



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ICE)/SEM-7/IC-703A/2011-12

2011

BIOMEDICAL INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) The membrane of heart is known as

- a) Pleurae
- b) Pericardium
- c) Meninges
- d) Peritoneum.

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ii) The type of Transducer used in Ultrasonography for ultrasonic wave generation is

- a) Capacitive Transducer
- b) Piezoelectric Transducer
- c) Inductive Transducer
- d) Resistive Transducer.

iii) The node which is known as pacemaker of the heart is

- a) AV node
- b) SA node
- c) Anode
- d) Cathode.

iv) Structural and functional unit of human body is

- a) Tissue
- b) Organ
- c) System
- d) Cell.

v) The resting membrane potential is approximately

- a) + 20m V
- b) 0m V
- c) - 20m V
- d) - 90m V.



- vi) EEG stands for
- a) Electroendograph
 - b) Electroenergygram
 - c) Electroencephalography
 - d) Electroencephalogram.
- vii) Amplitude of EEG signal is
- a) 50 μ V
 - b) 50 mV
 - c) 50 V
 - d) 50 kV.
- viii) MRI uses
- a) magnetic field
 - b) chemical field
 - c) radioactive field
 - d) X-ray.
- ix) Normally systolic/diastolic pressure is
- a) 120/80
 - b) 80/120
 - c) 100/100
 - d) 120/100.
- x) The normal heart rate is
- a) 60-100 beats/min
 - b) 120-140 beats/min
 - c) 120 beats/min
 - d) 140 beats/min.

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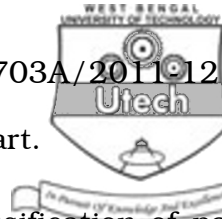
- xi) QRS complex signifies
- a) ventricular repolarisation
 - b) ventricular depolarisation
 - c) atrial repolarisation
 - d) atrial depolarisation.
- xii) The lung volume expired during maximal forced expiration following a maximal inspiration is known as
- a) vital capacity
 - b) functional residual capacity
 - c) total lung capacity
 - d) total ventilatory capacity.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What do you mean by bio-electric potential ? Give a brief note of Na^+ / K^+ pumping. 1 + 4
3. What is bio-electrode ? What are the desirable properties of bio-electrode ? What do you mean by half-cell potential of electrodes ? 1 + 2 + 2



4. Give a brief idea of electrical activity of heart. 5
5. What is natural pacemaker ? Give a classification of pacemaker. 2 + 3
6. a) What do you mean by defibrillation ?
- b) What are the differences between *ac* and *dc* defibrillators ? 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What are the problems encountered in a hydrogen electrode ?
- b) How can we overcome from these problems by using Ag/AgCl electrode ?
- c) How can the partial pressure of O₂ in the blood be measured by pO₂ electrode ? Why is 0.7 volt applied in this electrode ? 2 + 6 + 7
8. a) What is ECG ?
- b) Give description of ECG instrumentation system.
- c) What is the medical significant of the segment of ECG wave ? 2 + 8 + 5

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9. a) Why is X-ray used in imaging ?
b) Write down the limitation of X-ray.
c) Give a brief description of CAT scan system and operation of CAT scan.
d) What are the applications of Ultrasonography ?

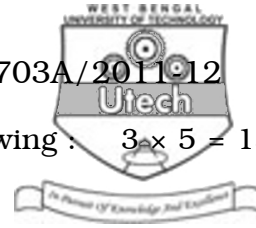
2 + 2 + 8 + 3

10. a) What do you mean by biomedical instrumentation ?
b) Discuss in brief with generalized block diagram of biomedical instrumentation system.
c) What is stimulus ?
d) What is the significance of action potential in medical field ?

2 + 8 + 2 + 3

11. a) What do you mean by EMG ?
b) Give some applications of it.
c) What is EEG ?
d) Describe the operation of EEG system and the difficulties in recording EEG signal.
e) Give some applications of EEG.

2 + 2 + 2 + 7 + 2



12. Write short notes on any *three* of the following : $3 \times 5 = 15$

- a) Blood pressure measurement
- b) Electrical Safety of biomedical instruments
- c) Cardiac Arrhythmia
- d) Pacemaker
- e) MRI system.

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