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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER MTECH DEGREE EXAM - July 2018
ELECTRONICS AND COMMUNICATION ENGINEERING
SIGNAL PROCESSING
01EC6315: BIOMEDICAL SIGNAL PROCESSING

Max. Marks : 60 marks

Answer *any two full* questions from *each* part

Limit answers to the required points

PART A

1. (i) Propose an adaptive noise cancellation filter to remove maternal ECG from foetal ECG. Chest lead ECG signal from mother may be used for reference. (6)
(ii) Discuss on objectives of biomedical signal analysis. (3)
2. (i) Design an optimal filter to remove noise from a signal, given that the signal and noise processes are independent, stationary, random processes. You may assume the “desired” or ideal characteristics of the uncorrupted signal as well as noise characteristics to be known. (6)
(ii) Explain the role of $\text{Na}^+ - \text{K}^-$ pump mechanism in the genesis of biomedical signals. (3)
3. (i) Propose a time domain technique to remove random noise if you are given realizations from a series of related events. How you will tackle the same situation if only one realization of the same event is available. Make suitable assumptions wherever you need. (6)
(ii) Propose a method for analyzing the randomness in a noisy signal. (3)

(9 x 2 = 18 marks)

PART B

4. (i) Explain an algorithm for the real time detection of QRS complex in an ECG waveform. (5)
(ii) Discuss on the pros and cons of synchronous averaging. (4)
5. (i) Develop a method for removing power line interference in an ECG signal which is less sensitive to noise. (5)
(ii) How muscle noise encountered during ECG acquisition can be rectified using signal processing technique? (4)

6. (i) How the method of polynomial fitting can be used to remove baseline wander from an ECG signal. (5)
(ii) Devise a method for the detection of epileptic seizures in EEG signals. (4)
(9 x 2 = 18 marks)

PART C

7. (i) Explain *any one* method for the analysis of EEG signals with regard to both time and frequency. (6)
(ii) How signal processing techniques helps in EMG waveform decomposition? (6)
8. (i) How matched filters can be used in the waveform analysis of EEG? (6)
(ii) What is the need for a time varying amplitude estimate of surface EMG signals? How it is achieved? (6)
9. (i) Write notes on recording of myoelectric signals. (4)
(ii) Give details of *any one* EEG segmentation scheme which is based on nonparametric estimation of the signal statistics? (8)
(12 x 2 = 24 marks)

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