Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:170804 **Date:18/05/2016**

Subject Name:Discrete Time Signal Processing

Time:02:30 PM to 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 Classification of Signals. **07**

(b) Perform linear convolution for following two sequences: **07**
x[n] = {1, -2, 3} and h[n] = {0, 0, 1, 1, 1, 1}

Q.2 **(a)** For the system described by the sequence y[n] = x[n^2], determine for the following conditions: **07**
(i) Time Invariance (ii) Causality (iii) Stability (iv) Linearity.

(b) Find out total solution of following difference equation with initial condition y [-2] = 25 and y [-1] = 6. **07**

$$y[n]-\frac{5}{6}y[n-1]+\frac{1}{6}y[n-2]=5^{-n} \quad n\geq 0$$

OR

(b) Prove: **07**
(i) For stable LTI system, the impulse response must be summable.
(ii) For causal LTI system, h[n] = 0, n<0.

Q.3 **(a)** Find out Z – transform for x[n] = $a^n\cos(\omega_0 n)$ u[n]. **07**

(b) What do you mean by the Region of Convergence of Z - transform? Explain various properties of ROC. **07**

OR

Q.3 **(a)** What is frequency domain sampling? What is the condition for avoiding aliasing for the reconstructed spectrum of the sampled sequence? **07**

(b) Find Inverse Z – transform of given X(z) for ROC: |z| > 4 **07**

$$X(z)=\frac{z(z-3)}{(z-4)(z^2-3z+2)}$$

Q.4 **(a)** Enlist the properties of DFT. Prove any two properties. **07**

(b) Find out the circular convolution of following Sequences: **07**
x [n] = {1, 0, 3, 2, 5, 1}, y [n] = {5, 6, -2, 3, -1, 2}

OR

Q.4 **(a)** What do you understand by FIR digital filter? Explain in brief FIR digital filter design using windowing techniques. **07**

(b) What are different specifications required to design a low pass IIR digital filter? Compare IIR digital filter design using the Butterworth and Chebyshev approximations. **07**

Q.5	**(a)**	Explain Radix- 2 FFT Algorithm. Why it is called decimation-in-time	**07**
	(b)	Compare FIR and IIR filters.	**07**

OR

Q.5	**(a)**	Compute IDFT for the sequence X[k] = {2, 1+ j, 0, 1- j}.	**07**
	(b)	Explain Impulse Invariance and bilinear transformation techniques of IIR filter design.	**07**

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