

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 **07**
- $$X(Z) = \frac{1-0.5Z^{-1}}{1-0.25Z^{-2}}, \quad |Z| > 0.5$$

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