Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 2713109 **Date: 09-01-2015**

Subject Name: Biomedical Signal Processing

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)**	Explain any example of concurrent, coupled and correlated process in human body.	**07**
	(b)	Explain Test for randomness of signal. Give all statistics related to random noise characterization.	**07**
Q.2	**(a)**	Explain basics of signal averaging. How it will improve Signal to Noise ratio?	**07**
	(b)	Design a time domain technique to remove base line drift in the ECG signal.	**07**
		OR	
	(b)	Design a frequency domain filter to remove periodic artifacts such as power line interface. Also indicate location of pole and zero in Z plane.	**07**
Q.3	**(a)**	Explain design of the Wiener filter.	**07**
	(b)	Explain derivative based methods for QRS detection.	**07**
		OR	
Q.3	**(a)**	Explain working of an adaptive filter with necessary schematic and equations.	**07**
	(b)	Give design steps of the Pan- Tompkins algorithm for QRS detection.	**07**
Q.4	**(a)**	Explain measures of waveform activity that may be used to analyze signal.	**07**
	(b)	Explain estimation of the Power spectrum Density function.	**07**
		OR	
Q.4	**(a)**	Explain signal analysis techniques for morphological analysis of ECG wave.	**07**
	(b)	Explore the possibilities of parametric modelling of signal characteristics using the general linear system model.	**07**
Q.5	**(a)**	Explain Auto regressive model with necessary equations. Also give signal flow diagram of AR model.	**07**
	(b)	We are given a set of features vectors with no classes attached to them. No prior training information is available. How may we group the vectors in to multiple categories?	**07**
		OR	
Q.5	**(a)**	Explain process of training and testing in Neural Network and its role in Biomedical field.	**07**
	(b)	A filter has transfer function $H(Z)= (1+2 z^{-1}+z^{-2})/ (1-z^{-2})$ • Write difference equation relating the output to the input. • Draw signal flow diagram of a realization of the filter. • Draw its pole zero diagrams.	**07**

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