

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - VI EXAMINATION - WINTER 2025

Subject Code: 3160308

Date: 21-11-2025

Subject Name: Biomechanics

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

	Marks
Q.1 (a) Define: (i) Work (ii) Power (iii) Statics	03
(b) Explain briefly that how the lever system differs from pulley system giving an appropriate example.	04
(c) Explain in detail the calculation of resultant force(s) in the case where multiple forces are acting on same point.	07
Q.2 (a) Enlist various types of human joints.	03
(b) Explain various factors need to be considered before performing the mechanical analysis of any human joint.	04
(c) Define Force. Enlist and explain all the forces acting on human body.	07
OR	
(c) Discuss in detail anatomical and mechanical similarity between Hip Joint and Shoulder joint.	07
Q.3 (a) Explain briefly the structure of bone with neat diagram.	03
(b) Explain briefly the need of understanding the material and mechanical properties of bone.	04
(c) Define viscoelastic material and explain in detail the maxwell's model for discussing the viscoelastic nature of bone.	07
OR	
(a) Explain material properties of cartilage.	03
(b) Enlist functions of Ligaments and explain its structure.	04
(c) State and explain in detail the purpose of developing the mechanical or any equivalent model of the soft tissue(s) in respect to biomechanics.	07
Q.4 (a) Enlist various types of artificial heart valves.	03
(b) State the basic difference between systemic and coronary circulation and also mention which valves are responsible for systemic circulation.	04
(c) Explain in detail the dynamics study/analysis of prosthetic heart valves.	07

OR

- (a) Explain the difference between laminar flow, turbulent flow and couette flow. **03**
- (b) Write down the following equation with description/notation of each parameters: **04**
(i) Bernoulli equation (ii) Hagen-poiseuille equation
- (c) Explain in detail the rheological properties of blood. **07**
- Q.5** (a) Discuss and compare the loading impact on hip joint in (i) Two legged stance (ii) Single legged stance. **03**
- (b) Explain briefly how the height of back support impacts the sitting posture. **04**
- (c) Explain in detail any one approach used for analysis of gait cycle and also mention its application. **07**

OR

- (a) Enlist various biomechanical factors that affects the quality of sleep. **03**
- (b) Enumerate the various steps involved in manufacturing of an implant. **04**
- (c) Discuss in details that how characteristics and other properties of biomaterials plays a critical role in biomechanical aspect of an implant. **07**
