Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(BME)/SEM-4/BME-402/2010

2010
BIOMECHANICS

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) The human C.G of a given posture can be measured by

   a) Segmental analysis b) Q.R. method

   c) C.P. method d) None of these.

   ii) Ligament connects

   a) Bone to Bone b) Bone to Muscle

   c) Muscle to Muscle d) None of these.

   iii) In the model based analysis of human bone the elastic property is represented by

   a) Spring

   b) Dashpot

   c) Combination of Spring & Dashpot

   d) None of these

   iv) The CGS unit of viscosity is

   a) poise b) pas

   c) centipoise d) none of these.

v) The freezing point of human blood is

a) – 0·55° C b) 5·5° C

c) 4° C d) 1° C

vi) Which one of the following is under the property of human cortical bone ?

a) Piezoelectric b) Thermo-electric

c) Thermo-resistive d) None of these.

vii) To measure the foot pressure we need

a) Load cell b) Thermometer

c) Viscometer d) None of these.

viii) The first mechanical heart valve is

a) Caged ball

b) Tilling disc

c) Bileaflet valve

d) Pulsed valve.

ix) The outermost layer of teeth is called

a) Dentin b) Enamel

c) Alveolar d) Base gum.

x) Fibroin is a bio-material of

a) natural polymer

b) a protein

c) biopolymer

d) polysaccharide.

GROUP – B

(Short Answer Type Questions)

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

2. How can you measure the C.G of human body of a given posture ?

3. Write the names of different heart valves present in human body with their locations and functions.

4. a) What are the different types of fractures occurring in bone ?
   b) Explain the different modes of fracture fixation. 2 + 3
5. a) Distinguish between tendon and ligament.
   b) Briefly explain the characteristic features of a typical synovial joint. 2 + 3
6. What basic considerations and assumptions should you prefer to solve the problems related to Bio-mechanics ?
7. Shortly discuss the different types of flow of fluid.

GROUP – C

(Long Answer Type Questions)

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

8. a) What would be the shortening (δ) of titanium in a prosthetic valve due to a force exerted by the flux of the blood ? Assume that the force of the blood = 0·003 lb exerted axially to the titanium round bar of diameter = 1·5 inch and length = 0·50 inch. ($E_{Ti} = 16800 \times 10^3$ Psi). 5
   b) Briefly discuss about the piezoelectric properties of human bone. 5
   c) What do you mean by heart valve prosthesis ? 5
9. a) A capillary tube of diameter 2 mm and length 100 mm is used for measuring viscosity of blood. The difference of pressure between the two ends of the tube is 0·6867 N/cm^2 and the viscosity of blood is 0·05 poise. Find the rate of flow of liquid through tube. 5
   b) Briefly discuss the structure and properties of teeth. 5
   c) Define viscosity. Write the different types of viscometer commonly used for measuring viscosity. 2 + 3

10. a) Define the terms 'anisotropy' and 'visco-elasticity' with respect to bone. 8

    b) Elbow joint consists of three joints explain it. 4

    c) What are the movements possible in the shoulder joint ? 3

11. a) Briefly explain the force plate analysis of human locomotion. 5

    b) Writ a short note on hip prosthesis. 5

    c) Sketch a long born with longitudinal section. 5

12. a) Write the rheological properties of blood. 5

    b) Derive Poiseulli's equation for a flowing fluid by dimensional analysis. 7

    c) Distinguish between Newtonian fluid and non-Newtonian fluid. 3

13. Write short notes on any *three* of the following : 3 × 5

    a) Mechanics of Hip Joint

    b) Fracture fixators

    c) Tooth and its properties

    d) Goniometry

    e) Human gait cycle.