

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

Max. Marks : 60 marks

Duration: 3Hrs

PART A

1. (i) Propose a time domain technique to remove random noise when only one realization of the signal or event of interest is given. (Assumption: processes are ergodic.) (6)
(ii) Explain the pros and cons of synchronized averaging. (3)
2. (i) A typical biomedical signal analysis of a subject shows that the acquired signal is affected by high frequency noise. Design a frequency-domain filter which has minimum computational complexity to remove this noise with minimal loss of signal components in the specified passband given below. $f_c = 40 \text{ Hz}$, $f_s = 200 \text{ Hz}$. Choose the order of the filter to be $N = 4$. Assume the data which are not given. (5)
(ii) What are the difficulties encountered while we analyze a biomedical signal? (4)
3. (i) How template matching can be used for QRS detection of ECG signal? (5)
(ii) Write notes on various epochs in ECG waveform. (4)

(9 x 2 = 18 marks)

PART B

4. (i) Show how Pan Tompkins algorithms can be used for real time QRS detection. (5)
(ii) Discuss on any one method to detect the presence of α rhythm in an EEG channel (4)
5. (i) What do you mean by evoked response? Explain the various steps you perform while doing synchronous averaging in EEG signals? What is the improvement in signal to noise ratio if you are given M copies of such responses? (5)
(ii) Write notes on EEG rhythms and waveform (4)

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6. (i) How base line wandering problem in ECG signal can be removed (5)
(ii) How EEG signals can be acquired for signal processing. (4)

(9 x 2 = 18 marks)

PART C

7. (i) Why are model based approaches preferred in EEG analysis? (3)
(ii) Why EEG signal processing is important ? (3)
(iii) 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) How EMG is measured and mention about its applications. (6)
9. (i) Discuss on amplitude and power estimation of EMG signals. (8)
(ii) Write notes on various artifacts in EEG. (4)

(12 x 2 = 24 marks)

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