JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

MTech-I Semester (BT)

Course Code (Credits): 13M11BT114 (3) Max. Marks: 35

Course Name: High Throughput Technologies (13M11BT114)

Course Instructors: Dr. Abhishek Chaudhary Max. Time: 2 Hour

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

(b)Marks are indicated against each question in square brackets.

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

Q.No	Question	Marks
Q-1	Centrifugation is a mechanical process that involves the use of the centrifugal force to separate particles from a solution according to their size, shape, density, medium viscosity and rotor speed Describe the different types of centrifugation techniques used for protein purification. Include differential and rate-zonal centrifugation along with examples.	**5**
Q-2a	Protein purification is one of the most important steps in scientific research to study protein structure and function, and in biotechnology for manufacturing therapeutic drugs like antibodies and insulin, producing vaccines, and developing industrial enzymes. You are given a mixture of proteins with different sizes, charges, and binding affinities. Propose a purification protocol combining chromatography and centrifugation techniques. Justify each step.	**5**
Q-3	Chromatography is an important biophysical technique that enables the separation, identification, and purification of the components of a mixture for qualitative and quantitative analysis. Write a detailed note on chromatographic protein purification. Discuss affinity, ion-exchange, and size-exclusion chromatography with examples	**5**
Q4	Discuss various type of biological database: primary, secondary and specialized data base with example. Also discuss the potential application of high through put technology in lifescience.	**4**
Q5	Protein-protein interactions (PPIs) are physical contacts between two or more proteins that are crucial for nearly all cellular processes, including cell signaling, transport, and protein folding. a. What are the different forces involve in protein-protein interactions? b. Explain the principle and significance of Immunoprecipitation and Immunofluorescence in protein protein interactions	**2+4**
Q6	Mass spectrometry is one of the important techniques to determine the m/z value as well as the molecular structure of the compound. Using the concept of mass spectrometry derived the molecular formula of hydrocarbon cation with an m/z value of 29, 43, and 51. Also explain free radical cation in mass spectrometery.	**4**

Q7	Two-dimensional gel electrophoresis or 2D-PAGE is the primary technique for proteomics work. a. Describe the principle and steps of the first dimension in 2D gel electrophoresis. b. Define isoelectric focusing (IEF) in the context of 2D gel electrophoresis. c. What is the purpose of SDS in SDS-PAGE during 2D gel electrophoresis	**3+2+1**