No. of Printed Pages : 3

RLSE–105

Ph. D. IN LIFE SCIENCES

(PHDLS)

Term-End Examination

June, 2026

RLSE-105 : BIOTECHNOLOGY

Time : 3 Hours *Maximum Marks : 100*

***Note** : (i) Attempt any **five** questions.*

(ii) All questions carry equal marks.

1. (a) Design experiments to distinguish λ phage lytic *vs.* lysogenic cycles including controls, assays and expected results. 10

   (b) Compare the advantages of real-time PCR over conventional end-point PCR explaining key benefits with underlying principles and applications. 10

2. (a) Explain the biology of yeast vectors including their important structural features and function in yeast cells. 10

   (b) Compare the advantages of molecular beacons over TaqMan probes in real-time PCR detection. 10

3. (a) Describe the construction of a cDNA library emphasizing mRNA isolation, cDNA synthesis and cloning into an appropriate vector. 10

   (b) Discuss the advantages of using animal cells as cloning and expression hosts in genetic engineering. 10

4. (a) Describe the role of the Ti-plasmid and T-DNA in the production of transgenic plants. 10

   (b) Discuss the major applications of CRISPR-cas 9 technology in genetic engineering and biomedicine. 10

5. (a) Compare the replication control and copy-number characteristics of the Gram-negative bacterial plasmids ColE1, p15A, R1, IncPα and pSC101. 10

(b) Describe the methods used to confirm the presence and orientation of an insert in recombinant DNA constructs. 10

6. (a) Describe the main techniques used for studying gene expression at the RNA and protein level. 10

(b) Explain the basic principles and describe any *two* types of mutagenesis used in molecular biology. 10

7. Write short notes on the following : 10+10

(a) Illumina (Solexa) sequencing

(b) 2D gel electrophoresis

× × × × ×