

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
