

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. 07
Explain any one application of Multirate signal processing.
- Q.5** (a) Using DFT and IDFT, determine the convolution of signals $x(n)=[2, 1, 2, 1]$ 07
and $h(n)=[1, 2, 3, 4]$.
- (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
