UNIVERSITY OF ESWATINI

FINAL EXAMINATION PAPER

PROGRAMMES: BACHELOR OF SCIENCE IN AGRONOMY YEAR FOUR
BACHELOR OF SCIENCE IN HORTICULTURE YEAR FOUR

COURSE CODE: CPR 403

TITLE OF PAPER: CROP BREEDING

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS

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QUESTION 1

Write short notes on the following statements as they are applied in crop breeding programmes;

a) Crop breeding as an art and science.   (6 Marks)

b) Any four (4) specific objectives of crop breeding with relevant examples.   (8Marks)

c) Conservation strategies of crop genetic resources with relevant examples.   (6 Marks)

d) Phenotyping and genotyping of crop genetic resources.   (5 Marks)

                                             [25 MARKS]

QUESTION 2

a) Discuss in detail how the megagametophyte and the microgametophyte are formed in crop plants. Your discussion should also include how genetic variation is created during the formation of the megagametophyte and the microgametophyte.   (12 Marks)

b) Discuss the process of double fertilisation in crop plant and explain the significance of this process in crop breeding   (8 Marks)

c) Describe the Mendelian Law of Segregation and explain its relevance in crop breeding programmes.   (5 Marks)

                                             [25 MARKS]

QUESTION 3

Early maturity in maize is one of the key characteristics for varieties intended for the drought prone areas. Assuming that you are a maize breeder, tasked with developing new early maturing varieties for small-scale farmers in the Lowveld of Eswatini, and you are given 6 diverse maize populations with the following data;

Genetic variance $(V_G) = 111.96$

Environmental variance $(V_E) = 10.42$

Population mean (Days to maturity) = 66

Based on the above data, calculate the following parameters giving your answers to 2 decimal points;

a) Phenotypic variance   (2 Marks)

b) Broad sense heritability   (3 Marks)

c) Genetic advance at 5% selection intensity (K value = 2.06)   (9 Marks)

d) Mean days to maturity of the progeny population after 5% selection intensity **on early maturing plants.**   (5 marks)

e) Describe the meaning of the broad sense heritability value obtained.   (3 Marks)

f) Describe the meaning of the genetic advance value obtained.   (3 Marks)

[25 MARKS]

QUESTION 4

a) In a tabular format, compare and contrast the mass selection and pure-line selection methods of crop breeding.   (10 Marks)

b) Give **any two advantages** and **any two disadvantages** of using the pedigree method of crop breeding.   (8 Marks)

c) Explain the significance of natural selection in the bulk population breeding method.

(2 Marks)

d) Discuss the key features of a backcross breeding programme.   (5 Marks)

[25 MARKS]

QUESTION 5

a) Define a molecular a marker and any give any two (2) examples of molecular markers used in crop breeding programmes.   (6 marks)

b) Discuss any five (5) uses of molecular markers in crop breeding programmes.   (10 Marks)

c) Give any two (2) types of transgenic crops commonly used in crop production. Your answer should also indicate how these transgenic crops are developed.   (9 Marks)

[25 MARKS]