Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(BME)/SEM-4/BME-403/2011

2011

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) According to Beer's law the relationship between the intensity of transmitted light and the rise in the number of light-absorbing particles is a/an

      a) exponential function b) inverse function

      c) linear function d) none of these.

   ii) An example of a biological transducer is

      a) skin b) cochlea

      c) retina d) all of these.

   iii) CMRR stands for

      a) Common Mode Rejection Ratio

      b) Common Mode Reverse Ratio

      c) Common Mode Reference Ratio

      d) Common Mode Right Ratio.

iv) Which of the following is a natural radio isotope ?

a) ^{16}O b) ^{16}N

c) ^{238}U d) None of these.

v) Which of the following is an ultrasonic wave detector ?

a) Cesium iodide b) Thermocouple

c) Piezoelectric crystal d) None of these.

vi) Phonocardiography technique is used to

a) record the electrical activity of heart

b) record the respiratory function

c) record the heart sound

d) none of these.

vii) Fluorescence occurs when

a) emitted light has longer wavelength than absorbed light

b) emitted light has equal wavelength of absorbed light

c) emitted light has shorter wavelength than absorbed light

d) emitted light has complete absorption.

viii) Indian standard for safety codes for electromedical equipment has been issued by

a) IEC b) ISO

c) BIS d) USP.

ix) In case of atrial flutter

a) interval between *T* and *P* waves completely disappears

b) interval between *P* and *Q* waves completely disappears

c) interval between *S* and *T* waves completely disappears

d) none of these.

x) Hypothermia is a combination in which the body temperature is at

a) below normal temperature

b) above normal temperature

c) normal temperature

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. If sound passes from material 1 to material 2, write the equation for the reflection coefficient and explain.

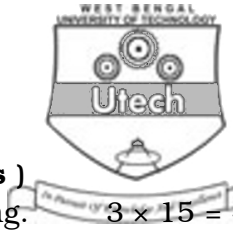
3. Briefly explain Compton effect or scattering with a simple sketch.

4. What are the physiological effects that can occur when a living organism suffers an electrical shock.

5. What are the main properties of ultrasound ? What are the specifications of medical (diagnostics) ultrasound ? 4 + 1

6. Write short notes on "application of biometric in modern technology".

7. What are the main electrolytes present in biological fluid ? Briefly explain a procedure for the determination of conduction of biological fluid. 1 + 4



GROUP – C
(Long Answer Type Questions)

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

8. Define ECG. With the help of Vector cardiography explain the flow of electrical impulse within the heart. Draw and describe a typical ECG wave. 2 + 6 + 7

9. Derive the equation for Gibbs-Donnan Membrane equilibrium. What are the biological applications of Donnan Membrane Equilibrium. What do you understand by Nernst Potential ? What is its significance ? 5 + 5 + 3 + 2

10. Define radioactivity with the help of law of radioactivity decay. How can you detect and measure the intensity of radioactivity ? What is electromagnetic radiation ? What is the photoelectric process and its significance in radiology ? 5 + 5 + 1 + 4

11. What is the electrical activity of human brain ? Briefly discuss about the recording procedure of EEG signals. Give a brief outline of medical significance of EEG waveforms. What is electroretinography ? 2 + 8 + 3 + 2

12. Explain the characteristics of electromagnetic waves. How does it differ from ultrasound waves ? Explain the interaction of (a) microwave (b) ultraviolet and (c) *X*-rays with matter. 5 + 2 + 8

13. Describe the technique for determination of EMF of a single biological cell. What do you mean by impedance of biological system ? Explain any two methods used to measure the impedance of the thoracic cavity. 6 + 2 + 7