Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 171003 **Date: 04/05/2017**

Subject Name: Digital Signal Processing

Time: 02:30 PM to 05:00 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)**	Perform the linear convolution of the following two sequences: $x(n) = \delta(n) + \delta(n-1) + \delta(n-2)$ $h(n) = \delta(n-1) + \delta(n-2)$	**07**
	(b)	Sketch each of the following special digital sequences: (i) $5\,\delta(n)$ (ii) $-2\,\delta(n-5)$ (iii) $-5u(n)$ (iv) $5u(n-2)$	**07**
Q.2	**(a)**	Derive the expression of recovering continuous time signal from discrete time samples.	**07**
	(b)	Define the following types of discrete time systems: (i)Linear (ii) Time invariant (iii)stable (iv) Causal	**07**
		OR	
	(b)	Solve the linear difference equation given below: $y(n) - 0.5y(n-1) + 0.06y(n-2) = 2(0.1)^n$ $y(-1) = 1$ and $y(-2) = 0$	**07**
Q.3	**(a)**	Find the z-transform for each of the following sequences: (i) $x(n) = 4u(n)$ (ii) $x(n) = (-0.7)^n u(n)$ (iii) $x(n) = 4e^{-2n} u(n)$	**07**
	(b)	Prove the following properties of z-transform: (i) Time shift (ii) Convolution	**07**
		OR	
Q.3	**(a)**	Find y(n) if $Y(z) = (z^2 (z+1)) / ((z-1)(z^2 - z + 0.5))$	**07**
	(b)	Find the inverse z-transform for each of the following functions: (i) $X(z) = 2 + (4z / (z-1)) - (z / (z-0.5))$ (ii) $X(z) = (5z / (z-1)^2) - (2z / (z - 0.5)^2)$	**07**
Q.4	**(a)**	Discuss the properties of Discrete Fourier Transform.	**07**
	(b)	Explain the different structures for implementing discrete time systems.	**07**
		OR	
Q.4	**(a)**	Compare FIR filter with IIR filter.	**07**
	(b)	Evaluate the DFT of $x(n) = \delta(n) + 2\delta(n-1) + 3\delta(n-2) + 4\delta(n-3)$	**07**
Q.5	**(a)**	Calculate the filter coefficients for a 5-tap FIR bandpass filter with a lower cutoff frequency of 2,000 Hz and an upper cutoff frequency of 2,400 Hz at a sampling rate of 8,000 Hz.	**07**
	(b)	Given an analog filter whose transfer function is $H(s) = 10 / (s + 10)$ Convert it to the digital filter transfer function and difference Equation, respectively, when a sampling period is given as T	**07**

=0.01 second. Use Bilinear Transformation method.

OR

Q.5	**(a)**	Explain Goertzel algorithm.	**07**
	(b)	Discuss the applications of Digital Signal Processing.	**07**

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