

III B.Tech. II Semester Regular Examinations, April/May -2005
BIOMEDICAL SIGNAL PROCESSING
(Bio-Medical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Write short notes on
 - (a) Amplification
 - (b) Sampling
 - (c) Percent root means square difference
2. List the data array that represents the AZTEC encoding of the signal where $X[n] = 2 \cdot \{0, 1, 1, 0, -1, 10, 20, 40, 50, 20, -1, -30, -20, -10, 0, 1, 0, 0, 1, -1\}$ Calculate data reduction ratio.
3. Explain about cardio vascular system. What are the difficulties in signal processing methods?
4. What are the components of ECG signal? Write their durations and amplitudes.
5. Explain the ANC method to Enhance fetal ECG.
6. Write an algorithm to implement prony's method on $y[n] = 20 \cdot e^{(-0.1 \cdot n)} \cos(2 \cdot \pi \cdot f \cdot n)$ where $f=0.4$, $p=2$, $N=100$
7. Draw and explain the block diagram of correlation canceller for third order predictor filter
8. Discuss how the EEG signals are generated. Give a model of EEG signal.

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1. Define redundancy. Explain the types of redundant data.
2. Write short notes on
 - (a) CORTES algorithm
 - (b) Lossy compression.
3. What are the characteristics of the signal and the noise to apply signal averaging. Show that $SNR_m = (SNR)$.
4. Explain template subtraction technique for QRS detection with neat sketches.
5. Explain about the principles of ANC. What are the different noise canceling methods.
6. What are the salient features of Prony's method of signal processing?
7. Draw and explain the block diagram of correlation canceller for third order predictor filter
8. Draw and explain the block diagram to show the inverse filtering function of given signal spectrum
$$y(n) = 0.52y(n-3) + 0.25y(n-2) - 0.12y(n-1) + e(n).$$

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1. Explain different types of medical data. Draw and explain the block diagram to record physiological signals.
2. Explain the AZTEC Algorithm in sloping mode
3. Describe arrhythmia detection algorithms.
4. Explain QRS detection using Nygards and Hulting algorithm and Explain how the heart rate is obtained
5. Describe ANC method using LMS algorithm. How does this help in fetal ECG monitoring
6. Mention the applications of pronys method. Explain how the evoked potentials are evaluated.
7. Explain the calculation of Mean Square Error from Y-W equations.
8. Define a random process. Explain statistical properties of a Random signal.

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1. Define redundancy. Explain the types of redundant data.
2. Explain the AZTEC Algorithm in its Horizontal mode
3. Explain how premature beat is identified and explain its significance in Rhythm analysis
4. Correlate the ECG signal with conduction system of heart.
5. Explain about the principles of ANC. What are the different noise canceling methods.
6. Explain how least squares prony's method overcomes the problem of non-linearity of original prony's method.
7. Explain the calculation of Mean Square Error from Y-W equations.
8. Explain how EEG signals are modeled by linear prediction. Describe the polynomial modeling technique.
