

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 1812

Your Roll No.....

Unique Paper Code : 2512042401

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Name of the Course : B.Sc.(H) Instrumentation (DSC)

Name of the Paper : Biomedical Instrumentation

Semester : IV

Duration : 3 Hours

Maximum Marks : 90

Instruction for Candidates

1. There are seven questions in all, out of which you have to attempt any five questions
2. All questions carry equal marks
3. The first question is Compulsory.

1.
 - (a) What is the circulatory system? How does this system work? (3)
 - (b) What is a pneumograph and what is its working principle? (3)
 - (c) Define Einthoven's triangle and its significance in ECG measurement. (3)
 - (d) Define blood pressure, pulse pressure, and mean pressure. (3)
 - (e) List the types of electrodes used to measure EEG. (3)
 - (f) Define motion artifacts and list out the measures taken to decrease motion artifacts. (3)
2.
 - (a) What do you understand by resting potential and action potential? Explain with the help of suitable examples and labeled diagrams. (6)
 - (b) Describe the different types of body surface biopotential electrodes used in biomedical applications, using suitable diagrams along with their advantages and disadvantages. (6)
 - (c) Discuss electrode-skin interface phenomena and methods to minimize contact impedance. (6)
3.
 - (a) Differentiate between the competitive and non-competitive pacing modes of the pacemaker. (6)
 - (b) Explain the recording of the ECG and the generation of the PQRST waveform in detail. (6)
 - (c) Classify direct and indirect blood pressure measurement techniques. Explain the ultrasonic method for measuring blood pressure, including a neat diagram. Additionally, discuss the advantages and disadvantages associated with this method. (6)
4.
 - (a) Define the terms dead space, tidal volume, residual volume, and vital capacity in pulmonary measurement. If a person has a total lung capacity of 6000ml and the volume of air left in the lungs at the end-expiratory level is 2.4 L, then calculate the inspiratory capacity of the person. (6)
 - (b) Discuss the nitrogen washout method for determining lung volume and capacity. (6)
 - (c) Compare different types of spirometers and discuss their advantages and limitations. (6)

5.
 - (a) Explain the generation and measurement of EEG signals, including the electrode placement system. (6)
 - (b) Describe the process of X-ray generation and explain how it is used for conventional radiography. (6)
 - (c) Explain the working principle of a thermal imaging system and types of infrared detectors used. (6)
6.
 - (a) Explain the types of transducers used to measure physiological parameters such as pressure, temperature, and displacement. (6)
 - (b) What is meant by a pacemaker? Differentiate between different types of the cardiac pacemaker. (6)
 - (c) Using a block diagram, explain ECG instrumentation, including signal conditioning and recording. (6)
7.
 - (a) Describe the construction and working of pneumotachometers and discuss their applications. (6)
 - (b) Discuss the design considerations, noise sources, and safety factors in bio-instrumentation systems. (6)
 - (c) Explain in detail the working of a differential bio-amplifier with suitable circuit diagram. (6)