Seat No.: _____

Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY PDDC SEMESTER VI. EXAMINATION – WINTER 2016

Subject code: X61103

Subject Name: Digital Signal Processing Time:10.30 AM - 01.00 PM

Total Marks: 70

Date: 22/10/2016

Instructions:

	1.	Attempt all questions.	
	2.	Make suitable assumptions wherever necessary.	
	3.	Figures to the right indicate full marks.	
Q.1	(a)	Draw the block diagram of a typical digital signal processing system and explain. What are the advantages of Digital signal	07
	(b)	Perform the linear convolution of the following two sequences: $x_1(n) = \{1, 2, 3, 4\}$; $x_2(n) = \{1, 1, 1\}$	07
Q.2	(a)	Explain the classification of discrete-time systems. Also prove that bounded input bounded output systems are stable systems.	07
	(b)	If the response of linear shift-invariant system to a unit step is $s(n) = n (1/2)^n u(n)$	07
		find the unit sample response h(n).	
		OR	
	(b)	A 90° phase shifter is a system with a frequency response	07
		$H(e^{J^{W}}) = -j ; 0 < w < \pi$	
		j ; $-\pi < w < 0$	
		Find the unit sample response of the system.	
Q.3	(a)	Discuss the properties of z-transform. Prove the property of	07
		convolution of sequences.	~
	(b)	Determine the z-transform of the following sequences.	07
		(1) $x_1(n) = 2^n u(n) + 3(1/2)^n u(n)$	
		(11) $X_2(n) = \cos(nW_0) u(n)$	
0.2			07
Q.3	(a)	Explain allasing effect in a discrete time system. What is	07
	(b)	Find the inverse of each of the following z transformer	07
	(0)	Find the inverse of each of the following z-transforms. (i) $\mathbf{V}(\mathbf{z}) = 4 + 2(\mathbf{z}^2 + \mathbf{z}^2)$ $0 < \mathbf{z} < \mathbf{z}$	07
		$(1)\Lambda(Z) = 4 + 3(Z + Z^{-1}), 0 < Z < \infty$ (ii) $Y(z) = (1/(1 - (1/2)z^{-1})) + (2/(1 - (1/2)z^{-1})) + z + 1/z$	
		(II)X(Z) = (I/(I - (I/2)Z)) + (J/(I - (I/3)Z)), Z > 72	
0.4	(a)	Define and explain the following:	07
L	()	(i)Discrete Time Fourier Series	
		(ii)Discrete Time Fourier Transform	
		(iii)Discrete Fourier Transform	
	(b)	Consider the causal linear shift invariant filter with system	07
	()	function	
		$H(z) = (1 + 0.875z^{-1}) / (1 + 0.2z^{-1} + 0.9z^{-2})(1 - 0.7z^{-1})$	
		Draw the signal flowgraph for this system using	
		(i)Direct Form-I (ii) Direct Form-II (iii) Cascade form with	
		direct form-II	
		OR	
Q.4	(a)	What is a Gibbs phenomenon? Discuss various window	07
		functions for FIR filter.	
	(b)	Discuss impulse invariance and bilinear transformation	07

Q.5	(a)	Discuss the properties of DFT.	07
	(b)	Consider the sequence	07
		$\mathbf{x}(\mathbf{n}) = \delta(\mathbf{n}) + 2 \overline{\delta(\mathbf{n}-2)} + \delta(\mathbf{n}-3)$	
		(i)Find the four point DFT of $x(n)$	
		(ii) If $y(n)$ is the four point circular convolution of $x(n)$ with	
		itself, find $y(n)$ and the four point DFT $Y(k)$.	
		OR	
Q.5	(a)	Discuss Decimation –in time FFT algorithms	07
	(b)	Discuss the key features of the architecture of DSP	07
		Processors.	
