Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1710422 **Date: 23-06-2014**

Subject Name: Digital Signal Processing and Applications

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)**	Define stable and causal system. Give an example of stable and causal LTI system expressed by a difference equation. How from difference equation stability and causality can be verified?	**07**
	(b)		**04**
	(1)	Show that the accumulator and the moving average systems are both Linear Time-Invariant (LTI) systems. Under which condition moving average system is causal?	
	(2)	Determine the inverse z-transform of $X(z) = \frac{z^2}{z^2 - 1.5z + 0.5}$, if x[n] is two-sided sequence.	**03**
Q.2	**(a)**	Explain the properties of Z transform.	**07**
	(b)	Find the inverse DFT of X (k) = {6,(-1-j),0,(-1+j)}	**07**
		OR	
	(b)	Determine the input x[n] of the system with impulse response h[n] = {1, 2, 3, 1} and output y[n] = {2, 5, 9, 9, 8, 7, 2}.	**07**
Q.3	**(a)**	Explain Decimation-In-Time Algorithm.	**07**
	(b)	Determine linear convolution of the given sequences x[n] = {1, 3} & h[n] = {3, 2} using DFT and IDFT methods. Compare it with circular convolution of x[n] & h[n].	**07**
		OR	
Q.3	**(a)**	Derive the DFT of the sample data sequence x(n) = {$\underline{0}$,2,-1} and compute the Corresponding amplitude and phase spectrum.	**07**
	(b)	Explain circular convolution with the help of an example.	**07**
Q.4	**(a)**	Give differences between DIT and DIF FFT algorithms.	**07**
	(b)	A continuous time signal is sampled at a sampling rate of 20 kHz and the DFT of 512 samples computed. Determine the frequency spacing between spectral samples. Justify your answer.	**07**
		OR	
Q.4	**(a)**	Give the difference between overlap-save method & overlap-add method.	**07**
	(b)	Discuss any two applications of DSP.	**07**
Q.5	**(a)**	Explain design of FIR filters by Kaiser window and mention its advantages against the commonly used windows.	**07**
	(b)	With the help of a neat sketch, explain Digital Signal Processor architecture.	**07**
		OR	
Q.5	**(a)**	Describe how sampling rate can be reduced by a non integer factor.	**07**
	(b)	What are the advantages and disadvantages of non-parametric methods for power spectrum estimation? Determine the frequency resolution of the Bartlett, Welch and Blackman-Tukey methods of power spectrum estimation for quality factor Q=10. Assume that overlap in Welchôs method is 50%. Given the length of the sample sequence is 1000.	**07**