Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET B

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester V - 2021
Course Code : ECE3034
Course Name : Biomedical Instrumentation
Program : B.Tech.

Date : 10-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **5 X 2M = 10M**

1. Blood flowmeters are used to measure blood flow in blood vessels throughout the circulatory system. Name the instrument that measures the difference in time from when an ultrasonic signal is transmitted from the first transducer until it crosses the pipe and is received by the second transducer.
(CO1) [Knowledge]
2. To measure biological signals and to design a medical instrument, concepts of electronics and measurement techniques are needed. A sphygmomanometer is an instrument used to measure Blood Pressure. State the type of measurement used by this instrument.
(CO2) [Knowledge]
3. A change within a cell, during which the cell undergoes a shift in electric charge distribution, resulting in less negative charge inside the cell compared to the outside. What is this phenomenon called?
(CO3) [Knowledge]
4. Bioelectric potentials are generated at a cellular level and the source of these potentials is ionic in nature. What are the devices that convert ionic potentials into electronic potentials called.
(CO3) [Knowledge]
5. An ultrasound machine uses high-frequency sound waves, emitting these waves toward the body. Characteristic impedance or the specific acoustic impedance of a medium used in ultrasound technique of imaging is defined as the product…..and …….
(CO4) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

6. A piezoelectric transducer (also known as a piezoelectric sensor) is a device that uses the piezoelectric effect to measure changes in acceleration, pressure, strain, temperature or force by converting this energy into an electrical charge. With the help of derivation illustrate how to calculate output voltage.

(CO1) [Comprehension]

7. A sphygmomanometer, also known as a blood pressure monitor, is a medical device used to measure blood pressure. The pressure at which Korotkoff sounds start and stops are observed to note the pressures. Describe the procedure of the sphygmomanometer method of arterial blood pressure measurement.

(CO2) [Comprehension]

8. EEG uses the principle of differential amplification, or recording voltage differences between different points using a pair of electrodes Explain how the 10-20 electrode system can be used for recording of EEG signal.

(CO3) [Comprehension]

9. In medical imaging, MRIs (magnetic resonance imaging) use radio waves and CT (computed tomography) scans use X-rays. What is MRI? Explain the technique with the help of a diagram.

(CO4) [Comprehension]

10. The circulatory system is made up of blood vessels that carry blood away from and towards the heart. With a neat schematic diagram explain the Blood Circulation system, also illustrate the use of an Oximeter.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **2 X 20M = 40M**

11. Brain waves are oscillating electrical voltages in the brain measuring just a few millionths of a volt. Describe the different brain waves, also describe the building blocks of the Block Diagram of Electroencephalograph.

(CO3) [Application]

12. Ultrasound imaging (sonography) uses high-frequency sound waves to view the inside of the body. Define ‘Resolution’ concerning ultrasound systems. What are the two types of resolution in an ultrasound system? Explain them.

A 3 cm diameter transducer, excited at 1 MHz is used in water. The velocity of sound in water is 1480 m/s. How much does the near field extend to? What is the semi-divergence angle?

(CO4) [Application]