Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 713104N **Date: 17-06-2013**

Subject Name: Bio-Signal Processing

Time: 10.30 am – 01.00 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 all practical consideration for signal conversions.	**07**
	(b)	Explain rubber membrane analogy for Z plane with example.	**07**
Q.2	**(a)**	Determine Inverse Z transform $X[z] = \frac{(8Z - 19)}{(Z^2 - 5Z + 6)}$	**07**
	(b)	Explain Time shifting and time reversal properties of Z transform.	**07**
		OR	
	(b)	Design a 50Hz notch filter. Draw signal flow graph and pole zero plot.	**07**
Q.3	**(a)**	Obtain co-efficients of an FIR Low pass filter to meet specifications given below using the window method. Passband Edge frequency 1.5KHz, Transition width 0.5 KHz Stopband attenuation > 50 dB, Sampling frequency 8 KHz	**07**
	(b)	Explain digital integration techniques with their pole-zero plots.	**07**
		OR	
Q.3	**(a)**	Design an 11 co-efficient FIR low pass filter, whose cut off frequency fc equal to 2fs/11.	**07**
	(b)	Explain the Biomedical applications of the adaptive filters.	**07**
Q.4	**(a)**	Explain simple one pole recursive filter with block diagram and their response to a unit impulse for different position of pole.	**07**
	(b)	A band pass digital filter is required to meet the following specifications: A complete signal rejection at dc and 250 Hz; A narrow pass band centered at 125 Hz; A 3 dB bandwidth of 10 Hz , Assuming a sampling frequency of 500Hz, obtain transfer function of the filter, by the pole-zero method, and its difference equations.	**07**
		OR	
Q.4	**(a)**	Explain structure of an adaptive filter noise canceller with necessary equations and diagram.	**07**
	(b)	Design first order High pass digital filter whose cutoff frequency is 1KHz at sampling frequency of 10^4 sample per second by using Bilinear Z-transform method.	**07**
Q.5	**(a)**	What is the advantage of integer filter over others? Explain basic design concepts of Integer filter.	**07**
	(b)	Explain steps of ECG interpretation.	**07**
		OR	
Q.5	**(a)**	Explain hardware design concepts of portable arrhythmia monitor.	**07**
	(b)	Prove that signal averaging improves the Signal to noise ratio.	**07**

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