Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 713104N **Date: 16-01-2013**

Subject Name: Bio-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)** Give brief idea of basic signal conversion requirements for Biomedical signal processing. **07**

(b) Explain rubber membrane analogy for Z plane with example. **07**

Q.2 **(a)** Determine Inverse Z transform for |z|>3. **07**

$$X[z] = \frac{(Z^2+Z)}{(Z^3-3Z^2+3Z-1)}$$

(b) Prove that Convolution of two sequences in time domain corresponds to multiplication of its Z transform in frequency domain. **07**

OR

(b) Explain polynomial smoothing filter. **07**

Q.3 **(a)** Obtain co-efficients of an FIR Low pass filter to meet specifications given below using the window method. **07**

Passband Edge frequency 1.5KHz
Transition width 0.5 KHz
Stopband attenuation > 50 dB
Sampling frequency 8 KHz

(b) Explain derivatives algorithms with signal flow graph and Pole zero diagrams. **07**

OR

Q.3 **(a)** Obtain the FIR Low pass filter coefficients Using Frequency sampling method for the following specifications: **07**

Pass band 0 to 5 KHz
Sampling frequency 18KHz
Filter length 9

(b) Explain structure of an adaptive filter noise canceler with necessary equations and diagram. **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: **07**

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.

OR

Q.4 **(a)** Explain digital Integration techniques. **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)**	Explain basic design concepts of Integer filter.	**07**
	(b)	Explain basic flowchart of the signal averaging program.	**07**
		OR	
Q.5	**(a)**	Explain hardware design concepts of portable arrhythmia monitor.	**07**
	(b)	Explain fundamental of ECG interpretation.	**07**

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