

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

B.Tech-VI Semester (BI)

COURSE CODE (CREDITS): 18B1WBI631 (3)

MAX. MARKS: 35

COURSE NAME: Advanced Algorithms for Bioinformatics

COURSE INSTRUCTORS: Dr. Tiratha Raj Singh

MAX. TIME: 2 Hours

**Note:** (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q.No	Question	CO	Marks
Q1	Write brute force motif search algorithm and its improvements. How it is different from median string search algorithm? Compare both wrt their complexities. Justify your answer through a data instance for these two algorithms.	CO-3	4
Q2	What are various applications of MSA? Generate MSA for the following 5 sequences using STAR method: S1 = ATTGCCATT, S2 = ATGGCCATT, S3 = ATCCAATTTT, S4 = ATCTTCTT, S5 = ACTGACC. Scoring system is Match =1, Mismatch =0 and Gap Penalty = -1.	CO-5	5
Q3	What is PSSM? Discuss Barton-Sternberg algorithm for MSA. How PSSM is useful for MSA. Explain with an example.	CO-5	4
Q4	Discuss statistical gene prediction methods with an example of real gene sequences data assuming length of gene is ~500 bp and it has at least 3 exons. Write pseudocode for the same.	CO-2,3	4
Q5	Realize search tree options for finding motifs in biological sequences. How the hybrid approach of linked lists and tree search provides improved solutions for this problem? Explain with an example.	CO-3	5
Q6	What is restriction mapping for genomic sequences? Elaborate partial digest problem with available methods and approaches. Solve the PDP for the following multiset of data: L = {1, 2, 2, 3, 3, 4, 5, 6, 7}	CO-4	5
Q7	Discuss the basic characteristics of an algorithm. What are various complexity analyses available for algorithms? Explain each with an example for a special reference towards biological sequence analysis.	CO-1-3	4
Q8	What are randomized algorithms? Explain with an example any 2 random algorithms used for the identification and analysis of motifs in DNA sequences.	CO-4	4