

$$x(n) = \alpha^n u(n) + \beta^n u(-n-1)$$

Q.3 **(a)** State various methods to find inverse Z transform. Find causal x(n) for the following: **07**

$$X(z) = \frac{1}{\left(1 - z^{-1} + \frac{1}{2} z^{-2}\right)}$$

(b) Write a note on correlation and its applications. **07**

OR

Q.3 **(a)** Explain decimation in frequency Radix-2 FFT algorithm for N=8. Draw signal flow graph. **07**

(b) Calculate 8-point DFT of x(n)={ 1, 0, 1, 1, 0, 1, 1, 1} using decimation in time algorithm. **07**

Q.4 **(a)** The impulse response of a linear time invariant system is h(n)=[1,2,3,4] with h[0]=3. Using convolution, determine the response of the system subject to input signal x(n)=[4,3,2,1] with x[0]=3. **07**

(b) Discuss (i) Comb Filter (ii) All-Pass Filter. **07**

OR

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

	(b)	Explain sampling rate alteration technique for multirate signal processing. Explain any one application of Multirate signal processing.	**07**
Q.5	**(a)**	Using DFT and IDFT, determine the convolution of signals x(n)=[2, 1, 2, 1] and h(n)=[1, 2, 3, 4].	**07**
	(b)	Write a note on special DSP architecture for FIR Filter.	**07**

OR

Q.5	**(a)**	Explain major features of general purpose DSP processor.	**07**
	(b)	What is sectional convolution? When it is used? Describe overlap save method.	**07**

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