Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 171704 **Date: 27/12/2012**

Subject Name: Digital Signals and Systems

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

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

Q.1 **(a)** List out the properties of z-transform. **07**

(b) Obtain Z-inverse of the following $X(Z) = \frac{1 - 0.5Z^{-1}}{1 - 0.25Z^{-2}}$, $|Z| > 0.5$ **07**

Q.2 **(a)** List out the properties of DFT. **07**

(b) A digital communication link carries binary coded words representing samples of input signal. **07**

$x(t) = 3\cos 600\pi t + 2\cos 1800\pi t$

The link is operated at 10,000 bits/s and each input sample is quantized into 1024 different voltage levels.

1) What is the sampling frequency and folding frequency in Hz?
2) What is Nyquist rate of sampling for x(t) in Hz?
3) What is resolution of quantization?

OR

(b) Compute the cross-correlation between **07**

$x(n) = \{1,2,3,4\}$ and $y(n) = \{1,2,1,2\}$

Q.3 **(a)** Compute the DFT of the 4-point sequence **07**

$x(n) = \{0, 1, 2, 3\}$

(b) Derive the lattice structures of FIR filters. **07**

OR

Q.3 Obtain the circular convolution by graphical method of following sequences. **14**

$x(n) = \{0,2,4,3,1\}$ and $h(n) = \{4,3,2,1,2\}$

Q.4 **(a)** Explain oversampling D/A Converters. **07**

(b) Develop direct form I realization of IIR filter having transfer function **07**

$$H(Z) = \frac{5 + 3Z^{-1} - 0.4Z^{-2}}{1 - 0.5Z^{-1} + 0.55Z^{-2}}$$

OR

Q.4 **(a)** Explain Notch filters with respective waveform. **07**

(b) Explain inverse DCT with necessary equations. **07**

Q.5 For a given discrete time systems, check whether they are: **14**

(1) Static or dynamic (2) Linear or non-linear
(3)Shift invariant or shift-varying
(4)Causal or non-causal (5)Stable or unstable

(i) $x(n^2)$ (ii) $x(2n + 5)$ (iii) $nx(n)$

OR

Q.5 **(a)** Determine the zero input response of the system described by the homogeneous second order difference equation **07**

$y(n) - 3y(n-1) - 4y(n-2) = 0$

(b) Explain properties of Fourier transform of discrete time system. **07**

****