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Question Paper Code:R5C04

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Fifth Semester

R21UBT504- PROTEIN ENGINEERING

Biotechnology

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Identify the types of bonds stabilizing the tertiary structure of a protein. CO1 - U
2. Which functional group is involved in phosphorylation during post-translational modification? Give an example amino acid. CO1 - U
3. Highlight the significance of the Greek key motif in beta-sheet structures. CO1 - U
4. Differentiate between up-and-down beta sheets and Greek key motifs using topology diagrams. CO2 - App
5. What is protein denaturation? Name two denaturing agents. CO1 - U
6. List one advantage and one limitation of cryo-EM in protein structure CO1 - U
7. Difference between light chains and heavy chains of IgG. CO3 - App
8. Why is the Fab region of IgG important for antigen recognition? CO3 - App
9. What are the advantages of studying proteins instead of only genes? CO1 - U
10. Why are protein arrays preferred for large-scale protein interaction studies? CO1 - U

PART – B (5 x 16= 80 Marks)

11. (a) Explain the role of electromagnetic radiation across different regions of the spectrum (radio, microwave, IR, UV, visible, X-ray) in the elucidation of protein structure. CO1 - U (16)
Or
(b) Describe how post-translational modifications (PTMs) influence protein structure and function. CO1 - U (16)
12. (a) Compare and contrast alpha helices and beta sheets in terms of CO2 - App (16)

hydrogen bonding, side-chain orientation, and stability.

Or

- (b) Describe peptide mapping. Outline the steps and applications in protein identification. CO2 - App (16)
13. (a) Compare and contrast monomeric proteins and multimeric proteins with examples. CO4 - Ana (16)
- Or
- (b) Analyze the relationship between amino acid composition (primary structure), folding patterns (secondary structure), and overall 3D conformation (tertiary structure) of a protein. Discuss with the help of suitable bioinformatics tools and databases. CO4 - Ana (16)
14. (a) Describe the organization of photosynthetic reaction centers in bacteria and plants. CO1 - U (16)
- Or
- (b) Describe the role of the Trp repressor and Lac repressor as DNA regulatory protein. CO1 - U (16)
15. (a) Analyze the impact of proteomic technologies on personalized medicine and pharmacogenomics. CO5 - Ana (16)
- Or
- (b) Illustrate the role of cross-linking methods in detecting protein interactions. CO5 - Ana (16)