COMPUTATIONAL BIOLOGY
(BIOT 4221)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Examples of acidic amino acids are
(a) Glutamic acid and Aspartic acid
(b) Glycine and Leucine
(c) Histidine and Lysine
(d) Methionine and Lysine

(ii) The major functions of carbohydrates include
(a) Structural framework
(b) Storage
(c) Both (a) and (b)
(d) None of these

(iii) In a protein, the amino acids are joined by
(a) Peptide bond
(b) Hydrogen bond
(c) Ionic bond
(d) Glycosidic bond

(iv) Which of the following the first database
(a) GenBank
(b) Swissprot
(c) OMIM
(d) DDBJ

(v) Which of the following is a metabolic database
(a) PDB
(b) PIR
(c) KEGG
(d) OMIM

(vi) Motifs that can form α/β horseshoes conformation are rich with which protein residue?
(a) Proline
(b) Arginine
(c) Leucine
(d) Valine

(vii) Where does the Hidden Markov Model is used?
(a) Speech recognition
(b) Understanding of real world
(c) Both Speech recognition & Understanding of real world
(d) None of the mentioned

(viii) What is the source of protein structures in SCOP and CATH?
(a) Uniprot
(b) Protein Data Bank
(c) Ensemble
(d) InterPro

(ix) Which of the following is a search tool of NCBI
(a) SAKURA
(b) SRS
(c) ENTREZ
(d) SEQUIN

(x) What are the issues on which biological networks proves to be superior than AI networks?
(a) Robustness & fault tolerance
(b) Flexibility
(c) Collective computation
(d) all of the mentioned

Fill in the blanks with the correct word

(xi) Number of amino acid residues in a protein of molecular weight 27830 is _____.

(xii) The repeating unit of starch is _____.

(xiii) In a nucleic acid, the nucleotides are joined together with _____linkages.

(xiv) The identification of drugs through the genomic study is called_____

(xv) _____ has desirable properties to become a drug.

Group - B

2. (a) Enumerate the mechanism of DNA transcription. *[(CO2) (Enumerate/HOCQ)]*
(b) Draw the predominant structure of an amino acid at normal physiological condition. Give reasons for your answer. *[(CO1) (Derive/HOCQ)]*

7 + 5 = 12

3. (a) State the functions of carbohydrates. *[(CO1) (Remember/LOCQ)]*
(b) Compare a globular protein with a fibrous protein. *[(CO1) (Compare/IOCQ)]*

6 + 6 = 12

Group - C

4. (a) What do you mean by databases? Name two international databases. [(CO3) (Remember/LOCQ)]
(b) Comment on interaction networks. [(CO3) (Analysis/IOCQ)]
(c) Mention the functions of databases. [(CO3) (Explain/IOCQ)]

(2 + 2) + 4 + 4 = 12

5. (a) Name one Primary protein database. Briefly describe its characteristics (any four). [(CO3) (Remember/LOCQ), (CO3)(Describe/IOCQ)]
(b) Write a comparative study of the following databases : PIR and PDB. [(CO4) (Comment/IOCQ)]

(2 + 4) + 6 = 12

Group - D

6. (a) Define pattern recognition and Mention the pattern recognition process *[(CO3)(Remember /LOCQ)]*
(b) Schematically describe the process of defining the problem in pattern recognition *(CO3)(Understand/LOCQ)]*
(c) Mention the application of pattern recognition. *[(CO3)(Explain/IOCQ)]*

(2 + 3) + 4 + 3= 12

7. (a) Define artificial neural network. State why it is called artificial and how it is related to biological neural network. *[(CO5)(Remember/LOCQ)]*
(b) Comment on the analogy of biological neural network and artificial neural network. *[(CO5)(Comment/IOCQ)]*
(c) Describe the architecture of neural network. *[(CO5)(Describe/HOCQ)]*

(1 + 1 + 2) + 3 + 5 = 12

Group - E

8. (a) What is metabolic engineering? Mention the fundamental requirements for metabolic engineering. *[(CO4)(Remember/LOCQ)]*
(b) Different approaches can be used to study metabolic engineering - Discuss these approaches with examples. *[(CO4)(Remember/LOCQ)]*

(2 + 4) + 6 =12

9. (a) Write the full form of CADD. Evaluate the role of CADD in drug discovery. *[(CO6)(Remember-analysis/IOCQ)]*
(b) Classify the categories of CADD and briefly describe them with suitable example. *[(CO6)(Classify-describe/IOCQ)]*

(2 + 2) + (4 + 4) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	43.75	17.71

Course Outcome (CO):

After the completion of the course students will be able to

1. Acquire basic understanding of structures and functions of different biomolecules.
2. Obtain knowledge about the different metabolic pathways.
3. Explain different biological data and biological databases.
4. Understand classification of databases and how the biological data are stored in those databases.
5. Obtain the knowledge of different algorithms and programming languages to manage biological data.
6. Apply different tools and software for analysis of biological data.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*