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MANIPAL INSTITUTE OF TECHNOLOGY
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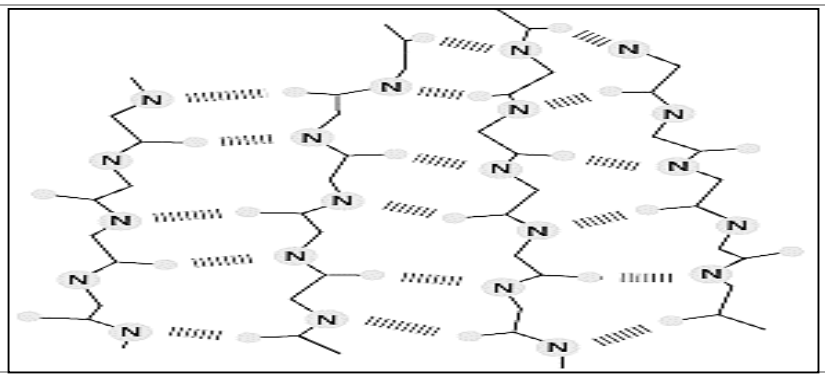
VII SEMESTER B.TECH. (BIOTECHNOLOGY)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: PROTEIN ENGINEERING [BIO 4008]

Time: 3 Hours **(28/11/2017)** MAX. MARKS: 50

Instructions to Candidates:
Answer ALL the questions, choose all that apply, Justify all answers with principle, Missing data may be suitable assumed.

1A.	Explain the types of interactions that spontaneously assemble phospholipid bilayer?	**2**
1B.	It is a common observation that antiparallel strands in a ß sheet are connected by short loops, but that parallel strands are connected by a helices. Why do you think this is?	**3**
1C.	The uniform arrangement of the backbone carbonyl oxygens and amide nitrogens in an α helix gives the helix a net dipole, so that it carries a partial positive charge at the amino end and a partial negative charge at the carboxyl end. Where would you expect the ends of α helices to be located in a protein? Why?	**3**
1D.	Examine the segment of β sheet shown. For each strand of the sheet decide whether it is parallel or antiparallel to each of its neighbors. 	**2**
2A.	Discuss coiled-coil alpha helical structure with example.	**3**
2B.	Explain the conformational changes in protein kinase during cell cycle regulation.	**3**
2C.	Examine the 3 protein monomers (A,B,C). From the arrangement of complementary binding surfaces, decide which monomer would assemble into a ring, which would assemble into a chain, and which would assemble into a sheet. 	**3**
2D.	What approximate number of non-covalent interactions differentiates a folded from a non-folded monomeric protein?	**1**
3A.	Proteins with intrinsic disorder are generally less stable than well-folded globular proteins. Why then is intrinsic disorder in a protein useful for the cell?	**2**
3B.	Discuss the protein structures and its power stroke mechanism in skeletal muscle.	**4**

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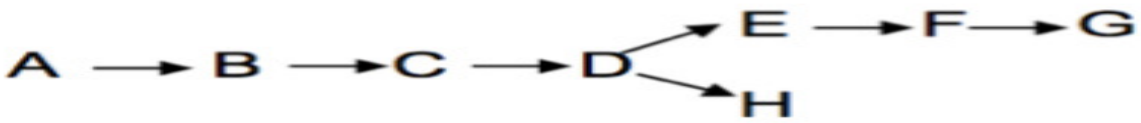
3C.	Explain how plaque and tangles relate to the amyloids that are characteristic of Alzheimer's disease?	**4**
4A.	Why does boiling a protein cause it to harden? Why does it require both a detergent and a reducing agent to dissolve the hard-protein?	**3**
4B.	Tropomyosin, at 93 kd, sediments at 2.6S, whereas the 65-kd protein, hemoglobin, sediments at 4.3S. How is it that the bigger protein sediments more slowly than the smaller one? Explain.	**3**
4C.	Why is determining the structure of a protein important?	**2**
4D.	A new protein found catalyzes the first reaction in the pathway indicated below. You find that when the levels of G are high, the reaction catalyzed by your protein is decreased. What is the most likely reason for this observation? 	**2**
5A.	Saliva is increasingly recognized as an attractive diagnostic fluid. From saliva samples, the presence and absence of various disease signaling salivary biomarkers could be detected. Design a solid-phase assay for the detection of oral cancer.	**4**
5B.	Subtilisin, a protease added in laundry detergent becomes inactivated by bleach. Experimental and structural analysis revealed that this inactivation is due to oxidation of the amino acid methionine at position 22. Design an engineered subtilisin with improved efficiency. Briefly explain the method.	**4**
5C.	Discuss the protein design principles with which you can improve protein stability.	**2**