Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015

Subject code: 713104N **Date: 15/12/2015**

Subject Name: Bio-signal Processing

Time: 10:30 AM to 1:00 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 rubber membrane concept with any example.	**07**
	(b)	Derive the transfer function of Various FIR filter for smoothing of the data.	**07**
Q.2	**(a)**	Explain working of successive approximation A to D converter.	**07**
	(b)	Explain concept of Digital Derivative Techniques. Derive transfer function of all techniques.	**07**
		OR	
	(b)	Explain concept of the Digital Integration techniques. Derive transfer function of all techniques.	**07**
Q.3	**(a)**	Prove that convolution in time domain equivalent to multiplication in Z domain with example.	**07**
	(b)	A band stop filter required to meet following specifications. A complete signal rejection at 50 Hz A 3 dB width of notch with ± 5 Hz Assuming sampling frequency of 500 Hz, obtain transfer function by suitably placing pole-zero.	**07**
		OR	
Q.3	**(a)**	Obtain the coefficients of an FIR low pass filter to meet the following specifications using Blackman Window method Stop Band Attenuation >50 dB Pass Band edge frequency 3.4.KHz Transition width 0.6 KHz Sampling Frequency 8 KHz	**07**
	(b)	Prove that signal averaging improves the SNR. Explain the block diagram of typical signal averager.	**07**
Q.4	**(a)**	Explain the working of adaptive filter noise canceller model with necessary equations.	**07**
	(b)	Write a conceptual note on ECG QRS detection techniques.	**07**
		OR	
Q.4	**(a)**	What is the advantage of the integer filters compare to others? Explain design concept of Integer filters.	**07**
	(b)	Write a short note on ECG analysis system.	**07**
Q.5	**(a)**	Write a short note on Huffman algorithm.	**07**
	(b)	Explain hardware design concepts of portable arrhythmia monitor.	**07**
		OR	
Q.5	**(a)**	Determine Inverse Z transform $X[z] = (8Z - 19)/(Z^2-5Z+6)$	**07**
	(b)	Explain design of 50Hz notch filter. Draw signal flow graph and pole zero plot	**07**

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