

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII • EXAMINATION – WINTER 2013

Subject Code: 171704**Date: 28-11-2013****Subject Name: Digital Signals and Systems****Time: 10:30 TO 01:00****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**
 $x(n) = \{a^n \cos \omega_0 n\} u(n)$

(b) Explain continuous-time, discrete time, continuous valued, discrete valued **07**
 signals.

Q.2 (a) What is aliasing effect and how it can be eliminated? **07**

(b) Determine the homogenous solution of the system described by **07**
 $y(n) - 3y(n-1) - 4y(n-2) = x(n)$

OR

(b) Determine the z-transform and sketch the ROC of **07**
 $x(n) = (1/2)n\{u(n)-u(n-10)\}$

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) $nx(n)$ (ii) $x(n^2)$ (iii) $x^2(n)$

OR

Q.3 Using graphical method, obtain a 5-point circular convolution of two DT **14**
 signals defined as,

$$x(n) = (1.5)^n, 0 \leq n \leq 2$$

$$y(n) = 2n - 3, 0 \leq n \leq 3$$

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

$$X(Z) = \frac{1}{1 - 1.5Z^{-1} + 0.5Z^{-2}}$$

when (a) ROC: $|z| > 1$ (b) ROC: $|z| < 0.5$

(b) List out the properties of z-transform. **07**

OR

Q.4 (a) Explain digital resonators. **07**

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

Q.5 (a) Determine auto-correlation of the following signal: $x(n) = \{1, 2, 1, 1\}$ **07**

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

OR

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

(b) Draw parallel realization of IIR filter having transfer function **07**

$$H(Z) = \frac{1 - Z^{-1}}{1 - 0.2Z^{-1} - 0.15Z^{-2}}$$
