



1ST SEMESTER 2018/2019

PAGE 1 OF 3

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 QUESTION 1 AND ANY OTHER THREE (3)
QUESTIONS OF YOUR CHOICE**

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CHIEF INVIGILATOR**

QUESTION 1 (THIS IS A COMPULSORY QUESTION)

- a) Define all terms in the equation: $V_P = V_A + V_D + V_I + V_E + V_{GXE}$ (6 Marks)
- b) Assuming that a groundnut breeding programme was conducted at Luyengo campus with the objective of increasing the number of pods per plant. Ten (10) different varieties were evaluated for number of pods per plant and the following variances were obtained at a selection intensity of 5% ($K=2.06$). $V_A=3.28$ $V_D=1.66$ $V_I=0.45$ $V_E=0.87$ Mean= 31.24 pods per plant. Using the above information and keeping to 2 decimal points, calculate the following and show all calculations;
- Genetic coefficient of variation (GCV) (2 Marks)
 - Phenotypic coefficient of variation (PCV) (2 Marks)
 - Genetic advance as percent of mean (10 Marks)
 - Discuss the gene action controlling the expression of the trait and suggest a breeding method that can be used to increase number of pods per plant in this breeding population. (5 Marks)

[25 MARKS]**QUESTION 2**

- a) Discuss how sexual gametes are formed in crop plants. (8 Marks)
- b) Discuss the process leading to the formation of the sporophyte in crop plants. (5 Marks)
- c) Crop breeding programmes relies heavily on the availability of genetic variation in the target crop species. Discuss how genetic variation is created in crop plants and also give the importance of genetic variation in crop breeding programmes. (12 Marks)

[25 MARKS]**QUESTION 3**

- a) Describe the various floral/reproductive mechanisms that facilitates cross pollination in crop plants. In each mechanism, give any crop species that is involved. (12 Marks)
- d) Define apomixes. Describe the various ways in which viable sporophytes are produced in apomictic crop species. (13 Marks)

[25 MARKS]

QUESTION 4

- a) List (in order of implementation), the steps that are involved in a typical crop breeding process. (14 Marks)
- b) Give the applicable conventional breeding method you can use under the following scenarios and justify your answer.
- i) Improving grain yield and baking quality traits in wheat. (2 Marks)
 - ii) Improving oil content in groundnuts. (2 Marks)
 - iii) Improving early blight disease tolerance caused by *Alternaria solani* in tomatoes. (3 Marks)
 - iv) Purification of maize landraces to ensure uniformity in some traits. (2 Marks)
 - v) To improve red speckled beans for a discrimination market that puts a premium on visual seed appearance. (2 Marks)

[25 MARKS]**QUESTION 5**

Discuss how the following biotechnology tools can be applied in crop breeding programmes. Support your answer with relevant practical examples.

- a) Tissue culture (8 Marks)
- b) Molecular markers (8 Marks)
- c) Transgenic plant technology (9 Marks)

[25 MARKS]