

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3160413

Date: 26/05/2026

Subject Name: Proteins and enzymes

Time: 10:30 AM TO 01:00 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) Mention two roles of entropy in enzyme catalysis. **03**
 - (b) Discuss the 'lock and key' and 'induced fit' models of enzyme-substrate interaction. **04**
 - (c) Give enzyme classification details-mentioning all classes, their function, along with example of each **07**

- Q.2**
- (a) Explain the turnover number in enzymatic reactions. **03**
 - (b) Explain the use of SDS-PAGE in protein characterization. **04**
 - (c) Describe various types of enzyme inhibition and their kinetic models with relevant graphs **07**

OR

- Q.2**
- (c) Explain enzyme kinetics with reference to multi-substrate reactions and discuss methods of estimating Michaelis-Menten parameters. **07**

- Q.3**
- (a) Define allosteric regulation with a suitable example **03**
 - (b) Differentiate between secondary and tertiary structures of proteins with example. **04**
 - (c) Discuss in detail the different physical and chemical techniques for enzyme immobilization, their advantages, and disadvantages **07**

OR

- Q.3**
- (a) What is meant by modular structure in proteins? **03**
 - (b) What are the factors affecting the rate of enzyme-catalyzed reactions? **04**
 - (c) Discuss methods for the determination of protein structure and implications of protein folding patterns. **07**

- Q.4**
- (a) What is the Ramachandran plot? State its significance in protein structure prediction **03**
 - (b) How are enzymes used in analytical or diagnostic laboratories? **04**
 - (c) Explain the different levels of protein structure with examples of protein folding and evolution **07**

OR

- Q.4**
- (a) What is post-translational modification? Mention any two types **03**
 - (b) Discuss the role of cofactors and coenzymes in enzyme catalysis. Provide two examples of metalloenzymes and explain their biochemical significance **04**
 - (c) Write an essay on protein engineering: principles, significance, and disease relevance **07**

- Q.5** (a) State the function of chaperonins in protein folding **03**
- (b) Describe the Lineweaver-Burk plot and explain how it is used to determine kinetic parameters K_m and V_{max} in enzyme kinetics **04**
- (c) Discuss the structure and molecular mechanism of the GroEL-GroES chaperone system in protein folding. Highlight how GroEL and GroES collaborate to assist folding of misfolded polypeptides, the role of ATP in this process, and the biological significance of this chaperonin complex in cellular protein quality control. Illustrate your answer with diagrams where appropriate. **07**
- OR
- Q.5** (a) How do protein domains differ from protein motifs? Illustrate with examples. **03**
- (b) Explain the principles of affinity chromatography for enzyme purification. What makes this method selective and effective for separating enzymes from crude extracts? **04**
- (c) Differentiate the thermodynamics and kinetics of protein folding, with chevron plots and folding funnels. **07**
