Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (BME)/SEM-4/BME-403/2010

2010
BIOPHYSICS

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 the following : $10 \times 1 = 10$

   i) Magnetic field effects on human body due to the

      a) presence of carbon element inside the body

      b) presence of K^+ inside the body

      c) presence of H^+ inside the body

      d) presence of water inside the body.

   ii) A radioisotope has a/an

      a) stable atomic nucleus

      b) unstable atomic nucleus

      c) floating atomic nucleus

      d) none of these.

iii) Skin impedance is

a) lower than tissue impedance

b) lower than muscle impedance

c) lower than fluid impedance

d) highest impedance in body.

iv) Cryogenics in medical use refers to treatment at

a) high temperature

b) low temperature

c) ambient temperature

d) ultralow temperature.

v) The frequency range of ECG signal is

a) 150 — 200 Hz b) 100 — 150 Hz

c) 0·05 — 100 Hz d) 50 — 100 kHz.

vi) Alpha block occurs in

a) ECG b) PCG

c) EMG d) EEG.

vii) Approximate value of let go current is

a) 5 mA b) 10 mA

c) 20 mA d) 40 mA.

viii) A radioactive element changes into its isotope by emitting

a) one β particle

b) one β & two α particles

c) one α & two β particles

d) one α particle.

ix) An abnormal *P* wave shows

a) Atrial dysfunction

b) Ventricular dysfunction

c) Ventricular hypertrophy

d) Bundle Branch Block.

x) An application of photochemical reaction is

a) respiration b) dialysis

c) Vitamin D_3 synthesis d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Define ultrasound. How does it differ from electromagnetic waves ? 3 + 2

3. State the frequency bandwidth of microwave. What are the applications of microwaves ? 2 + 3

4. State the applications of ultrasound for therapeutic treatment.

5. What do you understand by Nerve Conduction Velocity study ? What is its significance ? 3 + 2

6. Briefly discuss the skin-electrode interface and draw an equivalent electrical circuit of this system.

7. Briefly describe the procedures for production of ultralow and low temperatures in medical use.

GROUP – C

(Long Answer Type Questions)

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

8. Explain with neat sketch, the multi-path phenomena in reflected ultrasound. Write an equation for intensity of reflection coefficent when sound waves are travelling from medium 1 to medium 2. 8 + 7

9. What is meant by exponential attenuation of *X*-rays & gama rays in an object ? Derive an equation for the attenuation coefficient considering the incident radiation, transmitted radiation and thickness of the object. 6 + 9

10. State the laws of Photochemistry. What are the different processes involved with a photochemical reaction ? Explain with examples. Describe fluorescence & phosphorescence. 3 + 5 + 4 + 3

11. With the help of a block diagram, explain the functioning of a visual colorimeter. What is Flame photometry ? Describe with a neat sketch, the functioning of a flame photometer. 6 + 4 + 5

12. What is 'Let go current' ? Explain in detail what are electrical Macroshock and Microshock. What precautions are to be taken for electrical safety to patient and connected equipment ? 2 + 7 + 6

13. Briefly describe the procedure of 12-leads ECG recording. What is the medical significance (diagnostic importance) of ECG waveform ? 10 + 5