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 any 5 (five) from Group B to E, taking at least one 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) 1ST Heart sound called 'dub', frequency range is
(a) below 30Hz (b) 50-70Hz
(c) 30-45Hz (d) None of these.

(ii) In ECG Waveform QRS complex represents-
(a) atrial depolarisation (b) atrial repolarisation
(c) ventricular depolarization (d) both (b) and (c).

(iii) How many augmented lead(s) are there in 12 lead system of ECG
(a) 3 (b) 6
(c) 4 (d) 1.

(iv) Frequency range of ECG waveform is
(a) 0.05 Hz - 100 Hz (b) 0.05 Hz – 160 Hz
(c) 1 Hz - 160 Hz (d) 10 Hz - 100 Hz.

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

(vi) The range of EEG wave frequency above 13 Hz is named-
(a) Alpha (b) Beta
(c) Gamma (d) Delta.

(vii) Unit of x-ray is
(a) curie (b) Gray
(c) farad (d) None of these.

(viii) Graphical heart sound is recorded in
(a) Ballistocardiogram (b) Phonocardiogram
(c) Eletrcoencephalogram (d) Both (a) and (b).

(ix) Frequency range of abnormal Heart sound like murmur is
(a) 30 - 45 Hz (b) 50 - 70 Hz
(c) above 500 Hz (d) below 30 Hz.

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

Group - B

2. (a) Explain the term 'Half cell potential'. State and explain the equation helps in calculating Half cell potential.

(b) Describe the step by step electrical impulse conduction through the wall of chambers of heart related to ECG graph.

(c) Write short notes on Calomel Electrode.

(2 + 3) + 4 + 3 = 12

3. (a) Explain the process of Repolarisation. Define Absolute refractory period. What is propagation rate? What is the value of propagation rate in nerve cells?

(b) With neat diagram describe the construction and explain the working principle of PO_2 Electrode.

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

Group - C

4. Write short notes on (Any three): **(3 × 4) = 12**
(i) Pulse rate measurement
(ii) Blood pH measurement
(iii) Ultrasonic blood flow measurement
(iv) Strain gauge in biomedical measurement
(v) Systolic diastolic BP and Korotkoff sound.

5. (a) Describe the working principle of LVDT. Explain with neat diagram how LVDT is used in Blood Pressure measurement.

(b) What is Auscultation? How it helps in detection of abnormal and normal heart sound measurement? What are the cause of abnormal heart sound?

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

Group - D

6. What is ECG? Write about ECG amplifier. Draw and describe the 12 lead system of ECG. Point out the common errors of ECG measurement.

(1 + 2 + 6 + 3) = 12

7. What is impedance plethysmography? How blood volume is represented? Describe its drawbacks. Specify the disadvantages in two impedance technique? Describe how it is solved.

(1 + 5 + 2 + 2 + 2) = 12

Group - E

8. (a) Discuss various physiological effect of electrical shock.

(b) Write the significance of MRI? What are the advantages of using MRI over CT?

5 + (5 + 2) = 12

9. (a) What is EMG? How it is quantified?

(b) Explain the generation of X-Ray. How X-Ray is measured? Write short notes on Computed tomography.

(1 + 2) + (3 + 2 + 4) = 12