BIOMECHANICS (SEMESTER - 4)

CS/B.Tech (BME)/SEM-4/BME-402/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.Tech (BME)/SEM-4/BME-402/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

BIOMECHANICS (SEMESTER - 4)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

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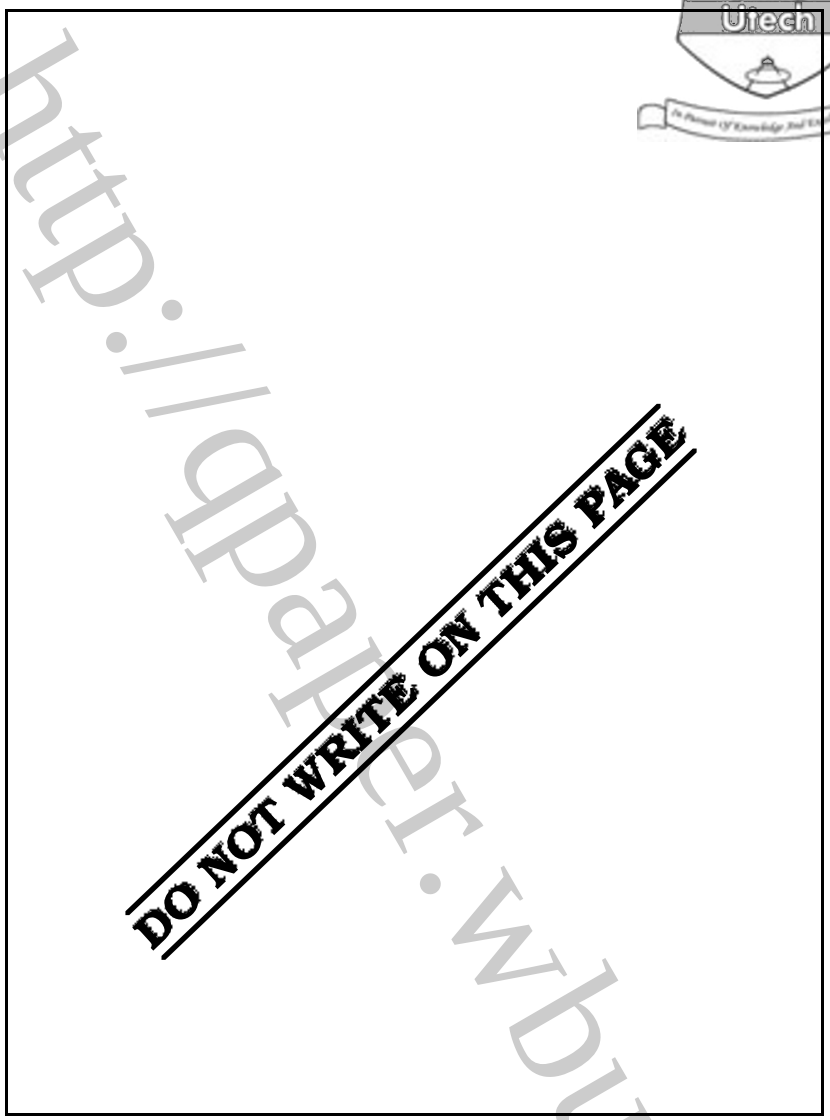
Head-Examiner/Co-Ordinator/Scrutineer



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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

i) Tendon connects

a) Bone to Bone b) Bone to Muscle

c) Muscle to Muscle d) None of these. ☐

ii) In the Stress-Strain analysis curve of Brittle type of biomaterials has more

a) Plastic region b) Elastic region

c) No Plastic region d) No Elastic region. ☐

iii) The hardest material of the human body is

a) enamel of the teeth b) femur bone

c) skull 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-Voight 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) Human Gait study mainly consists of

a) two phases b) three phases

c) four phases d) five phases. ☐

ix) Goniometer is used to measure the joint

a) angle b) length

c) diameter d) none of these. ☐

x) The moment of inertia of human limb can be measured by

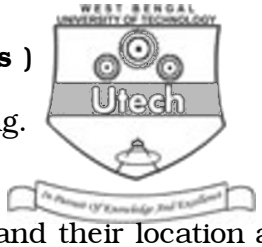
a) quick release method b) compound pendulum method

c) both (a) & (b) d) none of these. ☐

GROUP – B

(Short Answer Type Questions)

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



2. Write the different heart valves present in human body and their location and function.

3. Briefly discuss the Rheological properties of blood. 5

4. How you can determine the moment of inertia of human limb by Quick Release Method ? 5

5. Briefly discuss about the piezoelectric properties of bone. 5

6. Describe the force plate analysis method for Gait study. 5

7. Classify different types of cartilage according to their structure and position. Write down two important functions of cartilage. 3 + 2

GROUP – C

(Long Answer Type Questions)

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

8. a) With schematic diagram write the characteristic feature of sinovial joints.

   b) Classify the human skeletal joints with example.

   c) What do you mean by autograft for heart valve prosthesis ? 6 + 6 + 3

9. a) Fig. 1 represents the viscoelastic model (Standard Solid) of human bone. From basic consideration show that the material function relating the stress (σ), strain (ε) and their rates for this model is

$$E_1 E_2 \varepsilon + E_1 \eta \left(d\varepsilon / dt \right) = \left(E_1 E_2 \right) \sigma + \eta \left(d\sigma / dt \right)$$

Dia.

Fig : 1

All symbols carry their usual meaning.

b) What are the different types of fractures that can occur in human bone ? Also write the name of different fracture fixators. 6 + (5 + 4)

10. a) What is meant by viscosity ?

b) Derive an expression for a flowing fluid in a narrow tube.

c) Three capillaries of same length and internal radii $3r$, $4r$, $5r$ are connected in series and a liquid flows in them in streamline condition. If the pressure difference across the third capillary is 8·1 mm, find the pressure difference across the first capillary. 2 + 8 + 5

11. a) In Fig. 2 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 newtons respectively. The diimension of the cuboid are a = 3cm, b = 5cm and c = 4cm. Find out the vectorial form of the resultant moment and its magnitude.

Dia.

b) By dimension analysis establish the Poiseulli's equation.

c) What is Goniometer ? Why is it used in Biomedical and Clinical Engineering ? Write the names of different Goniometer. 6 + 3 + (1 + 2 + 3)

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

a) Mechanics of Shoulder joint

b) Mechanics of Elbow joint

c) Pedobarograph

d) Electrical properties of bone

e) Structure of teeth.

END