JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2025

M.Sc-IV Semester (BT)

COURSE CODE (CREDITS): 20MSWBT431 (2.0.0) MAX. MARKS: 25

COURSE NAME: VACCINES

COURSE INSTRUCTORS: Dr. Tyson MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	Marks
Q1	By what molecular mechanisms does class switch recombination (CSR) enable B cells to produce different antibody isotypes, and how do cytokine signals determine the specific isotype that is generated?	3
Q2	Inflammation is a crucial defense mechanism, yet its dysregulation can lead to chronic diseases. How do innate immune sensors detect danger signals, and what mechanisms ensure that the inflammatory response is appropriately initiated, sustained, and ultimately resolved to prevent tissue damage?"	3
Q3	Through which distinct developmental stages do B cells mature within the bone marrow, and what key markers and molecular events define each stage? Additionally, how does the pre-B cell receptor (pre-BCR) contribute to the survival and expansion of developing B cells?	4
Q4	T cell activation is a highly regulated process that requires interactions between multiple receptors and signaling pathways. Discuss the role of antigen-presenting cells (APCs) in this process and explain how co-stimulatory and cytokine-mediated signals influence T cell differentiation and function.	5
Q5	Compare and contrast the mechanisms of action of aluminum-based adjutants, MF59, and CpG oligodeoxynucleotides in enhancing vaccine-induced immunity. How do their interactions with innate immune receptors differ?	5

Q6	Explain somatic hypermutation (SHM) and discuss its significance in the immune response. Why does SHM specifically target the variable region of immunoglobulin genes while sparing the constant regions? Additionally, compare somatic hypermutation with V (D) J recombination.	5