

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3160308****Date:11-12-2023****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.

- Q.1** (a) Define following term: **03**
(i) Moment of Inertia (ii) Statics (iii) Dynamics
- (b) Explain briefly various types of mechanical levers with diagram. **04**
- (c) Explain in detail the calculation of resultant force when multiple forces are acting/origination on/from same point with neat diagram and necessary equation. **07**
- Q.2** (a) Define Free body diagram (FBD) and enlist purpose of developing FBD in biomechanics. **03**
- (b) Enlist the necessary assumption to be made before performing biomechanical analysis of any Human Joint. **04**
- (c) Define Force. Discuss in detail various forces acting on Human joint. **07**
- OR**
- (c) Explain in detail classification of Human Joint with neat diagram. **07**
- Q.3** (a) Enlist the function of Muscles and Tendons. **03**
- (b) Explain briefly Kelvin Voight Model. **04**
- (c) Explain in detail the mechanical properties of Bones. **07**
- OR**
- Q.3** (a) Write a note on structure and function of Ligaments. **03**
- (b) Explain Hill's muscle model. **04**
- (c) Explain in detail the modeling of any one soft tissue and justify the need of developing the model. **07**
- Q.4** (a) Explain systemic circulation of Cardiovascular system. **03**
- (b) Discuss briefly the Couette flow with neat diagram. **04**
- (c) Explain in detail Rheological properties of Blood. **07**
- OR**
- Q.4** (a) Enlist various intrinsic properties of fluid. **03**
- (b) State the difference between Laminar Flow & Turbulent flow. **04**
- (c) Discuss various types of artificial heart valves and comments on its durability considering valve mechanics. **07**
- Q.5** (a) Enlist various steps involved in manufacturing process of implant. **03**
- (b) Explain how characteristics of different material play a critical role in overall stability of Implant considering biomechanical aspect. **04**
- (c) Define Gait. Explain in detail importance of performing biomechanical analysis of Gait giving suitable examples. **07**
- OR**
- Q.5** (a) Discuss the process of fixation of implants. **03**
- (b) Compare and comment on Biomechanical load acting on Pelvic Girdle/Pelvic region during One leg stance and Two leg stance. **04**
- (c) Explain in detail various biomechanical aspects need to be considered prior to design of implant. **07**
