Question Paper

Exam Date & Time: 29-Apr-2019 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
FOURTH SEMESTER B.Sc. Applied Sciences in Engg.
END - SEMESTER THEORY EXAMINATION APR-MAY - 2019

FOUNDATIONS OF COMPUTATIONAL BIOLOGY [IBT 243]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1)		What is an open reading frame (ORF)? How many ORFs are possible for a given DNA sequence? Illustrate with an example.	(5)
	A)		
	B)	Discuss the human genome project and its relevance to computational biology.	(5)
	C)	What analysis can you make on a DNA sequence using computer programs.	(5)
	D)	What is a biological database? What is the difference between a primary and a secondary database? Explain with examples.	(5)
2)		What is data mining? What are supervised and unsupervised learning methods?	(5)
	A)		
	B)	Discuss any three supervised learning methods.	(5)
	C)	Discuss the different primary and secondary databases of protein structures.	(5)
	D)	What is a PDB Id? What are the characteristics of a PDD Id?	(5)
3)		Perform **Local alignment** of the given sequences using Dynamic Programming algorithm and calculate the score. Explain in detail the steps involved and scoring. S1: A T A C A T G T C T S2: G T A C G T C G G Match = 8; Mismatch = -5; Gap = -3	(20)
	A)		
4)		What are the steps involved in the BLAST similarity search algorithm?	(5)
	A)		
	B)		(5)

		What are the different BLAST programs? What is the type of query and database/output for each of them?	
	C)	Explain in detail the information obtained from the BLAST output.	(5)
	D)	What is E-value and its significance? What should be the ideal E-value? How do you trust the output from similarity search based on E-value?	(5)
5)		What is a substitution matrix? What is its significance in the sequence alignment? Why only protein sequences use these matrices?	(5)
	A)		
	B)	Discuss in detail about PAM matrices.	(5)
	C)	Discuss in detail about BLOSUM matrices.	(5)
	D)	Which PAM matrices are equivalent to BLOSUM matrices?	(5)
6)		Discuss in detail the various parameters that should be considered for primer design.	(10)
	A)		
	B)	Describe the various supersecondary structures seen in proteins.	(10)
7)		Explain the various protein and RNA secondary structure prediction methods.	(10)
	A)		
	B)	Explain the various protein tertiary structure prediction methods.	(10)
8)		Explain the steps involved in phylogenetic analysis. Discuss the various tree building methods.	(10)
	A)		
	B)	The following are the distinctive features of different organisms. Derive a character matrix and draw the corresponding cladogram that depicts their relationship. (The features that are not mentioned for the organisms should be assumed as absent) Human Body Louse: Three body regions, Flattened body. Beetle: Wings, Three body regions, Complete metamorphosis. Ant: Wings, Three body regions, Social, Complete metamorphosis, Mobile head. Assassin Bug: Wings, Three body regions. Bee: Wings, Three body regions, Social, Complete metamorphosis, Mobile head. Millipede: All the above features are absent.	(10)

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