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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 90028

M.E. / M.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2026

First Semester

Biotechnology

P23BT102 - ADVANCED RECOMBINANT DNA TECHNOLOGY

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define inclusion bodies and explain their significance in protein expression.	2	K1	CO1
2.	State the essential genetic components that allow a shuttle vector to function in two different host organisms.	2	K1	CO1
3.	Differentiate between transformation and transfection.	2	K2	CO2
4.	Explain the role of a selectable marker in a recombinant plasmid.	2	K1	CO2
5.	List the methods for labeling a nucleic acid probe with radioactive and non-radioactive.	2	K1	CO3
6.	What is the function of reverse transcriptase during the construction of a cDNA library?	2	K2	CO3
7.	Compare and contrast the Southern blotting and Northern blotting techniques.	2	K2	CO4
8.	State the principle of a microarray technology.	2	K1	CO4
9.	Explain the mechanism of Cre/loxP system and its unique application.	2	K2	CO5
10.	What is the role of viral vectors in gene delivery?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Discuss the principles for maximizing gene expression in a bacterial system with appropriate examples.	13	K1	CO1

	(OR)			
	b) Explain the various expression systems utilized for expression of eukaryotic protein along with the challenges associated.	13	K1	CO1
12.	a) Elaborate the process of creating a genetically modified bacterium, highlighting the various processes involved.	13	K2	CO2
	(OR)			
	b) Compare and contrast the different selection methods used to identify recombinant organisms.	13	K3	CO2
13.	a) Illustrate the process of construction of a genomic library and a cDNA library along with their advantages and disadvantages.	13	K4	CO3
	(OR)			
	b) Illustrate the process and various components utilized in over-expression and purification of a His-tag fusion proteins.	13	K4	CO3
14.	a) Elaborate the methodology of Real-time PCR (qPCR) for absolute quantification using the standard curve method. Discuss the roles of the standard curve, threshold cycle, and digital PCR.	13	K2	CO4
	(OR)			
	b) Explain the process of gene expression from DNA to protein. How are techniques like RNA-seq and ribosome profiling are supporting in this effort?	13	K2	CO4
15.	a) Elucidate the basic mechanism of the CRISPR-Cas9 system and how it can be applied for specific applications.	13	K2	CO5
	(OR)			
	b) Write about the various gene delivery systems, including physicochemical methods and viral vectors. Discuss the advantages and disadvantages of each approach.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.	Questions	Marks	KL	CO
16.	a) A research team is developing a personalized gene therapy for a type of cancer. They have identified a specific gene, "Gene A," that is overexpressed in tumor cells and promotes their growth. The goal is to create a therapeutic molecule that can selectively silence this gene in the cancer cells.	15	K4	CO2
	i. Develop a strategy to produce a recombinant protein/ antibody which can bind and silence the expression.			

- ii. Can the gene be directly inactivated? Propose the possible technique.
- iii. How can the gene delivery into the human cell lines be tested?

(OR)

- b) A team of agricultural scientists wants to develop a new variety of grapes that is resistant to a fungal disease. They have identified a gene from a wild grass species that shows natural resistance to the fungal disease. 15 K4 CO3
- i. Develop a strategy for introducing finding and introducing this gene and discuss the choice of vector/ genome editing techniques that can possibly be utilized.
 - ii. Suggest methods to confirm the integration of resistance gene into the grape genome.
 - iii. Discuss the potential ethical or regulatory considerations.
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