

2125

**B.E. (Biotechnology) Fifth Semester  
BIO-515: Bio-Instrumentation**

Time allowed: 3 Hours

Max. Marks: 50

*NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.*

x-x-x

1. Answer Briefly
- |    |  |   |
|----|--|---|
| a) | What are funny currents.   | 1 |
| b) | Define fibrillation.   | 1 |
| c) | What will be the signal in the frequency domain when a signal is discrete and periodic in time domain? | 2 |
| d) | What are beta waves in EEG.  | 1 |
| e) | Give relationship between cardiac output and heart rate.   | 1 |
| f) | What is the attenuation coefficient in a CT scan?  | 1 |
| g) | Give one difference between polarizable and non-polarizable electrode.                                 | 1 |
| h) | What is a signal and system?   | 2 |

**SECTION A**

- |    |   |   |
|----|---|---|
| 2a | Define and provide examples for the properties of linearity, causality, time-invariance, and stability.   | 5 |
| b  | Determine if the following signals are periodic. If periodic, find the fundamental period: $x(t) = 2\cos(10t + 1) - \sin(4t - 1)$ and $x(n) = \cos(0.1\pi n)$ . | 5 |
| 3a | Explain the principle of a capacitive transducer.   | 5 |
| b  | Explain how to measure the unknown frequency in lab.  | 5 |
| 4a | Explain the technique and principle involved in measuring cardiac output by the dye dilution method.  | 5 |
| b  | Explain invasive blood pressure (BP) monitoring using intra-arterial catheterization. Give its advantage over indirect blood pressure measurement.              | 5 |

**SECTION B**

- |     |  |    |
|-----|--|----|
| 5   | Explain the generation and conduction of cardiac impulse. Elucidate the function of the refractory period.         | 10 |
| 6a. | Give basic principle of MRI. Explain the relaxation times and role of magnetic field gradient.                     | 5  |
| b.  | Elucidate the lead placement in ECG. Give block diagram of ECG recording unit.                                     | 5  |
| 7a. | Write short note on energy storage and discharge system, waveform generation, and battery used in a defibrillator. | 5  |
| b.  | Explain the principle and components of an evoked potential audiometer. Give its applications.                     | 5  |

x-x-x