

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2018****Subject Code: 2171708****Date: 19/11/2018****Subject Name: Digital Signal Processing****Time: 10:30 AM TO 01:00 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 of finite duration sequence $x(n) = \{1, 2, 3, 4, 5\}$ **03**
 (b) Write about anti-aliasing filter for DSP system. **04**
 (c) Explain classification of discrete time systems in detail. **07**

- Q.2** (a) Decide whether system $y(n) = x(n^2)$ is linear or nonlinear. **03**
 (b) Introduce quantization and quantization errors. **04**
 (c) Brief about architecture of DSP processor with necessary sketch. **07**

OR

- (c) Discuss advantages of digital over analog signal processing. **07**
Q.3 (a) What are even and odd signals? Give example. **03**
 (b) Compute 4 point DFT of sequence $x(n) = \{1, 0, 2, 3\}$ with matrix of twiddle factor. **04**
 (c) Represent the system transfer function **07**

$$H(z) = (1 - \frac{3}{7}z^{-1} + \frac{7}{8}z^{-2})(1 - \frac{7}{9}z^{-1} - \frac{3}{2}z^{-2})$$
 using direct form structure and cascade form structure.

OR

- Q.3** (a) Write any three properties of z transform. **03**
 (b) Brief about relationship of the discrete Fourier transform to the z transform. **04**
 (c) Compute 4 point DFT of sequence $x(n) = \{2, 1, 1, 2\}$ by definition and with matrix of twiddle factor. **07**

- Q.4** (a) Explain transposed form of structure for discrete time systems. **03**
 (b) Perform linear convolution using mathematical equation for following sequences $h(n) = \{1, 1, -1\}$ and $x(n) = \{1, -1, 2\}$ **04**
 (c) Determine cross correlation $r_{xh}(l)$ for following sequences **07**
 $x(n) = \{-3, -2, 1, 4, 8, -3\}$ and $h(n) = \{1, 1, 1, -1, 2, -2\}$

OR

- Q.4** (a) Introduce various terms of specifications for FIR filter design. **03**
 (b) List windowing techniques for filter design. Explain any one window in detail. **04**
 (c) Perform circular convolution for following two sequences **07**
 $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$

- Q.5** (a) Explain term 'radix' for FFT algorithm. **03**
 (b) Find sequence $X(k)$ using decimation in time FFT technique for $x(n) = \{0, 1, 2, 3\}$ **04**
 (c) Determine the inverse z transform of $X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$ by power series expansion for ROC $|z| > 1$. **07**

OR

- Q.5** (a) With example explain signal flow diagram representations of Linear Constant-Coefficient Difference equations. **03**
 (b) Determine digital filter for analog filter $H(s) = \frac{s+a}{(s+a)^2 + b^2}$ using impulse invariance method. **04**
 (c) Find z transform and ROC of $x(n) = (-1/5)^n u(n) - (1/2)^n u(-n-1)$ **07**