

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2024****Subject Code:3140410****Date:26-11-2024****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

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| Q.1 | (a) Describe the main characteristics of adaptive immunity. | 03 |
| | (b) Discuss the characteristics of T and B cell epitopes. How do these epitopes contribute to the specificity of immune responses? | 04 |
| | (c) Explain the process of B cell maturation, activation and differentiation with neat diagram. | 07 |
| Q.2 | | |
| | (a) Define: Haptens and adjuvants | 03 |
| | (b) Explain how the ABO blood group antigens can affect blood transfusion outcomes. How does the immune system recognize incompatible blood types? | 04 |
| | (c) Explain the process of antibody-mediated immune response. How does the structure and function of the different classes of antibodies contribute to their specific roles in defending the body against pathogens? | 07 |
| OR | | |
| | (c) Discuss how the characteristics of antigens, such as molecular size and chemical nature, affect their ability to elicit an immune response. Provide examples of endogenous and exogenous antigens and their role in immunity. | 07 |
| Q.3 | | |
| | (a) Define hybridoma technology and explain its role in the production of monoclonal antibodies. | 03 |
| | (b) What is immune tolerance, and how does it help prevent autoimmunity? | 04 |
| | (c) Explain the complement system in detail. Describe the components of the complement system, the steps involved in complement activation, and the different pathways of activation with neat diagram. | 07 |
| OR | | |
| Q.3 | (a) What is the principle of the Western blot technique, and what is it commonly used for? | 03 |
| | (b) Discuss the structure, function, and applications of cytokines in regulating the immune system. | 04 |
| | (c) Explain the structure and function of MHC Class I and Class II molecules in the immune system. Discuss their role in the presentation of exogenous and endogenous antigens to T cells. How do MHC molecules influence the specificity of the immune response? | 07 |
| Q.4 | | |
| | (a) What is the meaning of hypersensitivity, and how does it relate to allergies? | 03 |
| | (b) Discuss the principle of Radioimmunoassay (RIA) and its application in detecting low concentrations of antigens. | 04 |
| | (c) Discuss the principle of Fluorescence-Activated Cell Sorting (FACS) and its applications in immunology. How does FACS enable detailed analysis of cell populations based on surface markers, and what are its clinical uses? | 07 |
| OR | | |
| Q.4 | (a) What are whole organism vaccines, and what are the advantages and disadvantages of using them? | 03 |

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| | (b) | Discuss the significance of SCID mice and SCID human mice in the development of monoclonal antibodies and immune research. | 04 |
| | (c) | Explain the principle, procedure, and different types of ELISA (direct, indirect, sandwich, and competitive), and discuss their applications, advantages, and factors affecting sensitivity and specificity in clinical diagnostics. | 07 |
| Q.5 | (a) | Explain: Synthetic peptide vaccine | 03 |
| | (b) | Differentiate: Active immunization and passive immunization | 04 |
| | (c) | What are the immunological principles behind organ transplantation? Discuss the types of graft rejection (hyperacute, acute, and chronic) and the immunosuppressive therapies used to prevent rejection. | 07 |
| | | OR | |
| Q.5 | (a) | Explain: Multivalent subunit vaccine | 03 |
| | (b) | Discuss these types of vaccines: i) whole organism vaccines, ii) purified macromolecule vaccines, and iii) recombinant vector vaccines, with examples for each. | 04 |
| | (c) | Compare and contrast Type I, Type II, Type III, and Type IV hypersensitivity reactions in terms of their mechanisms, symptoms, and provide examples of diseases associated with each type of hypersensitivity. | 07 |
