

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2024

BTech-VIII Semester [BI]

COURSE CODE(CREDITS): 18B1WB1831 (3)
COURSE NAME: Computational Molecular Evolution

MAX. MARKS: 25

COURSE INSTRUCTOR: Dr. Tiratha Raj Singh

MAX. TIME: 1 Hour 30 Minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Calculator is permitted.

Q.1. Explain how allelic drift is associated with the fitness of the individuals in a population? What are various kind of selection pressures working on the biological sequences? Explain each with an example. If a particular genotype produces only 45 percent viable young, what will be its selection coefficient? (CO-3) [4]

Q.2. What is Kimura's two parameter model of nucleotide evolution? Derive it with all possible conditions of the transitions and transversions. (CO-3) [5]

Q.3. What is codon usage bias (CUB)? Explain any three crucial measures for the same. For a protein encoding gene where 25 codons are there, calculate RSCU and CAI. Assume all the required parameters as per the requirements. (CO-2,3) [4.5]

Q.4 Discuss the concept of multi-gene families through the involvement of pseudo genes. What are the two basic types of pseudo genes? Give an example of a pseudo gene with its evolutionary timelines. (CO-2,3) [3]

Q.5. Realize the significance of mutations in the light of evolution for their role in various crucial human diseases and disorders with an emphasis as:
(i) Non-synonymous SNPs.
(ii) Frame-shift mutations.
(iii) DNA repair mechanisms. (CO-4) [1.5*3=4.5]

Q.6. Realize 'theories of evolution' for the following entities:
(a) Introns (b) Genetic code (CO-2,3) [2*2=4]