



Name :
Roll No. :
Invigilator's Signature :

CS / B. TECH (BME) / SEM-4 / BME-402 / 2011

2011

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) Scapula is an example of

- a) Short bone b) Flat bone
c) Irregular bone d) Long bone.

ii) Hyaline cartilage presents in

- a) Diarthrodial joints b) Amphiarthrodial joints
c) Synarthrodial joints d) none of these.



vii) The hardest material of the human body is

- a) Enamel of the teeth
- b) Femur bone
- c) Skull
- d) none of these.

viii) Walking velocity is equal to

- a) cadence \times step length
- b) cadence / step length
- c) cadence + step length
- d) none of these.

ix) Goniometer is used to measure the joint

- a) Diameter
- b) Length
- c) Angle
- d) none of these.

x) The viscoelastic model of bone is represented by

- a) Spring
- b) Dashpot
- c) Combination of spring and dashpot
- d) none of these.



GROUP – B

(Short Answer Type Questions)

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

2. Explain the stress-strain diagram of collagen rich tissue.
3. Classify different types of cartilage according to the structure, position and function.
4. How do you measure the moment of inertia of human limb quick release method ?
5. Bone is a viscoelastic & composite material — Explain it.
6. What do you mean by Bio-mechanics ? Why is this so important in medical field ?
7. Write the different heart valves present in human body and their location and function.

GROUP – C

(Long Answer Type Questions)

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

8. Classify different types of synovial joint with example. Explain the characteristics feature of synovial joint. Why is hip joint stable compare to shoulder joint ? $6 + 6 + 3$



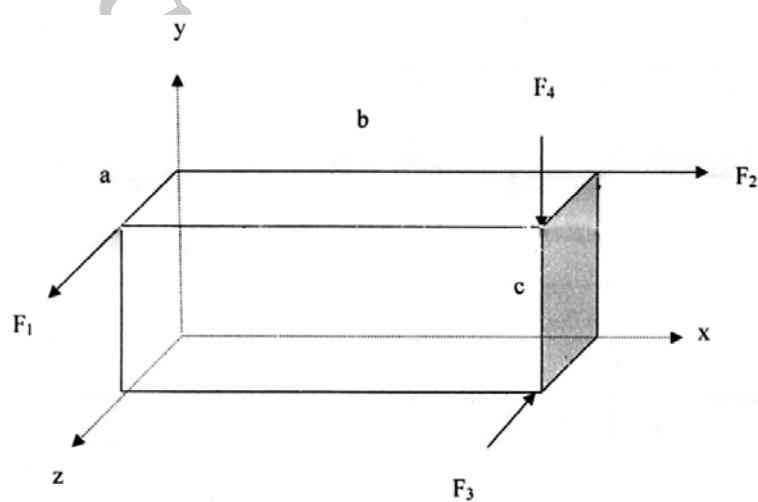
9. What do you mean by viscosity ? Derive an expression for a flowing fluid through a narrow tube. Three capillaries of same length but internal radii $3r$, $4r$ are connected in series and a liquid flow through them is in streamline condition. If the pressure difference across the 3rd capillary is $8 \cdot 1$, find the pressure difference across the 1st capillary. $2 + 8 + 5$

10. What are the problems occurred in natural heart valves ? Briefly explain about the different types of artificial heart valves with their advantages and disadvantages. What are the tests should be performed before implanting an artificial heart valve ? Write down the name of the factors that affect blood viscosity. $2 + 6 + 3 + 4$

11. Explain the viscoelastic behaviour of bone with model. Describe the human gait cycle. $9 + 6$



12. a) In the given figure, F_1 , F_2 , F_3 and F_4 are the forces acting at different points of a cuboid and their values are 5, 10, 15 and 20 newton's respectively. The dimension of the cuboid are $a = 3$ cm, $b = 5$ cm and $c = 4$ cm. Find out the vectorial form of the resultant moment and its magnitude.



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- b) By dimension analysis establish the Poiseuille's equation. 3
- c) What is Goniometer? Why is it used in Biomedical and Clinical Engineering? Write the name of different Goniometers. 1 + 2 + 3



13. Write short notes on any *three* :

3 × 5

- a) Force plate analysis of human locomotion
- b) Plasma skimming and cell free layer
- c) Bone fracture
- d) Mechanics of shoulder joint
- e) Pedobarograph.

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