Printed Page:- 03

Subject Code:- BBT0303

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Genetics and Molecular Biology

Time: 3 Hours Max. Marks: 100

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 20

1. Attempt all parts:-

1-a. The arms of a chromosome are called: (CO1, K1) 1

(a) Telomeres
(b) Centromeres
(c) Chromatids
(d) Genes

1-b. Karyotyping is used to detect: (CO1, K1) 1

(a) Gene mutations
(b) Chromosomal abnormalities
(c) Protein malfunctions
(d) RNA degradation

1-c. In Griffith's experiment, what organism was used? (CO2, K1) 1

(a) Mice and Streptococcus pneumoniae
(b) E. coli
(c) Bacteriophage
(d) Fruit fly

1-d. What radioactive element did Hershey and Chase use to label DNA? (CO2, K1) 1

(a) Carbon-14
(b) Phosphorus-32
(c) Sulfur-35

(d) Hydrogen-3

1-e. Which part of the DNA does RNA polymerase bind to initiate transcription? (CO3, K1) 1

(a) Terminator
(b) Promoter
(c) Enhancer
(d) Operator

1-f. In eukaryotes, transcription occurs in the: (CO3, K1) 1

(a) Cytoplasm
(b) Nucleus
(c) Mitochondria
(d) Ribosomes

1-g. In positive regulation, the regulatory protein acts as: (CO4, K1) 1

(a) A repressor
(b) An activator
(c) A terminator
(d) A helicase

1-h. Post-transcriptional regulation primarily affects: (CO4, K1) 1

(a) DNA replication
(b) RNA processing
(c) Protein folding
(d) Ribosome assembly

1-i. The law of independent assortment applies to: (CO5, K1) 1

(a) Linked genes
(b) Genes on the same chromosome
(c) Genes on different chromosomes
(d) Homologous chromosomes

1-j. The formula for chi-square is: (CO5, K1) 1

(a) $(O+E)/2$
(b) $(O-E)^2/E$
(c) O^2+E^2
(d) $(O-E)/(O+E)$

2. Attempt all parts:-

2.a. Define the principles of Mendelian genetics. (CO1, K1) 2

2.b. Explain the function of centromeres in chromosome stability. (CO2, K1) 2

2.c. What are Okazaki fragments? (CO3, K1) 2

2.d. Break down the structure of a prokaryotic promoter region. (CO4, K1) 2

2.e.	Classify the types of gene regulation in prokaryotes. (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Outline the features of multiple alleles and their inheritance patterns. (CO1, K2)	6
3-b.	Recite the process of linkage analysis in genetic studies. (CO1, K2)	6
3-c.	Explain the steps involved in preparing a karyotype and its diagnostic applications. (CO2, K1)	6
3-d.	Summarize the major types of mutations and their effects on proteins. (CO2, K2)	6
3.e.	Break down the steps of Avery, McLeod, and McCarty's experiment and explain how they confirmed DNA as genetic material. (CO3, K3)	6
3.f.	Break down the significance of wobble pairing in translation. (CO4, K3)	6
3.g.	Categorize the types of transcription factors and analyze their specific functions. (CO5, K4)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Define the steps of the chi-square test and explain how it is used to verify genetic ratios. (CO1, K2)	10
4-b.	Label the mechanisms of sex determination in humans, birds, and insects. (CO1, K2)	10

5. Answer any one of the following:-

5-a.	Contrast the mechanisms of base excision repair and nucleotide excision repair. (CO2, K2)	10
5-b.	Demonstrate the steps involved in using FISH to diagnose sex chromosome aneuploidy. (CO2, K2)	10

6. Answer any one of the following:-

6-a.	Illustrate the stages of PCR and analyze its applications in biotechnology. (CO3, K3)	10
6-b.	Eukaryotic DNA replication is similar to bacterial replication but differs in several aspects. Explain these differences. (CO3, K3)	10

7. Answer any one of the following:-

7-a.	Analyze the mechanisms of transcription in eukaryotes, focusing on the role of transcription factors. (CO4, K4)	10
7-b.	Illustrate the pathway of mRNA translation from initiation to termination in eukaryotes. (CO4, K4)	10

8. Answer any one of the following:-

8-a.	Simplify the process of feedback inhibition in gene regulation and analyze its significance. (CO5, K4)	10
8-b.	Categorize the various mechanisms of post-transcriptional regulation and analyze their contributions to gene expression. (CO5, K4)	10