Seat No.: _____ Enrolment No.

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 $x(n)=\{1,\underset{\uparrow}{2},3,4,5\}$	**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 $x(n)=\{\underset{\uparrow}{1},0,2,3\}$ with matrix of twiddle factor.	**04**
	(c)	Represent the system transfer function $H(z)=(1-\frac{3}{7}z^{-1}+\frac{7}{8}z^{-2})(1-\frac{7}{9}z^{-1}-\frac{3}{2}z^{-2})$ using direct form structure and cascade form structure.	**07**
		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 $x(n)=\{\underset{\uparrow}{2},1,1,2\}$ 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 $h(n)=\{1,1,\underset{\uparrow}{-1}\}$ and $x(n)=\{1,\underset{\uparrow}{-1},2\}$	**04**
	(c)	Determine cross correlation $r_{xh}(l)$ for following sequences $x(n)=\{-3,-2,1,\underset{\uparrow}{4},8,-3\}$ and $h(n)=\{1,1,1,\underset{\uparrow}{-1},2,-2\}$	**07**
		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 $x_1(n)=\{\underset{\uparrow}{2},1,2,1\}$ and $x_2(n)=\{\underset{\uparrow}{1},2,3,4\}$	**07**

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 $X(z)=\dfrac{1}{1-1.5z^{-1}+0.5z^{-2}}$ 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 $H(s)=\dfrac{s+a}{(s+a)^2+b^2}$ using impulse invariance method. **04**

(c) Find z transform and ROC of $x(n)=(-1/5)^n u(n)-\left(\frac{1}{2}\right)^n u(-n-1)$ **07**