MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

VII SEMESTER B.TECH. END EXAMINATIONS 2018

SUBJECT: PROTEIN ENGINEERING [PROGRAM ELECTIVE VI] [BIO 4008]

Date of Exam: 01/12/2018 Time of Exam: 2.00 to 5.00 PM Max. Marks: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1a.	A student has extracted a novel protein from the bacteria. He would like to identify the amino acid sequence. Please suggest him a suitable method for the same and also the steps involved.	**4**
1b.	While protein engineering, an α-helix is introduced by adding different amino acids except Glycine and Proline. What is the reason for not choosing these two amino acids in helical regions though they are preferred in the turns?	**3**
1c.	What are super secondary structural elements? Does two proteins having similar super secondary structural elements will have similar functions? Why?	**3**
2a.	Formation of water-insoluble aggregates/polymers is seen in the curd and Alzheimer's disease. Explain the reasons behind these phenomena.	**3**
2b.	What will happen if the protein disulfide isomerase and peptidylprolyl cistrans isomerase in a cell gets mutated and become non-functional? What are heat shock proteins? What is their relation with the chaperones?	**3**
2c.	Why do proteins contain: (i) multiple similar domains (ii) multiple dissimilar domains? Explain with an example each.	**4**
3a.	How the speed of folding is matched with enormous number of conformational search? Explain with respect to Anfinsen's view and Levinthal paradox.	**4**
3b.	Discuss the journey of a protein from its primary to tertiary structure through energy funnel and energy landscape.	**4**
3c.	What are the roles of entropy, enthalpy and water molecules in protein folding?	**2**
4a.	Mr. X is drafting a plan to engineer an enzyme for improved stability and specificity. He would also like to add a novel functional module to this protein. Give your suggestions for the success of this plan.	**3**
4b.	How do you introduce mutations *in vitro*? Discuss the different methods available.	**5**
4c.	A scientist is performing an experiment to express a eukaryotic protein in the bacteria. What suggestions do you give to avoid the formation of inclusion bodies?	**2**

5a.	Though the inactivated virus as a vaccine is more effective than killed virus, the major problem is the reversal of toxicity. Suggest a protein engineering strategy to deal with this problem, with the help of a case study.	**5**
5b.	Discuss the role of protein engineering in food and detergent industry.	**3**
5c.	What are the nano-biotechnology applications of protein engineering?	**2**