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(20425) Roll No.  
B.Sc. (Bio-tech.)-I Year.

**3459**  
**B.Sc. (Bio-Tech.)**  
**Examination, April-2025**  
**Genetics**  
**(B-105)**  
**(B.Sc. Biotech.)**

*Time : Three Hours ] [Maximum Marks : 50*

**Note :** Attempt any **five** questions. **All** questions carries equal marks.

1. (a) What type of cross would produce the following genetic ratios? 5
- (i) 3:1
  - (ii) 1:1
  - (iii) 1:2:1
  - (iv) 9:3:3:1
  - (v) 1:1:1:1

- (b) You hypothesized that snapdragon flower color is controlled in a co-dominant manner. You created an  $F_1$  population by crossing red and white parents. You selfed the  $F_1$  plants and obtained the following ratio: 31 red, 66 pink, and 27 white flowered plants. Perform an analysis of this data to determine if co-dominant gene action is the correct hypothesis. 5

2. Explain the concept of isoalleles and how they differ from multiple alleles. How do multiple alleles contribute to genetic variation within a population? 10
3. Describe the process of meiosis and its importance in genetic variation. Additionally, explain the role of telomeres in chromosome stability and aging. 10

**P.T.O.**

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4. Explain how linkage maps are constructed and their importance in genetics. Additionally, in a genetic cross where two genes A and B are linked and are 10 map units apart, if an individual heterozygous for both genes (AB/ab) is testcrossed (AB/ab x ab/ab), what proportion of the offspring will be recombinant? 10
5. How does the study of intragenic crossing over in T4 phage contribute to our understanding of gene structure and function? 10
6. Discuss the role of mutations in evolution and genetic variation within populations. Given a population of 1,000 individuals, where 50 individuals have a specific genetic disorder caused by a mutation in a single gene, calculate the frequency of this mutation in the population. 10

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**P.T.O.**

7. In a pedigree showing a rare autosomal recessive disorder, if both parents are carriers and the disorder is present in some offspring, what are the probabilities of the disorder appearing in the next generation? 10
8. What is the chi-square test? In a genetic cross, the expected ratio of phenotypes is 3:1. If you observe 75 individuals with the dominant phenotype and 25 with the recessive phenotype out of a total of 100 individuals, calculate the chi-square value and determine if the observed data fits the expected ratio. 10
9. Explain with followings: 5 each
  - (a) 2-point test cross
  - (b) Mutation detection techniques
10. Define the Hardy-Weinberg equilibrium. What are the key assumptions that must be met for a population to be in Hardy-Weinberg equilibrium? 10

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