

**III B.Tech II Semester Supplementary Examinations,
November/December 2005
BIOMEDICAL SIGNAL PROCESSING
(Bio-Medical Engineering)**

Time: 3 hours**Max Marks: 80**

**Answer any FIVE Questions
All Questions carry equal marks**

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1. Explain the significance of Huffman coding in data reduction. What are its limitations? [16]
2. Write short notes on [16]
 - (a) CORTES algorithm
 - (b) Lossy compression.
3. Explain the significance of R-R interval in Rhythm analysis. [16]
4. Mention template-matching techniques of QRS detection and explain any one technique. [16]
5. The main signal consists of $X(n)$ and $V(n)$
 $S(n) = X(n) + V(n)$
 If $X(n) = 0.05\pi n$. For $n = 0, 1, 2, \dots, N$. The signal $V(n)$ is related to the reference noise $R(n)$ as
 $V(n) = R(n) + 0.7V(n-1) - 0.5V(n-2) + 0.25V(n-3)$ and
 $R(n) = 0.5R(n-1) - 0.05R(n-2) + 0.01R(n-3) + E(n)$
 Calculate $E(n)$ and weight factor. [16]
6. Mention the applications of prony's method. Explain how the evoked potentials are evaluated. [16]
7. What are the disadvantages of YW equations of linear prediction code? Explain how it is eliminated by stochastic approximation of YW equations. [16]
8. Explain 10-20 lead system using lateral measurements. [16]

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1. Explain the significance of Huffman coding in data reduction. What are its limitations? [16]
2. Explain the need of data compression. What are precautions to be taken when data reduction algorithms are implemented on the data array? [16]
3. Explain different arrhythmias of heart with a neat flow diagram. [16]
4. Draw and explain the block diagram of ECG Preprocessing. [16]
5. Describe ANC filter using LMS algorithm. [16]
6. What are the salient features of prony's method of signal processing? [16]
7. Write short notes on [16]
 - (a) ARMA model
 - (b) Correlation canceller for FOP.
 - (c) Data compression.
8. Explain 10-20 lead system to record EEG. [16]

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1. Define redundancy. Explain the types of redundant data. [16]
2. Explain the need of amplification of Biomedical Signals [16]
3. Explain how premature beat is identified and explain its significance in Rhythm analysis [16]
4. Write the flow chart for the detection of QRS complex using differentiation technique. [16]
5. Explain the principle of Adaptive filters with a neat block diagram and mention its applications. [16]
6. Write an algorithm to implement prony's method on $y(n) = 20 * e^{(-0.1 * n)} \cos(2 * \pi * f * n)$ where $f=0.2$, $p=2$, $N=100$ [16]
7. Explain the calculation of Mean Square Error from Y-W equations. [16]
8. Explain how EEG signals are modeled by linear prediction. Describe the polynomial modeling technique. [16]

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1. Explain different types of medical data. Draw and explain the block diagram to record physiological signals. [16]
2. Compare the data reduction algorithms of ECG. [16]
3. Apply signal-averaging technique on given data sample sets. [16]
 $A1 = \{0, 10, 0, 0, 1, 50, 100, 50, 1, 0, -20, -10, 0, 0, 0, 10, 60, 20, 10, 0\}$
 $A2 = \{1, 11, 1, 1, 2, 51, 101, 51, 2, 2, -19, -9, 1, 1, 1, 11, 61, 21, 11, 1\}$
 $A3 = \{-1, 9, -1, -1, 0, 49, 99, 49, 0, -1, -21, -11, -1, -1, -1, 9, 59, 19, 9, -1\}$
4. Explain template subtraction technique for QRS detection with neat sketches. [16]
5. Explain the principle of Adaptive filters with a neat block diagram and mention its applications. [16]
6. Mention the applications of prony's method. Explain how the evoked potentials are evaluated. [16]
7. Derive the expression to get coefficients and MSE for FOP from ZOP using LD algorithm. [16]
8. Explain 10-20 lead system using anterior and posterior measurements [16]
