

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



B. Tech (Eighth Semester - Regular) Examinations, April - 2025

**21BBTOE48021 - Biomedical Instrumentation**

(Biotechnology)

Time: 3 hrs

Maximum: 70 Marks

**Answer ALL questions**  
(The figures in the right hand margin indicate marks)

## PART – A

(2 × 5 = 10 Marks)

Q.1. Answer **ALL** questions.

- |   | CO # | Blooms Level |
|---|------|--------------|
| a. Write few advantages of using floating electrodes.         | CO1  | K1           |
| b. What is Larmor frequency in NMR Blood Flowmeter?           | CO1  | K2           |
| c. Distinguish between Absolute Pressure and Gauge Pressure.  | CO2  | K2           |
| d. List various types of Electromagnetic Blood Flowmeter.     | CO3  | K1           |
| e. List types of standards for regulation of medical devices. | CO4  | K1           |

## PART – B

(15 × 4 = 60 Marks)

Answer **all** the questions.

- |  | Marks | CO # | Blooms Level |
|--|-------|------|--------------|
| 2. a. Illustrate with the help of a block diagram a generalized medical instrumentation system and its various subsystems.   | 8     | CO1  | K2           |
| b. List out the various biomedical signal analysis techniques and explain any one of them in detail.   | 7     | CO1  | K2           |
| (OR)   |       |      |              |
| c. Describe the origin of bioelectric signals. Draw a typical cell potential waveform, label it properly and explain the phenomena of depolarization and repolarization.   | 8     | CO1  | K2           |
| d. What are the various types of electrodes used for the recording of ECG signals? Give a brief description of at least 3 types of electrodes.   | 7     | CO1  | K2           |
| 3.a. Define Gauge Factor of a Strain Gauge. Describe how Strain Gauge is used for pressure measurement.  | 8     | CO2  | K3           |
| b. Briefly describe the classification of transducers.   | 7     | CO2  | K2           |
| (OR)   |       |      |              |
| c. List out different types of transducers for the measurement of temperature in the medical field. Explain the principle of 'thermocouples'. Which is the most common thermocouple used for a body temperature measurement? | 8     | CO2  | K3           |
| d. What is a biosensor? Describe with the help of a diagram the construction of a blood glucose biosensor.   | 7     | CO2  | K2           |
| 4.a. What are the major constraints encountered while designing a measurement system for medical applications? Explain with examples.  | 8     | CO3  | K4           |
| b. Explain the purpose of using the following functional units in signal conditioners.<br>(i) Filtering      (ii) Isolation  | 7     | CO3  | K2           |

(OR)

- |             |   |   |     |    |
|-------------|---|---|-----|----|
| <b>c.</b>   | Describe the method of calculating the Average Heart Rate and Instantaneous Heart Rate of humans.   | 8 | CO3 | K3 |
| <b>d.</b>   | What is an electrocardiograph? Describe the major building blocks of an electrocardiograph machine. | 7 | CO3 | K2 |
| <b>5.a.</b> | Briefly describe the effects of Electric Current on the human body.                                 | 8 | CO4 | K2 |
| <b>b.</b>   | What are the performance characteristics of transducers? List them out and define them.             | 7 | CO2 | K1 |

(OR)

- |           |   |   |     |    |
|-----------|---|---|-----|----|
| <b>c.</b> | Briefly describe types of Leakage Current and their paths of flow. What are the precautions to minimize Electric Shock Hazards?                                   | 8 | CO4 | K2 |
| <b>d.</b> | Write basic principle of Blood Flow measurement using Electromagnetic Blood Flowmeter. What is Transformer Voltage and how does it affect Blood Flow measurement? | 7 | CO3 | K2 |

--- End of Paper ---