JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- MAY-2025

COURSE CODE (CREDITS): 18B11BI412 (3) MAX. MARKS: 35

COURSE NAME: GENETIC ENGINEERING AND GENOMICS

COURSE INSTRUCTORS: DR. JATA SHANKAR 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	Discuss the concept of gene density and compare the genomic organization of *E. Coli* with that of *Saccharomyces cerevisiae* (yeast) and the human genome. How do differences in gene density reflect the complexity and regulation of gene expression in these organisms?	5	5
Q2	What is the difference between exonuclease and restriction endonucleases? Write the restriction sites of *EcoRI*. Draw the structure of ribose, deoxyribose and dideoxyribose sugar, and what are the key points of DNA polymerase?	1	5
Q3	Simply ligating a foreign (non-bacterial) gene into a standard vector and cloning it in *E. coli* often results in minimal recombinant protein production due to the absence of essential regulatory signals. What are the key signals required for efficient expression of foreign genes in *E. coli*? What are important ways to predict genes from the given set of nucleotide sequences?	3	5
Q4	Explain the principle and methodology of pyrosequencing and Illumina sequencing technology. What are its key applications in genomics and molecular biology?	4	5
Q5	pBR322 and pUC8 are commonly used cloning vectors. What are their respective sizes, and how is a recombinant vector identified using these systems? Additionally, illustrate the structural features of the pBR322 and pUC8 vectors.	2	5
Q6	Explain the process of identifying and studying single-nucleotide polymorphisms (SNPs), and describe how this knowledge is applied to develop genetic markers that differentiate healthy individuals from those with disease. Use the TP53 gene as an example to illustrate your explanation.	4	5
Q7	Explain in detail how DNA microarray technology can be used to identify differentially regulated genes in cancerous cells compared to normal control cells. Also, briefly outline the key features of DNA microarray technology.	5	5