7. Write short notes on any *two* of the following : **15**

(a) Biological functions of cytokines in innate and adaptive immunity

(b) ELISPOT assay and its applications in immunological research

(c) Antigen processing and presentation via the endogenous (MHC I) pathway.

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755205

May 2026

M.Sc. (Biotechnology/Microbiology/Zoology)

(Second Semester)

Immunology (BTP-110-V)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. Define the following :

(a) Toll-like receptors and their role in innate immunity **1.5**

(b) Haptens **1.5**

(c) Antibody avidity **1.5**

(d) Allelic exclusion **1.5**

(e) Significance of class switching by B-Cells **1.5**

(f) Superantigens **1.5**

(g) Immunofluorescence microscopy **1.5**

(h) Autoimmunity and Multiple sclerosis **1.5**

(i) Lymphokines **1.5**

(j) Murine monoclonal antibodies and their application. **1.5**

Part B

2. (a) Discuss the role of bone marrow and thymus in lymphocyte development. Describe the significance of spleen, lymph nodes and MALT as secondary lymphoid organs. **10**

(b) Describe the structure of antibodies in detail. **5**

3. (a) Discuss the coordination between B cells, T cells, MHC molecules and complement in adaptive immunity. **5**

(b) Describe T cell development in the thymus. Explain positive and negative selection and central tolerance. **10**

4. Explain the mechanism of complement activation and fixation that includes C3 convertase formation, membrane attack complex (MAC) and regulation. **15**

5. (a) Describe the principle and types of ELISA (direct, indirect, sandwich, competitive). **5**

(b) Define hypersensitivity and classify it according to Gell and Coombs. Explain Type I, II, III and IV hypersensitivity reactions with examples. **10**

6. (a) Define Vaccines. Classify vaccines based on their composition and method of preparation including COVID-19 vaccines. **10**

(b) Describe the principle and steps involved in hybridoma technology for production of monoclonal antibodies. **5**