

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- 2023

B.Tech-III Semester (BI)

COURSE CODE (CREDITS): 18B11BI313

MAX. MARKS: 35

COURSE NAME: Biological computation

COURSE INSTRUCTORS: Dr. Shikha Mittal

MAX. TIME: 2 Hours

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

*(b) Marks are indicated against each question in square brackets.*

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

**Q1.** Define the UPGMA algorithm and state and justify its complexity. What is the output of the algorithm given the distance matrix of the species A, B, C, D, and E below? (5 marks) [CO-4]

|   | A   | B  | C  | D  | E |
|---|-----|----|----|----|---|
| A | 0   |    |    |    |   |
| B | 20  | 0  |    |    |   |
| C | 60  | 50 | 0  |    |   |
| D | 100 | 90 | 40 | 0  |   |
| E | 90  | 80 | 50 | 30 | 0 |

**Q2.** Discuss the importance of biological databases in bioinformatics. (3 marks) [CO-2]

**Q3.** What are the common structural motifs in RNA? What base-pairing are used in RNA? (4 marks) [CO-3]

**Q4.** Consider the DNA strings TCGCA and TCCA. Compute the best global alignment of the two strings assuming match score of 1, and mismatch/indel penalty of  $-1$ ? [CO-1] (4 marks)

**Q5.** Differentiate between template modeling and template-free modeling. Explain the steps of comparative modeling in detail (5 marks) [CO-4 & CO-5]

**Q6.** Define root node and clade in an evolutionary tree with the help of a diagram. If we have 4 nodes in a phylogenetic tree, how many rooted and unrooted trees can be constructed from them (4 marks) (CO-4)

**Q7.** Draw a dotplot of the following sequence from the Wheat dwarf virus genome: ttttcgtgagtgcgcggaggctttt against itself. In what respects is it not a perfect palindrome? (4 marks) [CO-2 & CO-3]

**Q8.** Explain the following (6 marks) [CO-1, CO-4 & CO-6]

- (a) Sensitivity and specificity in BLAST
- (b) Different between global and local alignment
- (c) Functions of mRNA, tRNA and rRNA

JUIT TEST-3 EXAMINATION- DEC-2023