Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 710422 **Date: 26-06-2014**

Subject Name: Digital Signal Processing and Application

Time: 02:30 pm - 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)**	An analog signal x(t)=3 cos 100 ´ t is sampled. Determine the minimum required sampling rate to avoid aliasing. If the sampling rate is 200 Hz, what is the discrete time signal obtained after sampling ? Plot this discrete time signal.	**07**
	(b)	Determine the impulse response for the cascade of two linear time ï invariant systems having impulse responses $h_1(n)=0.5^n u(n)$ and $h_2(n)= 0.25^n u(n)$.	**07**
Q.2	**(a)**	Determine the Fourier transform of the following signals: (i) x(n)=u(n) (ii) x(n)= cos ϖ$_0$ n u(n)	**07**
	(b)	Determine the inverse z-transform of $X(z)= 1 / (1-1.5 z^{-1}+0.5 z^{-2})$ when ROC $\|z\| > 1$ and ROC $\|z\| < 0.5$.	**07**
		OR	
	(b)	Determine the z-transform and the ROC of the signal $x(n)=[3(2^n)-4(3^n)] u(n)$	**07**
Q.3	**(a)**	Obtain Direct form ï I, direct form ï II, cascade and parallel structures for the following system :y(n)=y(n-1)-0.5 y(n-2)+x(n)-x(n-1)+x(n-2)	**07**
	(b)	Explain windows based FIR filter design techniques.	**07**
		OR	
Q.3	**(a)**	What is impulse invariance? Compare impulse invariance technique with bilinear transformation technique.	**07**
	(b)	Design a digital low pass filter using bilinear transformation method to meet the following specifications: passband ripple <= 1 dB;passband edge: 4 kHz, stopband attenuation >=40 dB; stop band edge :6 kHz, sample rate: 24 kHz	**07**
Q.4	**(a)**	What is circular convolution? Relate it with linear convolution.	**07**
	(b)	By means of DFT and IDFT, determine the sequence $x_3(n)$ corresponding to circular convolution of two sequences $x_1(n)$ and $x_2(n)$ given by {2,1,2,1} and {1,2,3,4} respectively.	**07**
		OR	
Q.4	**(a)**	Compare computational complexity of direct computation of DFT versus the FFT algorithm.	**07**
	(b)	Explain Goertzel algorithm .	**07**
Q.5	**(a)**	How do we use DFT in power spectrum estimation?	**07**
	(b)	What are the applications of DSP in the area of speech processing ?	**07**
		OR	
Q.5	**(a)**	Write a short note on DSP applications in radar signal processing.	**07**
	(b)	What are the effects of quantization of filter coefficients ?	**07**

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