Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 171704 **Date: 28/05/2012**

Subject Name: Digital Signals and Systems

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)** Determine the z-transform and sketch the ROC of **07**

$x(n) = \{\sin\omega_0 n\}u(n)$

(b) Explain sampling theorem in detail. **07**

Q.2 **(a)** Describe the superiority of digital signal processing over analog signal processing. **07**

(b) Find the impulse response of the given system. **07**

$y(n) = x(n) - 5/6y(n-1) + 1/6y(n-2)$

OR

(b) Determine the z-transform and sketch the ROC of **07**

$x(n) = (1/3)^n$, $n > 0$;

$= (0.5)^{-n}$, $n < 0$;

Q.3 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

Explain with reasons:

(i) $e^{x(n)}$ (ii) $x(2n)$ (iii) Trunc[x(n)]

OR

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

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

Q.4 **(a)** Obtain Z-inverse of the following and comment on ROC. **07**

$$X(Z) = \frac{1 + Z^{-1}}{1 - Z^{-1} + 0.5Z^{-2}}.$$

(b) List out the symmetry properties of Fourier Transform for discrete time signals. **07**

OR

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

(b) Explain oversampling A/D Converters. **07**

Q.5 **(a)** Compute the DFT of the 4-point sequence **07**

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

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

OR

Q.5 **(a)** Derive the frequency sampling structures of FIR filters. **07**

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

$$H(Z) = \frac{1 + 0.8Z^{-1} - 2Z^{-2}}{6 - Z^{-1} + 0.55Z^{-2}}$$

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