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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: Genetic Engineering

Time: 3 Hours

Max. Marks: 70

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

15

1. Attempt all parts:-

- (1.1) If linkers are combined with other features such as a selectable marker, it is called as _____ (CO1, K2) 1
- (a) cassette
 - (b) modified linker
 - (c) adaptors
 - (d) induced linker
- (1.2) PCR technique was invented by (CO2, K1) 1
- (a) Karry Mullis
 - (b) Boyer
 - (c) Sanger
 - (d) Cohn
- (1.3) Which of the following statements is accurate for the PCR – polymerase chain reaction? (CO3, K3) 1
- (a) Automated PCR machines are called thermal cyclers
 - (b) A thermostable DNA polymerase is required
 - (c) Millions to billions of desired DNA copies can be produced from microgram quantities of DNA
 - (d) All of the above
- (1.4) HaeIII and AluI have _____ recognition sites. (CO3, K1) 1
- (a) Different
 - (b) Similar
 - (c) Short

- (d) Unrecognizable
- (1.5) The shotgun approach _____ sequences clones from _____ of cloned DNA. (CO5, K2) 1
- (a) randomly, one end
- (b) randomly, both ends
- (c) specifically, both ends
- (d) specifically, one end

2. Attempt all parts:-

- (2.1) What do you understand by nick translation? (CO1, K2) 2
- (2.2) What is cloning vector? (CO2, K1) 2
- (2.3) What is cloning? (CO3, K1) 2
- (2.4) What is the application of multiplex PCR? (CO4, K2) 2
- (2.5) Which DNA sequencing technique is better ? (CO5, K3) 2

SECTION-B

20

Answer any one of the following:-

- (3.1) Write a note on homopolymer tailing method. (CO1, K3) 4
- (3.2) Mention about the important features of DNase I footprinting. (CO1, K3) 4

Answer any one of the following:-

- (3.3) What are cloning vectors? Explain any one cloning vector in detail. 4
- (3.4) Write a note on inclusion bodies and its types. (CO2, K3) 4

Answer any one of the following:-

- (3.5) Explain any one expression system in detail. (CO3, K3) 4
- (3.6) Write on various applications of yeast two hybrid system. (CO3, K3) 4

Answer any one of the following:-

- (3.7) Write about any two enzymes used in PCR method. What are their characteristics? (CO4, K4) 4
- (3.8) What are primers? Describe their role in PCR amplification. (CO4, K4) 4

Answer any one of the following:-

- (3.9) What are the challenges associated with gene therapy? (CO5 K5) 4
- (3.10) What are the different types of protein microarrays? Mention any two application of protein microarrays. (CO5 K4) 4

SECTION-C

35

4. Answer any one of the following:-

- (4.1) What is chromatin immunoprecipitation (ChIP) and how does it work? Mention about any two modified ChIP techniques? (CO1 K2,K3,) 7
- (4.2) Explain various methods of labelling DNA probes. What is the purpose of nick translation and random priming? (CO1 K4,K5,) 7

5. Answer any one of the following:-

- (5.1) Describe different methods of vector cloning with suitable examples. (CO2,K3,) 7

- (5.2) Describe various types of cloning vector and their applications in genetic engineering. (CO2,K3,) 7
6. Answer any one of the following:-
- (6.1) What is the procedure of isolating mRNA from a cell? Why we need to isolated mRNA?(CO3,K3,) 7
- (6.2) Describe various steps involved in cDNA cloning. State the importance of cDNA cloning. (CO3,K2,K3) 7
7. Answer any one of the following:-
- (7.1) Discuss the RT-PCR process in detail along with its applications. (CO4,K3) 7
- (7.2) Describe the role of DNA polymerases in the context of PCR. (CO4,K3) 7
8. Answer any one of the following:-
- (8.1) Explain the mechanism of siRNAs and miRNAs. (CO5,K2,) 7
- (8.2) What are the enzymes involved in enzymatic DNA sequencing? Discuss their importance. (CO5, K3) 7