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18BM71

Seventh Semester B.E. Degree Examination, Feb./Mar.2022

Biomedical Digital Signal Processing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the objectives of biomedical signal analysis? Explain in detail the different signal acquisition procedures. (10 Marks)
- b. Explain the difficulties encountered in biomedical signal processing. (10 Marks)

OR

- 2 a. Describe time-frequency and parametric model of EEG analysis. (10 Marks)
- b. Using Levinson's algorithm obtain 2nd order prediction filter coefficients. (10 Marks)

Module-2

- 3 a. Describe Random noise, structural noise and physiological interference. (10 Marks)
- b. Explain how moving average filter is useful in noise removal. (10 Marks)

OR

- 4 a. Design a frequency-domain filter to remove high frequency noise with minimal loss of signal components in the specified pass band (Butterworth low-pass filter). (10 Marks)
- b. Design a Notch filter in frequency domain to remove powerline interference. (10 Marks)

Module-3

- 5 a. Define signal averaging. Explain the basics of signal averaging. Hence show that signal averaging improves SNR by a factor of \sqrt{m} . (10 Marks)
- b. Discuss the classification of sleep stages. Give the time and frequency domain representation of different stages. (10 Marks)

OR

- 6 a. Explain the Markov-model to analyse the sleep behavior. (10 Marks)
- b. Explain dynamic of sleep-wake transitions. (10 Marks)

Module-4

- 7 a. Describe differentiations based QRS-detection techniques. (12 Marks)
- b. Explain the principle of Adaptive filter. Let the adaptive filter linear combiner characterized by, $E[y^2(n)] = 2$, $E[x^2(n)] = 6$, $E[x(n)y(n)] = 2$ and $y(n) = y(n-1)$. Find optimum value of 'h' that minimizes the mean square error $E[e^2(n)]$ and find the corresponding minimum mean square error. (08 Marks)

OR

- 8 a. Explain cancellation of donar-heart interference in heart-transplant electrocardiography with neat diagram. (10 Marks)
- b. With neat diagram, explain cancellation of high frequency noise in electrosurgery. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-5

- 9 a. Define data compression. What is the need of data compression? Describe the zero order predictor algorithms. (10 Marks)
- b. Explain Turning point algorithm in detail. Give its advantages and disadvantages. (10 Marks)

OR

- 10 a. With neat diagram and flow-chart explain CORTES algorithm. (10 Marks)
- b. Explain data compression by Differential Pulse Code Modulation (DPCM) and entropy coding. (10 Marks)

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