JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-3 EXAMINATION-2024
B. Tech.-V Semester (BT)
COURSE CODE (CREDITS): 18B1WBT532 (3) MAX. MARKS: 35
COURSE NAME: COMPARATIVE AND FUNCTIONAL GENOMICS
COURSE INSTRUCTORS: DR. JATA SHANKAR MAX. TIME: 2 Hour

Note: (a) *All questions are compulsory.*
(b) *The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

Q. No	Questions	CO	Marks
Q1	Discuss the mechanisms through which RNA interference (RNAi) regulates gene expression in eukaryotic cells. How has the understanding of RNAi advanced the development of therapeutic strategies, and state challenges in translating RNAi-based therapies into clinical practice?	CO III	5
Q2	Draw and label the complete structure of a eukaryotic gene, including the promoter region, exons, introns, splice donor and acceptor sites, and the polyadenylation signal. Explain the role of each of these components in the process of transcription and RNA splicing	CO I	3
Q3	Analyze the role of DNA microarray technology in studying the whole-genome expression profiles of drug-resistant versus drug-sensitive *Escherichia coli* cells. How can this technique help identify key genes involved in drug resistance and assist in developing more effective treatment strategies?	CO II	5
Q4	What is metagenomics, and how does metagenomic analysis contribute to improving environmental CO_2 levels? Provide an example of how metagenomics has been used to identify microorganisms or processes that play a role in carbon sequestration or CO_2 reduction.	CO III	4
Q5	Analyze and compare the genome sizes of *Escherichia coli* and *Saccharomyces cerevisiae*. Discuss the concept of gene density and how it relates to the complexity of these two organisms. How does gene density influence genome organization and cellular functions in *E. coli versus S. cerevisiae?*	CO I	3
Q6	The effectiveness of a drug often depends on the genotype of the individual. Provide examples of diseases and drugs where genetic variation plays a crucial role in selecting the appropriate drug or determining the optimal dose. Discuss how pharmacogenomics helps personalize medicine in these cases	CO II	5
Q7	What are the characteristics of a Biomarker, explain it with a suitable example?	CO III	3
Q8	Design an experiment to investigate the role of tumour suppressor genes in different types of cancer. Outline the methodology (sequencing), including the types of cancer to be studied, the techniques for gene expression analysis, and how you would assess the relationship between tumour suppressor gene mutations and cancer progression.	CO II	5