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

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–IV • EXAMINATION– WINTER • 2015

Subject Code: 744101 **Date: 05/12/2015**

Subject Name: Advance Topics in Signal and Image 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.**

Q.1	**(a)**	What is the Periodogram ? What is its limitation? Interpret the periodogram in terms of filter bank. How is it used in signal processing ?	**07**
	(b)	Which two modifications were proposed by Welch over Barlett's method ? Explain the method stating its properties. How this method is being in use for image processing so far?	**07**
Q.2	**(a)**	Explain the steps involved in parametric method of spectrum estimation. How to make use of this estimate in signal processing ?	**07**
	(b)	For Auto-regressive, Moving average and ARMA, what are the representative equations for power spectrum ? How do one use them in signal processing ?	**07**
		OR	
	(b)	Explain minimum variance power spectral estimation method.	**07**
Q.3	**(a)**	Explain your understanding about Wavelet Transform. Explain about Haar Wavelet.	**07**
	(b)	Explain any one application of Wavelet Transform in image processing with suitable example.	**07**
		OR	
Q.3	**(a)**	What are clusters ? What is clustering? What is the need for clustering? Is it applicable to one dimensional signal or two dimensional signal ?	**07**
	(b)	Explain hierarchical clustering using average linkage algorithm. Use Euclidian distance between samples.	**07**
Q.4	**(a)**	Write down steps for k-means clustering algorithm. How can one compute the centroid ?	**07**
	(b)	How can one use PCA for feature extraction and description? Explain with suitable example.	**07**
		OR	
Q.4	**(a)**	What is a chain code ? What is a shape number ? Give one example that illustrate chain code and shape number.	**07**
	(b)	What is the signature of a shape ? Obtain signature for circle and square shape .	**07**
Q.5	**(a)**	Explain about polygonal approximation and Fourier descriptors.	**07**
	(b)	Compare minimum distance classifier and Bayesian classifier with example where in they can be applied.	**07**
		OR	
Q.5	**(a)**	Define variance, co-variance, eigenvectors and eigenvalues.	**07**
	(b)	Explain about central limit theorem with one application to signal processing.	**07**

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