



Agrotechnology Discipline
Khulna University, Khulna
MS in GPB 1st Year Term-II, Examination 2025

0811 08 GPB 5201: Quantitative Genetics

Full Marks: 60, Time: 3 hours, Credit: 03

- The FIGURES in the right margin indicate full marks. The questions are of equal value.
- Use separate sheets for each section.
- There are **FOUR** questions in each section, answer any **THREE** questions from each.

Section A

1. (a) Discuss the concept and importance of quantitative genetic analysis in plant breeding. [L2; CLO1] 3.0
(b) Explain the components of genetic variance: additive, dominance, and epistatic. [L4; CLO2] 3.0
(c) Explain how heterosis is measured biometrically and its significance in plant breeding. [L4; CLO2] 2+2=4.0
2. (a) Describe the role of genotype $\times$ environment interaction in determining phenotypic variation. [L2; CLO2] 2.0
(b) How do segregation and independent assortment contribute to genetic variability? [L4; CLO2] 3.0
(c) Differentiate between qualitative and quantitative traits with suitable examples. [L2; CLO2] 2.0
(d) What is gene interaction? Explain different types of non-allelic interactions with examples. [L2; CLO2] 1+2=3.0
3. (a) Define multiple factor hypothesis. How does the multiple factor hypothesis explain continuous variation? [L3; CLO2] 1+3=4.0
(b) Explain how ANOVA is used to partition genetic and environmental variation. [L2; CLO3] 3.0
(c) Discuss the role of mean, variance, and covariance in quantitative genetic analysis. [L5; CLO3] 3.0
4. (a) Define correlation and regression. What does a positive correlation indicate between two traits? [L1, L2; CLO2] 1+2=3.0
(b) How do regression coefficients and R^2 are interpreted in yield prediction studies? [L5; CLO2] 3.0
(c) Explain how heritability and genetic advance are used to predict response to selection. [L5; CLO5] 4.0

Section B

5. (a) What do you mean by bioinformatics? State the main goals and objectives of bioinformatics. [L1; CLO2] 1+3=4.0
(b) How bioinformatics contributes to molecular biology and biotechnology? [L2; CLO2] 3.0
(c) Compare and contrast among genomic, proteomic, and metabolomic data with suitable examples. [L4; CLO2] 3.0
6. (a) 'The sequence data (DNA, RNA, protein) have a great significance in bioinformatics analysis.' Explain. [L5; CLO4] 3.0
(b) Define data redundancy. Describe the causes of data redundancy? [L1, L2; CLO2] 1+3=4.0
(c) Explain the methods used to manage and reduce data redundancy in biological databases. [L4; CLO4] 3.0
7. (a) What do you know about the GenBank sequence databases and protein PDB databases? [L2; CLO2] 2+2=4.0
(b) Write a short note on primary and secondary data sources. [L1; CLO2] 3.0
(c) Discuss the applications of bioinformatics in agriculture. [L6; CLO4] 3.0
8. (a) How does a panmictic population differ from a dynamic population? [L2; CLO4] 2.0
(b) What does $p^2 + 2pq + q^2 = 1$ represent in Hardy-Weinberg law? Explain each term. [L4; CLO4] 4.0
(c) Suppose a random sample of 100 individuals was drawn from a random mating population of *Mirabilis jalapa*. Out of 100 plants, 30 were red, 40 were pink, 30 were white flowers. Estimate the allele frequency. [L6; CLO4] 4.0

[L1-Remember, L2-Understand, L3-Apply, L4-Analyze, L5-Evaluate, L6-Create]