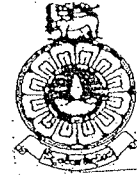


THE OPEN UNIVERSITY OF SRI LANKA
 DIPLOMA IN PLANT BREEDING - LEVEL 3
 FINAL EXAMINATION – 2024/2025
 BYD3622 – CONCEPTS IN PLANT BREEDING



DURATION – TWO and HALF (2 1/2) HOURS

Date – 28.06.2025

Time – 9.30 am to 12.00 noon

Answer **any four (04)** questions.

This paper consists of six (06) questions and three (03) pages.

01.

- A) i) What is Plant Breeding?
 ii) On what two key factors does the success of a breeding program depend?
 iii) Breeding programs aim to improve specific crop characteristics.
 What are the five (05) major factors that affect selection methods in plant breeding program? Briefly describe.
- B) i) What is heterosis?
 ii) Explain how heterosis is utilized in a breeding program.

02.

- A) i) What is heritability?
 ii) Beta carotene content in a variety of tomato is about 450- 650 micro grams per plant and the phenotypic variance associated with the beta carotene content of the plants is about 0.25 units under field conditions. Beta carotene content in the same Tomato variety does not change even grow in a greenhouse condition. However, in greenhouse conditions the phenotypic variance is 0.15.
- Determine the genotypic variance of the plant.
 - Find the environmental variance of that Tomato variety in the field.
 - Calculate the heritability of trait of Beta carotene content in both field and green house conditions.
- B) Quantitative as well as qualitative traits are found in crop varieties.
- Give a brief comparison of quantitative and qualitative traits.
 - In quantitative genetics, four types of gene actions affect the expression of traits. What are they?

03.

- A) i) What is the definition of a population in Genetics.
ii) Explain the term "Population Mean".
iii) What are the factors affecting gene frequencies in a population?

B) Fruit diameter of sweet orange (*Citrus sinensis*) is determined by the gene $+/l$. The three genotypes have the following genotypic values;

++	+l	ll
9cm	6cm	2cm

(Consider that the allele frequency (q) of l is 0.4, $a = 3$ cm and $d = 1$ cm)

- a. Calculate average effects of genes.
b. Calculate breeding values of genes.
c. Calculate additive variance V_A , Dominance variance V_D , and Genetic variance V_G (Consider $V_I = 0.24$)

Genotype	a	d	q
++	3.5	2	0.4
+l	3.0	2	0.7
ll	2.0	2	0.2

04.

- i) Plant breeders classify crop species into four fundamental population types. What are they?
- ii) In self-pollinated crops, breeding methods involve have two main approaches. What are they?
- iii) Mass selection and Pure-line selection are often used in self-pollinated crop breeding. Compare these two selection methods.
- iv) Several types of selection methods are practiced for cross-pollinated crops. Identify these different types.
- v) Hybridization in cross-pollinated crops, plant breeders classify crop species into four fundamental population types. What are they?

05.

- A) Asexually propagated plants include vegetables, fruit, and ornamental crops that are cultivated using vegetative parts.
- i) These plants can be categorized into four groups based on their reproductive characteristics. Explain briefly.
 - ii) A variety of breeding methods can be applied for breeding asexually propagated plants.
Name three (03) such key breeding methods.
- B) i) What is a mutation?
- ii) Plant mutations are classified into four types. What are they? Briefly explain.
 - iii) What are the applications of mutation breeding?
 - iv) What are the limitations in Mutation breeding?

06.

- A) i) What is pollination?
- ii) Explain the process of self-pollination and cross-pollination.
 - iii) What are the main factors which influence whether a plant is self-pollinated or cross-pollinated?
 - iv) Describe monoecious and dioecious plants.
- B) i) What is emasculation?
- ii) What are the different methods of emasculation?
 - iii) Briefly explain the importance of emasculation in plant breeding.

