Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2712910 **Date: 04/01/2016**

Subject Name: DISCRETE TIME SIGNAL PROCESSING

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Notations and symbols used have usual meaning**

Q.1	**(a)**	State and prove initial value and final value theorem for Z-transform. Obtain the initial value for $x(z) = 2+3z^{-1}+4z^{-2}$.	**06**
	(b)	(i) Draw low-pass filter magnitude characteristics with all necessary tolerance limits. (ii) State relation between z- transform and discrete Fourier transform. (iii) State and explain sampling theorem. (iv) State and prove differentiation property of Fourier Transform.	**08**
Q.2	**(a)**	Explain DIF- FFT Algorithm using signal flow graphs for N=4.	**07**
	(b)	Describe any one type of DSP architecture.	**07**
		OR	
	(b)	Describe Implementation of a DSP algorithm.	**07**
Q.3	**(a)**	An LTI system is characterized by $y(n) - ay(n-1) = x(n)$; determine its frequency and impulse response using DTFT.	**07**
	(b)	Discuss changing the sampling rate using discrete time processing	**07**
		OR	
Q.3	**(a)**	For the two four-point sequences $x(n) = \cos(n\pi/2)$ and $y(n) = \sin(n\pi/2)$. Obtain linear convolution of x(n) with y(n) directly	**07**
	(b)	Define sampling .Define aliasing and discuss its remedies.	**07**
Q.4	**(a)**	Find inverse Z –transform of (i) $X(z) = \dfrac{1}{(1-0.25z^{-1})(1-0.5z^{-1})}$ $\quad \lvert z \rvert > (1/2)$. (ii) $X(z) = \log(1 + a z^{-1}) \quad \lvert z \rvert > \lvert a \rvert$.	**07**
	(b)	For $H(z) = 2/(z+3)$, obtain Direct form - II and its transposed realization.	**07**
		OR	
Q.4	**(a)**	Obtain z-transform for (i) $x(n) = -a^n u(-n-1)$ and (ii) $x(n) = a^n u(n)$. Also, state ROC for each and plot pole- zero diagram.	**07**
Q.4	**(b)**	For linear phase FIR filters, how constant group and phase delay is achieved? Also, enlist various design techniques for linear phase FIR filter.	**07**

Q.5	**(a)**	State and prove the following properties of DFT: (i) linearity (ii) duality (iii) periodicity (iv) circular convolution.	**07**
	(b)	Describe the Kaiser window filter design procedure for a high pass filter.	**07**

OR

Q.5	**(a)**	Find the 4- point DFT of the sequence x(n) ={1,1,0,0}.	**07**
	(b)	Compare FIR filter with IIR filter in tabular form.	**07**

****