Your Roll No .....

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B.Sc. (HONS WITH RESEARCH) / B.Sc. BOTANY
V SEMESTER EXAMINATION DECEMBER 2025

Paper Name: **Genetic Engineering** Paper Code: **BBODSC502**
Time: **2½ hours** Maximum Marks: **60**
Note: This paper has 3 sections A, B, and C.
Section A: Answer all the questions. **Section B**: Attempt any 5 out of 6.
Section C: Attempt any 2 out of 3.

Abbreviations used:
CO-Course Outcomes
CLO 1: appreciate the milestones and basic tools responsible for laying the foundations of genetic engineering;
CLO 2: recall and recollect the relevance of use of vectors and host systems in gene cloning and expression;
CLO 3: appreciate the potential of PCR and molecular markers in identification and authentication of a particular species; and
CLO 4: relate the importance and applications of genetic transformation, gene libraries, microarrays, protein-DNA interactions and gene silencing in recombinant DNA technology.

BTL-Bloom's Taxonomy Levels
1- Remembering, 2-Understanding, 3-Applying, 4-Analyzing, 5-Evaluating, 6-Creating

SECTION A

Very Short Type Question (15 questions) 15 x 1 = 15 marks

Q.No.	Questions	Marks	CO	BTL
	Give **ONE SIGNIFICANT** difference between each of the following pairs:			
1	Kinase and phosphatase.	1	1	3
2	T4 DNA ligase and *E.coli* DNA ligase.	1	1	3
3	Adapter and linker.	1	1	3
4	Plasmid and vector.	1	2	3
5	Probe and primer.	1	2	3
6	Hot-start PCR and Touch-down PCR.	1	3	3
7	Mutation and polymorphism.	1	3	3
8	dNTP and ddNTP.	1	3	3
9	Transcriptional and post-transcriptional gene silencing.	1	4	3
	Name/Mention			
10	The inventor of PCR.	1	3	1
11	A plant-based cloning vector.	1	2	2

12	A strong promoter of viral origin.	1	2	2
13	A thermostable DNA polymerase with proof-reading activity.	1	3	2
14	A co-dominant PCR-based marker.	1	3	3
15	The target in a mRNA which is the blocked by miRNA.	1	4	4

SECTION B

Short Type Question. (Attempt any five out of six) 5 x 5 = 25 marks

Q.No.	Question	Marks	CO	BTL
1	List **ANY FIVE** historical landmark events that paved way for genetic engineering.	5	1	3
2	Bring out **SIGNIFICANT DIFFERENCES** between type I, II and III restriction endonucleases.	5	1	2
3	Briefly describe the blotting and hybridization technique which estimates relative abundance of mRNA (gene transcripts).	5	1	4
4	How are the artificial chromosomes designed to carry fragments of DNA?	5	2	4
5	Outline the principle and application of RFLP.	5	3	3
6	What is reverse transcription? Comment briefly on how a cDNA is synthesized.	5	4	3

SECTION C

Long type Question (Attempt any two out of three) 2 x 10 = 20 marks

Q.No.	Question	Marks	CO	BTL
1	You are expected to clone and express a gene fragment of 1.5 kb from *Arabidopsis thaliana* in yeast. Describe in detail all the steps involved in the entire process.	10	1 & 2	6
2	Draw **SIGNIFICANT DIFFERENCES** between each of the following pairs: a. siRNA and miRNA b. *in vivo* DNA replication and PCR	10	 4 3	 4 4
3	Write notes on the following: a. Enzymatic DNA sequencing b. Applications of gene silencing in crop improvement	10	 3 4	 3 3

END OF QUESTION PAPER