



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH(BME-OLD)/SEM-4/BME-402/2012**

**2012**

**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 × 1 = 10

- i) In the Strees-Strain analysis curve of Brittle type of biomaterials has more
  - a) plastic region
  - b) elastic region
  - c) no plastic region
  - d) no elastic region.
- ii) The most freely movable joint is
  - a) Shoulder joint
  - b) Hip joint
  - c) Elbow joint
  - d) None of these.
- iii) In mechanics 'Creep' is the term associated with
  - a) deformation
  - b) creation
  - c) relaxation
  - d) none of these.



- iv) Rod cell is a
- a) touch receptor
  - b) vision receptor
  - c) pressure receptor
  - d) none of these.
- v) The blood protein which is important for blood velocity is
- a) Albumin
  - b) Globulin
  - c) Myosin
  - d) None of these.
- vi) The proper Visco-elastic model of the bone can be represented by
- a) Kelvin-Vioght model
  - b) Maxwell model
  - c) Standard solid model
  - d) None of these.
- vii) Human Elbow Joint is under the group of
- a) Synarthrosis
  - b) Amphiarthrosis
  - c) Diarthrosis
  - d) None of these.
- viii) The moment of inertia of human limb can be measured by
- a) quick release method
  - b) compound pendulum method
  - c) both (a) and (b)
  - d) none of these.
- ix) The Bio-mechanical model of Human Bone is represented
- a) only by Spring
  - b) only by Dashpot
  - c) combination of Spring & Dashpot
  - d) no Spring or Dashpot.
- x) Ligament connects
- a) Bone to Bone
  - b) Bone to Muscle
  - c) Muscle to Muscle
  - d) None of these.



**GROUP - B**

**( Short Answer Type Questions )**

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

2. Classify the different types of human skeletal joints with examples.
3. Define the terms 'Anisotropy' and 'Visco-elasticity' with respect to bone.
4. Briefly discuss the Rheological properties of blood.
5. Explain the stress-strain diagram of a soft tissue under tensile testing.
6. Describe the force plate analysis method for Gait study.
7. Define cartilage, tendon and ligament. Distinguish between tendon and ligament.

**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. 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  $0.6867 \text{ N/cm}^2$  and the viscosity of blood is 0.05 poise. Find the rate of flow of liquid through tube. 4
- b) Write the names of different types of mechanical heart valves with sketch and their advantages and disadvantages. 6
- c) What are the problems occurred in natural heart valves? 2
- d) What is the test performed before implanting an artificial heart valve? 3



9. a) How you can determine the moment of inertia of human limb by Compound Pendulum methods ? 6  
b) What are the different types of fractures that can occur in human bone ? Also write the names of different fracture fixators and explain in brief. 5 + 4
10. a) Name the various types of septum and orifice present inside our heart. 2  
b) Explain the blood flow through the heart and blood supply to the myocardium. 8  
c) What is cardiac cycle ? 2  
d) Classify different types of cartilage according to their structure and position. 3
11. a) With schematic diagram write the characteristic features of sinovial joints. 6  
b) Briefly discuss about the piezoelectric properties of Human Bone. 6  
c) What do you mean by autograft for heart valve prosthesis ? 3
12. a) What type of tissue is bone ? Briefly explain the structure of bone. 1 + 4  
b) What are called as soft tissue ? Give some of the examples of soft tissue which are commonly found in our body. 1 + 2  
c) How could you find out the C.G. of human body of a given posture by Segmental Analysis ? 4  
d) Elbow joint consists of three joints. Explain it. 3
13. Write short notes on any *three* of the following : 3 × 5  
a) Mechanics of knee joint  
b) Dynamics of hip  
c) Structure of tooth with mechanical properties  
d) Human gait cycle  
e) Electrical properties of bone.