

Total number of printed pages – 7 **B. Tech**
PEBT 8405

Eighth Semester Examination – 2008

PROTEIN ENGINEERING

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory
and any **five** from the rest.*

*The figures in the right-hand margin
indicate marks.*

1. Answer the following questions : 2 × 10
- (a) What is the contribution of conformational entropy of a polypeptide chain of 100 amino acids residues to its free energy ?



- (b) Name the four different bond interactions to confer stability to the engineered protein.
- (c) What do you mean by Molecular Chaperons ? What role it plays in protein architecture ?
- (d) What do you mean by 'cotton effect' in Circular Dichroism ?
- (e) How many numbers of primers were used for PCR based site directed mutagenesis to insert a mutation in the DNA ?
- (f) What is the approximate frequency of amide-1 band of peptide linkage in IR spectroscopy and what it infers ?

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- (g) What is anti-idiotopes ? What is its significance in enzyme engineering ?
- (h) How many number of α -helices and β -sheets are present in 'NAD binding domain' ?
- (i) The first three rotational Raman lines of linear tri-atomic molecules are at 4.86, 8.14 and 11.36 cm^{-1} from the exciting Raman line. Estimate the rotational constant and the moment of inertia of the molecule.
- (j) The structure of protein has been determined by X-ray diffraction of a protein crystal. It is found to contain 31% α -helices, 58% β -sheets and 11% random coils.

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From the Circular Dichroism analysis the values are 60% α -helices, 35% β -sheets and 5% random coils. What inference will you draw about the structure ?

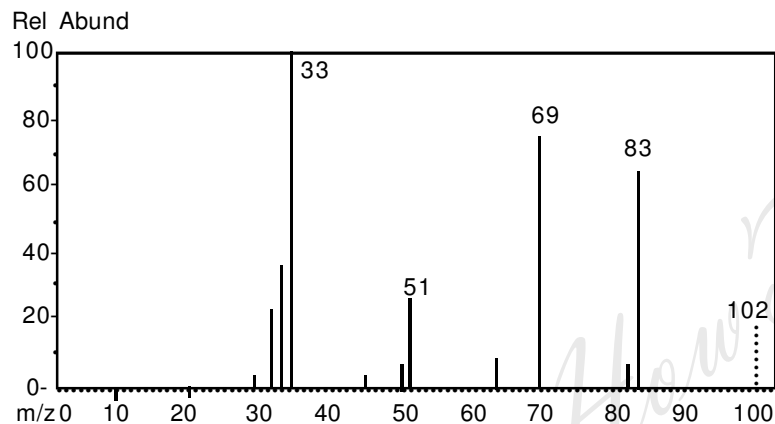
2. What are the protein engineering targets relating with biosensor research and development ? Briefly explain the strategies of genetically fused protein with suitable examples. 4+6
3. What do you mean by site directed Mutagenesis ? Briefly explain the various methods of site directed mutagenesis used for genetic engineering of novel protein. Add a note on the strategies of selection of mutants. 2+5+3
4. (a) Briefly explain the principle, Instrumentation and applications of Mass Spectroscopy for protein analysis. 7

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- (b) The mass spectra of a constitutional isomer is shown below. It became gas at room temperature. The molecular ion is the small peak at $m/z = 102$ amu. Name the isomer, which will provide this spectrum. 3



5. (a) Briefly explain the rational approaches of enzyme engineering for stabilization with reference to protease isolated from *Bacillus subtilis* ? 7

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- (b) Briefly explain the designing of lysozyme with reference to its thermo stability. 3

6. (a) Briefly explain the methods used for the determination of the covalent structure of protein. 6

- (b) What is the role of Edmann's reagent in Amino acid sequencing ? 4

7. Write down short notes on any two of the following : 5×2

- (a) Ramachandran Plot
(b) Protein Engineering through covalent modifications
(c) Characteristic of IR bands of peptide linkage.

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8. What are the various hierarchical level of protein structure ? Briefly explain the various kinds of bonds and interactions at various level of structure. Add a note on thermodynamics of polypeptide chain folding. 4+3+3

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