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Roll No.

18BB1401

M. Tech. EXAMINATION, 2020

(Second Semester)

(C Scheme) (Re-appear)

(BME)

MTBM502C

ADVANCED BIOMEDICAL SIGNAL
PROCESSING

Time : 2½ Hours]

[Maximum Marks : 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks. Draw neat diagrams wherever applicable.

1. (a) Give brief introduction of ECG, EEG and EMG signals.
(b) How FIR filters are different from IIR filters ? Give any *one* method of FIR filter design.
2. (a) Discuss the design and function of notch filters.
(b) Define Poles and Zeros. Plot poles and zeros on Z-plane of the following function :
$$H(Z) = Z + 1/2 / ((Z - 1/4)Z + 3/4).$$
3. (a) Explain the ECG acquisition system with description of different lead positioning systems.
(b) Outline the different ways of QRS detection.
4. (a) Define artifacts. Explain the methods of baseline wander removal in ECG.
(b) Summarize the phenomena of detection of first and second heart sounds.

5. (a) Explain the neural transmission. Also discuss EEG recording techniques.
(b) Argue upon detection of sleep disorders using EEG.
6. (a) Emphasize on the method of artefact cancellation using reference signals.
(b) Elaborate the autoregressive moving average models for EEG signal analysis.
7. (a) Describe the mechanism of muscle conduction. How to estimate conduction velocity in EMG ?
(b) Invent the role of Independent Component Analysis for source separation.
8. (a) Illustrate the function neural networks as a classifier.
(b) Assess the significance of Hidden Markov model for pattern recognition of EMG signals.

9. (a) Explain the types of filters.
- (b) Illustrate the role of SA node.
- (c) ECG waveform.
- (d) EEG electrode placement scheme.
- (e) Discuss the phenomena of unsupervised classification.