BIOMEDICAL INSTRUMENTATION
(AEIE 3241)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

 (i) Second Heart sound called 'dub', frequency range is
 (a) below 30Hz   (b) 50-70Hz
 (c) above 700Hz   (d) none of these.

 (ii) The technique of listening to sounds produced by various organs and vessels of body is called
 (a) vasoconstriction   (b) auscultation
 (c) murmurs   (d) angina pectoris.

 (iii) Study of minute structure of cell by means of microscope is called
 (a) microscopic anatomy   (b) cytology
 (c) gross anatomy   (d) none of these.

 (iv) In ECG Waveform P peak represents
 (a) arterial systole   (b) arterial diastole
 (c) ventricular systole   (d) ventricular diastole.

 (v) In bio telemetry subcarrier frequency lies in
 (a) AF range   (b) RF range
 (c) VHF range   (d) none of these.

 (vi) Heart beat rate is controlled from
 (a) SA node   (b) AV node
 (c) central nervous system   (d) none of these.

 (vii) In Defibrillators the electrodes used are
 (a) polarizable   (b) nonpolarisable
 (c) none of these   (d) both (a) and (b).

 (viii) Unit of x-ray is
 (a) curie   (b) volt   (c) farad   (d) none of these.

 (ix) Oxygen and nutrients are supplied to heart muscles trough
 (a) pulmonary artery   (b) aorta
 (c) coronary artery   (d) both (a) and (c).

 (x) The pH level of human blood is typically
 (a) 7   (b) 6.8   (c) 7.4   (d) None of these.

Group – B

2. (a) Describe the process of depolarisation and repolarisation.

 (b) Explain the term 'Half Cell Potential'? With required diagram explain the electrical model used for Body surface-Electrode interface.

 (c) Describe the construction of various Microelectrode.

             4 + (1 + 3) + 4 = 12

3. (a) With neat diagram write short notes on Body surface Electrode. Compare between Needle electrode and Microelectrode.

 (b) Describe the electrical model of Electrode Tissue (skin surface) Interface with neat diagram.

             (4 + 2) + 6 = 12

Group – C

4. (a) What is normal pulse rate of adults? With neat diagram describe one automated pulse rate measurement technique.

 (b) What do you mean by pH? What is the normal value of pH of water? How do you measure pH of Blood?

             (1 + 5) + (1 + 1 + 4) = 12

5. (a) Explain the principle of electromagnetic induction for flow measurement. Describe the construction of electromagnetic blood flow sensors. What are the drawbacks of dc flow meter?

 (b) Explain the modes of operation by ultrasonic sensors.

             (2 + 4 + 2) + 4 = 12

Group – D

6. (a) Why do we need artificial Pacemaker? Describe various types of Synchronous Pacemakers and describe their operation with neat block diagram.

 (b) Write short notes on 'Bipolar Limb Lead' of ECG.

             (2 + 7) + 3 = 12

7. (a) Write the purpose of Defibrillator. Discuss about the electrodes. Describe various construction of Defibrillator.

   (b) What are the common Artefacts in ECG.

$$(1 + 2 + 6) + 3 = 12$$

Group – E

8. (a) State the principle of generation of X-Ray.

   (b) What do you mean by Bio telemetry? How it is implemented?

   (c) Discuss about physiological effect of Electrical shock.

$$3 + (1 + 5) + 3 = 12$$

9. Write short Notes on *any three* from the following: $(4 \times 3) = 12$
   (i)   Magnetic Resonance Imaging
   (ii) Electro Encephalography
   (iii) Ultrasonic imaging
   (iv) Electrical Safety measurement in Patient care.