

Enrollment No./Seat No.:

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

Subject Code: 3140410

Date: 20-11-2025

Subject Name: Immunology

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) Differentiate between Innate and Adaptive immunity.	03
(b) What are Primary and Secondary Lymphoid Organs? Give two examples of each and state their primary function.	04
(c) Explain the process of Clonal Selection and Expansion as it relates to a T-cell or B-cell encounter with an antigen. Why is this process fundamental to adaptive immunity?	07
Q.2 (a) Briefly define the two main categories of Physical Barriers (e.g., skin, mucous) and Chemical Barriers (e.g., pH, enzymes) involved in innate defense.	03
(b) Explain the concept of Immunological Memory. Differentiate between the primary and secondary immune response kinetics.	04
(c) Discuss the process of Affinity Maturation and Class Switching (Isotype Switching) that occurs in B-cells following activation.	07
OR	
(c) What is Transplantation Immunology? Discuss the concept of Immune Tolerance in this context.	07
Q.3 (a) Define Haptens and Adjuvants with suitable examples.	03
(b) Explain the Organization and Expression of the Immunoglobulin (Ig) Gene, focusing on the concept of V-D-J recombination.	04
(c) Describe the Structure and Functions of the five different classes of antibodies (Immunoglobulins). Include a note on their distribution and involvement in different immune processes.	07
OR	
(a) Explain the concept of Cross-Reactivity in antigen-antibody interactions.	03
(b) Define Epitopes and Paratopes. Differentiate between T-cell Epitopes and B-cell Epitopes.	04
(c) What are Antigens? Discuss the various factors affecting the immunogenicity of a molecule in detail.	07

- Q.4 (a)** Briefly explain the role of Cytokines in the regulation of the immune response (e.g., differentiation, proliferation). **03**
- (b)** Differentiate between the Exogenous and Endogenous pathways of antigen processing and presentation. **04**
- (c)** Discuss the Structure and Function of MHC molecules (Major Histocompatibility Complex). Focus on Class I and Class II molecules. **07**

OR

- (a)** List the components of the Membrane Attack Complex (MAC) and briefly state its mechanism of action and function. **03**
- (b)** Explain the activation mechanism of the Alternative Pathway of the Complement system. **04**
- (c)** Describe the Complement System, detailing its components and the different pathways of Complement activation (Classical, Lectin, and Alternative). **07**

- Q.5 (a)** State the principle of Agglutination in serological diagnosis. **03**
- (b)** Explain the principle and procedure of Western Blotting for detecting specific proteins. **04**
- (c)** Describe Hybridoma Technology for the production of Monoclonal Antibodies (MAbs). Highlight the steps of cell fusion and selective growth. **07**

OR

- (a)** Differentiate between Active and Passive immunization. **03**
- (b)** Discuss Autoimmunity and its underlying mechanisms (e.g., molecular mimicry, breakdown of T-cell tolerance). **04**
- (c)** Explain the concept of Vaccines. Describe the preparation and advantages of DNA Vaccines and Recombinant Vector Vaccines as advancements in vaccine technology. **07**
