JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-VIII Semester (BI)

COURSE CODE (CREDITS): 18B1WBI831 (3) MAX. MARKS: 15

COURSE NAME: Computational Molecular Evolution

COURSE INSTRUCTOR: Dr. Tiratha Raj Singh MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory. Calculator is not permitted.*

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

Q.No	Question	CO	Marks
Q1	What is homoplasy? Mention one evolutionary mechanism responsible for it. Explain convergent evolution in comparison to parallel and divergent evolution.	1	2
Q2	Explain the relationship between gene evolution and protein evolution through the genetic code. Describe known variations of the genetic code across organisms and discuss mechanisms through which evolutionary pressures may alter codon usage and genetic code interpretation.	2	3
Q3	Discuss the evolutionary significance of orthologous and paralogous genes in comparative genomics and phylogenetic analysis. Illustrate how gene duplication and speciation events influence gene function diversification using suitable examples.	1	2
Q4	Construct a conceptual evolutionary timeline describing how major discoveries such as natural selection, molecular genetics, genome sequencing, and comparative genomics have shaped our understanding of evolution. Highlight how different evolutionary theories contributed to modern evolutionary biology.	1	3
Q5	Differentiate between homologous structures, analogous structures, orthologous genes, paralogous genes, and convergent evolution. Provide biological examples demonstrating how evolutionary similarity can arise from both shared ancestry and independent evolutionary events.	1	3
Q6	Two homologous DNA sequences of length 1000 bp differ at 120 positions. Calculate the evolutionary distance (proportion of substitutions). If the substitution rate is 2×10^{-8} substitutions/site/year, estimate the divergence time between the two sequences.	2	2

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