Total number of printed pages: 02 **D/6/DIE602**

2025

BIOMEDICAL INSTRUMENTATION

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

Part-A: Answer all questions

1. a) When ventricles are polarized, the heart atriums are …….

   b) EMG is the electrical activity of the ……

   c) When the cell is depolarized, ……. potential is generated in it.

   d) Electrodes convert ionic potentials to …….. potentials.

   e) ECG is the electrical activity of the ……

   f) …… number of chest lead configurations are in 12 standard lead ECG measurement system.

   g) ……. measures heart sounds.

   h) In sphygmomanometer, …… to Korotkoff sounds helps to find BP values in human.

   i) SA node is the natural …… of heart.

   j) The atrium chambers are ..... during its systole.

   k) ……. number of unipolar limb lead configurations are in 12 standard lead ECG measurement system.

   l) ……. transducers are used in ultrasound imaging machine.

   m) The QRS complex of ECG represents ..... depolarization.

   n) PPG measures a person's …….volume changes in a limb.

   o) EEG records the electrical activity of ……..

   p) Metal plate electrode is a type of ..... bioelectrode.

   q) .....mm of Hg is the systolic pressure of a healthy person.

   r) Human heart has ..... number of chambers.

   s) The …….. limb electrode is connected to the amplifier positive terminal in the lead III configuration of ECG measurement.

t) The …….. wave of ECG represents atrial depolarization. 1*20=20

2. Draw the following:

a.) Differential amplifier and specify its output voltage.
b.) ECG waveform and label it. 5

Part-B: Answer any three questions

2. a) With a block diagram, explain the biomedical instrumentation system. 7

b) With neat diagrams, explain the limb lead configurations of 12 standard lead in ECG measurement system. 8

c) Specify the role of biopotential electrode in medical field. Explain in detail the types of biopotential electrode. 10

3. With a neat diagram, explain an instrument for the following:
a.) Height Measurement
b.) Heart Sound Measurement
c.) Blood Pressure Measurement
d.) Correcting Fibrillation 4+5+6+10 =25

4. Explain the following:
a.) Cell Action Potential
b.) Pacemaker
c.) Photoplethsymograph
d.) X-ray Machine 3+6+6+10 =25

5. a) Write a note on piezoelectric transducer. 3

b) Design an instrumentation amplifier for a gain of 2000. 10

c) With a neat diagram, explain the working of human heart and also the generation of ECG. 12

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