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**Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)**



Ph.D. (First Semester-Summer) Examinations, December - 2025

23SPPEEC1013 - Biomedical Signal Processing

(ECE)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions.	(14 x 5 = 70 Marks)	Marks
1.a. Explain the process of acquisition and generation of bio-signals. Provide examples of different bio-signals and discuss their diagnostic significance.		8
b. What are the various types of bio-signals, and how do their origins differ? Discuss the parameters that are diagnostically significant for each type.		6
2. Explain the principles of signal conditioning in the context of bio-signal acquisition. How do analog-to-digital converters (ADCs) and digital-to-analog converters (DACs) play a role in the process?		14
3.a. Explain the role of Fourier analysis in biomedical signal processing. How does it help in understanding the frequency components of bio-signals?		7
b. Provide a detailed overview of the computational methods for extracting diagnostically significant parameters from bio-signals using Fourier and wavelet analysis.		7
4. Explore the applications of spectral analysis in diagnosing and monitoring medical conditions. How does spectral analysis aid in understanding the underlying physiological processes?		14
5.a. Define Principal Component Analysis (PCA) and explain its application in biomedical signal processing. Provide examples of how PCA can be used to extract meaningful information from bio-signals.		7
b. Discuss the concepts of correlation and regression in the context of analyzing biosignals. How do these statistical techniques help in medical research and diagnosis?		7
6.a. Provide an in-depth explanation of motion artifacts in bio-signal acquisition. How can these artifacts be minimized or corrected in signal processing?		7
b. Explore the array of electrodes and microelectrodes. How are they used in specialized applications such as neural signal recording and mapping?		7
7. Discuss the advantages of wavelet analysis, specifically time-frequency analysis, in processing bio-signals. Provide examples of bio-signals where wavelet analysis is particularly useful.		14
8.a. Define signal classification and discuss its importance in biomedical signal processing. How is it used to distinguish between signals and noise?		7
b. Explain the analysis of chaotic signals and their relevance in biomedical signal processing. Provide examples of bio-signals that exhibit chaotic behavior.		7

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