Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VI EXAMINATION – WINTER 2015

Subject Code:X61103 **Date:05/12/2015**

Subject Name: Digital Signal Processing

Time: 02:30pm to 05:00pm **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)**	What is signal processing? Explain the advantages and disadvantages of Digital signal processing over Analog signal processing.	**07**
	(b)	Perform the linear convolution of the following two sequences: $x_1(n) = \{ \underset{\uparrow}{0}, 1, 2, 3, 4 \}$; $x_2(n) = \{ \underset{\uparrow}{1}, -1, 1 \}$	**07**
Q.2	**(a)**	(i) For the following system, determine whether the system is stable, causal, linear, time-invariant, memory less along with justification: $T\{x(n)\} = e^{x(n)}$	**07**
	(b)	By direct evaluation of the convolution sum, determine the step response of a linear time invariant system whose impulse response is $h(n) = a^{-n} u(-n)$, $0 < a < 1$	**07**
		OR	
	(b)	Consider an LTI system with the frequency response $H(e^{jw}) = (1 - e^{-j2w}) / (1 + (1/2) e^{-j4w})$; $-\pi < w \leq \pi$ Determine the output y(n) for all n if the input x(n) for all n is $x(n) = \sin(\pi n / 4)$.	**07**
Q.3	**(a)**	Determine the z-transform of the following sequences. Sketch ROC and pole zero plot : (i) $x_1(n) = (1/2)^n u(n) + (-1/3)^n u(n)$ (ii) $x_2(n) = a^n$, $0 \leq n \leq N-1$	**07**
	(b)	Determine the inverse z-transform of the following using partial fraction expansion method: $X(z) = 3 / (z - (1/4) - (1/8) z^{-1})$, x(n) stable	**07**
		OR	
Q.3	**(a)**	Derive the expression of spectrum of sampled continuous time signal.Explain the effect of sampling rate on the spectrum.	**07**
	(b)	Discuss the structures to implement the discrete time systems.	**07**
Q.4	**(a)**	Find the circular convolution of the following sequences: $x_1(n) = \{ \underset{\uparrow}{0}, 1, 2, 3\}$ $x_2(n) = \{ \underset{\uparrow}{1}, 2, 1, 2\}$	**07**
	(b)	Discuss the effects of coefficient Quantization in IIR systems	**07**
		OR	
Q.4	**(a)**	Design a first order digital low-pass filter with a 3-dB cutoff frequency of wc = 0.25 π by applying the bilinear transformation to the analog butterworth filter $Ha(s) = 1 / (1 + (s / \Omega c))$	**07**
	(b)	What is windowing in FIR filter design?Discuss various	**07**

windows.

Q.5	**(a)**	Given a sequence x(n)={1,2,3,4} , evaluate its DFT X(k) using the decimation-in-time FFT method.	**07**
	(b)	Discuss the key features of the architecture of DSP Processors.	**07**

OR

Q.5	**(a)**	Discuss the properties of DFT.	**07**
	(b)	Compare FIR filters with IIR filters.	**07**

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