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Printed Page:-2 **Subject Code:- BBT0303Y**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: III - THEORY EXAMINATION (2025- 2026)
Subject: Genetics and Molecular Biology

Time: 2 Hours **Max. Marks: 50**

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-a. Genetic counseling is important for: (CO1, K1) 1

(a) Reducing gene expression
(b) Treating genetic disorders
(c) Preventing chromosomal translocations
(d) Helping individuals understand inherited conditions

1-b. The primary structure of DNA is: (CO2, K1) 1

(a) A double helix
(b) A single-stranded molecule
(c) A polymer of nucleotides
(d) A complex of proteins and RNA

1-c. In which organisms does RNA splicing primarily occur? (CO3, K1) 1

(a) Prokaryotes
(b) Eukaryotes
(c) Bacteria
(d) Archaea

1-d. Which type of molecule is involved in post-transcriptional gene silencing? (CO4, K1) 1

(a) tRNA
(b) mRNA
(c) miRNA
(d) rRNA

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1-e.	What is the role of enhancers in eukaryotic gene regulation? (CO4, K1)	1

(a) They suppress gene expression
(b) They promote gene expression
(c) They terminate transcription
(d) They bind repressors

2. Attempt all parts:-

2.a.	List the differences between linkage and crossing over. (CO1, K1)	2
2.b.	Describe the impact of chromosomal disorders on phenotypic traits. (CO2, K1)	2
2.c.	Break down the stages of PCR amplification. (CO3, K1)	2
2.d.	What is a codon? Give examples of start and stop codons. (CO3, K1)	2
2.e.	Simplify the process of transcription initiation in prokaryotes. (CO4, K1)	2

SECTION-B 15

3. Answer any three of the following:-

3-a.	Define Mendel's Law of Dominance. Explain it with the help of an example of tall (TT) and dwarf (tt) pea plants. (CO1, K2)	5
3-b.	Describe any two laboratory techniques used to detect mutations (e.g., PCR, DNA sequencing, RFLP, gel electrophoresis). (CO2, K2)	5
3-c.	What is chromosomal microarray analysis (CMA)? Explain its principle and uses in genetic diagnosis. (CO2, K2)	5
3.d.	List and explain the applications of PCR in biotechnology and diagnostics. (CO3, K2)	5
3.e.	Describe the major steps involved in post-transcriptional modification of eukaryotic mRNA. (CO4, K2)	5

SECTION-C 20

4. Answer any five of the following:-

4-a.	Compare incomplete dominance and codominance with examples. (CO1, K3)	4
4-b.	Explain sex determination in Drosophila using ratio theory. (CO1, K3)	4
4-c.	What is a frameshift mutation? Why is it harmful? (CO2, K3)	4
4-d.	What is a loss-of-function mutation? Explain its effect in easy words. (CO2, K3)	4
4-e.	Explain the experiment conducted by Hershey and Chase to prove DNA as genetic material. (CO3, K3)	4
4-f.	What are the roles of helicase, primase, and ligase in replication? (CO3, K3)	4
4-g.	Discuss the significance of the origin of replication in prokaryotes vs eukaryotes. (CO4, K3)	4
4-h.	What are silencers? Explain how they influence gene expression. (CO4, K3)	4