Printed page:4 Subject Code:BBT0402

Roll No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM:IV - THEORY EXAMINATION (2025-2026)

Subject: Immunology and Immunotechnology

Time: 3 Hours **Max. Marks:100**

General Instructions:

IMP: Verify that you have received question paper with correct course, code, branch etc.

1. *This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION – A 20

1. Attempt all parts:-

(1.1) The primary site of negative selection of T cells is: (CO1,K1) 1

(a) Bone marrow

(b) Cortex of thymus

(c) Medulla of thymus

(d) Spleen

(1.2) Which cytokine is anti-inflammatory? (CO1, K1) 1

(a) TNF-α

(b) IL-1

(c) IL-10

(d) IFN-γ

(1.3) Which Ig activates complement most efficiently? (CO2, K1) 1

(a) IgG

(b) IgM

(c) IgA

(d) IgD

(1.4) Epitope recognized by T cells is: (CO2, K1) 1

(a) Native protein

(b) Linear peptide with MHC

(c) Conformational determinant

(d) Carbohydrate antigen

(1.5) A protein shows a band in Western blot but not in ELISA. The most plausible explanation is: (CO3, K1) 1

(a) ELISA is more sensitive

(b) Epitope is conformational and lost in ELISA

(c) Epitope is linear and exposed only after denaturation

(d) Antibody is non-specific

(1.6) A vaccine induces strong humoral but weak cellular response. Likely type: (CO3, K1) 1

(a) Live attenuated

(b) Inactivated

(c) DNA vaccine

(d) Viral vector

(1.7) Which co-stimulatory interaction is essential for T cell activation? (CO4, K1) 1

(a) CD28–B7

(b) CD40–CD40L

(c) PD1–PDL1

(d) CTLA4–B7

(1.8) A tumor downregulates MHC I expression. Which immune cell is most effective? (CO4, K1) 1

(a) $CD8^+$ T cells

(b) $CD4^+$ T cells

(c) NK cells

(d) B cells

(1.9) In Type II hypersensitivity, tissue damage occurs mainly via (CO5, K1) 1

(a) Immune complexes

(b) Antibody-mediated cytotoxicity

(c) T cell activation

(d) Cytokine storm

(1.10) Protozoan infections often evade immunity by: (CO5, K1) 1

(a) Complement activation

(b) Antigenic variation

(c) Strong MHC binding

(d) Cytokine release

2. Attempt all parts:-

(2.1)	State the significance of MHC restriction in T-cell activation. (CO1, K1)	2
(2.2)	What is somatic hypermutation and where does it occur? (CO2, K1)	2
(2.3)	What is meant by affinity vs avidity in antigen–antibody interactions? (CO3, K1)	2
(2.4)	Differentiate between MHC class I and MHC class II molecules. (CO4, K2)	2
(2.5)	State the role of IgE in Type I hypersensitivity? (CO5, K1)	2

SECTION – B 30

Answer any <u>one</u> of the following-

(3.1)	Explain T-cell maturation in the thymus, including positive and negative selection. (CO1, K2)	6
(3.2)	Compare humoral vs cell-mediated immune responses with suitable examples. (CO1, K2)	6

Answer any <u>one</u> of the following-

(3.3)	Discuss the hybridoma technology for monoclonal antibody production. (CO2, K2)	6
(3.4)	Compare T-cell epitopes and B-cell epitopes in terms of structure, recognition, and processing. (CO2, K2)	6

Answer any <u>one</u> of the following-

(3.5)	Describe the principle and working of flow cytometry, including forward and side scatter. (CO3, K2)	6
(3.6)	Explain cross-reactivity and discuss its implications in diagnostic immunology. (CO3, K2)	6

Answer any <u>one</u> of the following-

(3.7)	With the help of flow diagram discuss antigen-antibody complement pathway in detail. (CO4, K2)	6
(3.8)	Describe the endogenous pathway of antigen processing and presentation. (CO4, K2)	6

Answer any <u>one</u> of the following-

(3.9)	Explain how recombinant antibodies are designed and engineered for therapeutic use. (CO5, K2)	6
(3.10)	Discuss the immunological basis of graft rejection. (CO5, K2)	6

SECTION – C 50

4. Answer any <u>one</u> of the following-

(4.1)	Describe the molecular and cellular events of inflammation, including vascular changes, leukocyte recruitment, and resolution. (CO1, K2)	10

(4.2)	Compare the thymus and bone marrow as primary lymphoid organs, highlighting their roles in lymphocyte maturation, selection processes, and establishment of self-tolerance. (CO1, K2)	10

5. Answer any <u>one</u> of the following-

(5.1)	Evaluate the mechanism of generation of antibody diversity in terms of integrating V(D)J recombination and junctional diversity. (CO2, K4)	10
(5.2)	Illustrate T cell-dependent antigen responses, including molecular mechanisms and immunological outcomes. (CO2, K3)	10

6. Answer any <u>one</u> of the following-

(6.1)	Critically evaluate ELISA vs Western blot vs RIA in terms of sensitivity, quantification, safety, and clinical applicability. (CO3, K4)	10
(6.2)	Write a note on vaccines and their types. (CO3, K2)	10

7. Answer any <u>one</u> of the following-

(7.1)	Explain B cell activation and differentiation into plasma and memory cells with molecular signalling details. (CO4, K2)	10
(7.2)	Evaluate immune checkpoint pathways (PD-1and CTLA-4) and their therapeutic implications. (CO4, K4)	10

8. Answer any <u>one</u> of the following-

(8.1)	Write a note on Type II and Type III hypersensitivity. (CO5, K2)	10
(8.2)	Explain the immunopathogenesis of AIDS, including viral lifecycle, immune depletion, and opportunistic infections. (CO5, K2)	10