



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRIBUSINESS MANAGEMENT AND TRADE

THIRD YEAR SPECIAL/ SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

AGR 305: PLANT BREEDING

DATE: 24/3/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS:

Answer *ALL* questions from Section A and any other *TWO* from Section B:

SECTION A: COMPULSORY: (40 MARKS)

QUESTION ONE (30 MARKS)

- a) Define the following terms in relation to plant breeding
- i. Homozygous (2 marks)
 - ii. Aneuploidy (2 marks)
 - iii. Apomixis (2 marks)
 - iv. Chasmogamy (2 marks)
- b) i) Explain THREE roles of Mendelian genetics in plant breeding (6 marks)
- ii) Differentiate between environmental and hereditary sources of variation (2 marks)
- c) Distinguish between *in situ* and *ex situ* forms of preserving germplasm (2 marks)
- d) i) Explain THREE conventional methods used by researchers in breeding new green grams varieties (6 marks)
- ii) Describe TWO differences between self and cross pollinated crops (4 marks)

- e) i) Explain SIX steps used by plant breeders to develop new sorghum varieties (6 marks)
- ii) Explain TWO main differences between vertical and horizontal disease resistance (2 marks)
- f) Explain TWO factors that affect heritability of genes in breeding new cultivars (4 marks)

SECTION B: Answer Any THREE Questions (60 Marks)

QUESTION TWO (20 MARKS)

- a) Explain FOUR forms of intellectual property rights (IPR) that a plant breeder can sought to be protected (8 marks)
- b) Explain FOUR modern methods of plant breeding adopted by researchers to speed up the process of breeding for traits controlled by minor/polygenes (12 marks)

QUESTION THREE (20 MARKS)

- a) Using a backcross illustration, explain how a breeder can develop rice varieties that are resistant to leaf rust disease (11 marks)
- b) Explain THREE mechanisms of disease resistance exploited in plant breeding (9 marks)

QUESTION FOUR (20 MARKS)

- a) Explain FOUR breeding methods used to improve field bean varieties (12 marks)
- b) Explain THREE mechanisms that enhance self-incompatibility in crops (8 marks)

QUESTION FIVE (20 MARKS)

- a) Explain FIVE roles of plant breeding in crop improvement and sustainable agriculture (10 marks)
- b) Explain FIVE ways employed by wheat breeders to generate variation in varieties (10 marks)