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Question Paper Code:R5C02

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Fifth Semester

R21UBT502 – GENETIC ENGINEERING

Biotechnology

(Regulations R2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Differentiate between RFLP and RFLP markers. CO2- App
2. How do restriction enzymes recognize specific DNA sequences? CO3- App
3. What is a genomic library? CO1- U
4. How does Western blotting differ from Southern blotting? CO2- App
5. How does random mutagenesis differ from site-directed mutagenesis? CO2- App
6. What is the purpose of Nested PCR? CO1- U
7. What is a TOPO vector, and how is it used in cloning? CO1- U
8. What are the key features of eukaryotic expression vectors? CO1- U
9. What are the benefits of GMOs in agriculture? CO1- U
10. What is RNA interference (RNAi)? CO1- U

PART – B (5 x 16= 80 Marks)

11. (a) How can RFLP be applied in genetic fingerprinting and disease diagnosis, and what are its practical implications in forensic and medical research? CO2-App (16)
- Or
- (b) How do restriction enzymes and DNA ligase function together in genetic recombination, and how can this process be applied in gene cloning and molecular biology experiments? CO2-App (16)

12. (a) Explain the construction of genomic and cDNA libraries and their significance in genetic research. CO1- U (16)
- Or
- (b) Demonstrate the importance of chromosomal walking in identifying genetic mutations. CO1- U (16)
13. (a) How do Inverse PCR and Nested PCR improve DNA amplification efficiency and accuracy, and in what experimental scenarios would each method be most suitable? CO2-App (16)
- Or
- (b) How can fluorescence-based techniques like FRET be applied to investigate biomolecular interactions, and what advantages do they offer in molecular biology research? CO2-App (16)
14. (a) Evaluate the importance of heterologous expression systems in large-scale protein production. CO2-App (16)
- Or
- (b) A pharmaceutical research lab is working on large-scale recombinant protein production. They need to decide whether to use a prokaryotic or eukaryotic expression system. As a molecular biologist, compare the effectiveness of prokaryotic and eukaryotic expression vectors, discussing factors such as yield, post-translational modifications, and ease of production. CO2-App (16)
15. (a) Explain the principle and applications of DNA fingerprinting in forensic and medical research. CO1- U (16)
- Or
- (b) How do GMOs contribute to agricultural productivity and sustainability, and what are their potential benefits and challenges? CO1- U (16)