**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**
**(END SEMESTER EXAMINATION)**

**CLASS: MSC** **SEMESTER : III**
**BRANCH: BIOINFORMATICS AND COMPUTATIONAL BIOLOGY** **SESSION : MO/2025**

**SUBJECT: BI301 PROTEOMICS, METABOLOMICS AND BIOMARKER DESIGN**

**TIME: 3 Hours** **FULL MARKS: 50**

**INSTRUCTIONS:**
**1. The question paper contains 5 questions each of 10 marks and total 50 marks.**
**2. Attempt all questions.**
**3. The missing data, if any, may be assumed suitably.**
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
**5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

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| Q.1(a) | Give a brief note on the physicochemical properties of the proteins. | [5] | 1 | 1 |
| Q.1(b) | Write the principle and working of SDS-PAGE technique, and explain how this technique helps in the characterization of proteins? | [5] | 1 | 2 |
| Q.2(a) | Explain how Fourier-Transform Infrared (FTIR) spectroscopy technique helps in protein structure determination. | [5] | 2 | 3 |
| Q.2(b) | What do you understand by NMR spectroscopy. Give the significance of isotopic labeling in protein nuclear magnetic resonance (NMR). | [5] | 2 | 3 |
| Q.3(a) | Describe methods and applications of protein sequencing. | [5] | 2 | 2 |
| Q.3(b) | What do you understand by peptide mass fingerprinting (PMF). Give different steps of this technique. | [5] | 2 | 2 |
| Q.4(a) | What are primary and secondary metabolic pathways. Compare between KEGG and MetaCyc pathway databases. | [5] | 4 | 2 |
| Q.4(b) | Write a short note on precision medicines. | [5] | 4 | 1 |
| Q.5(a) | Define biomarkers. Outline the key characteristic features that make a biomarker more reliable and efficient. | [5] | 5 | 2 |
| Q.5(b) | Explain omics-based biomarker designs. | [5] | 5 | 2 |

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