

Total No. of Questions : 10]

SEAT No. :

P4574

[4760] - 291

[Total No. of Pages :3

M.E. (E & TC) (VLSI & Embedded Systems)

BIOMEDICAL SIGNALS & SYSTEMS

(2008 Pattern) (Semester - II) (Elective - III)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any three questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Explain the action potential & Na⁺ - K⁺ pump action. [8]
b) Explain the bio-instrumentation setup for acquiring EMG signals. Highlight the important design constraints for the same. [8]
- Q2)** a) Draw a typical ECG waveform over one cardiac cycle indicating the important component of the wave. How is the waveform affected by passage through [12]
i) A low pass filter with cut off frequency of 40Hz?
ii) A high pass filter with cut off of 5Hz?
b) Describe difficulties encountered in biomedical signal acquisition & analysis. [6]
- Q3)** a) Explain 10-20 electrode system for acquiring EEG signal. [8]
b) Explain following with reference to cardio-vascular system [8]
i) Heart rate variability
ii) Arrhythmia
iii) Myocardial Infraction
iv) Slow heart & fast heart

P.T.O.

- Q4)** a) Explain the terms. [8]
- i) ECG
 - ii) EMG
 - iii) PCG
 - iv) VAG
- b) Explain any one technique for 'QRS' detection in ECG signal. [8]
- Q5)** a) Explain the genesis of PCG signals & their correlation with ECG. [8]
- b) Explain the butterworth LPF for high frequency noise removal, also explain design steps for the same. [8]

SECTION - II

- Q6)** a) Show how ECG signal & carotid pulse signals may be used to break a PCG signal into it's systolic & diastolic parts. [9]
- b) Explain the operations involved in homophoric filter & state it's applications for any bio-medical signal. [9]
- Q7)** Write short notes on (Any two). [16]
- a) The Pan-Tompkin's Algorithm
 - b) Application of Neural Network in biomedical signal analysis
 - c) Use of adaptive filters for segmentation.
- Q8)** a) Why is the 'ST' segment of ECG signal is relevant in diagnosis? Recommend signal analysis techniques for analysis of 'ST' segment variation in clinical applications. [10]
- b) Enlist & explain various short-time statistical measures used to characterize a non - stationary signal. [6]

Q9) Propose a method to detect the presence of ‘ α ’ rhythm in EEG channel. How would you extend the method to detect the presence of the same rhythm simultaneously in two EEG channels? **[16]**

Q10) a) Discuss any one technique for envelope extraction & analysis of any appropriate bio-signal activity. **[8]**

b) State & explain the signal - flow diagram of AR model with appropriate example. **[8]**

