GWANDA STATE UNIVERSITY

FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

CROP BREEDING

LCS 4209

Final Main Examination Paper

June 2024

This examination paper consists of Three pages.

Time Allowed: **Three (3) Hours**

Total Marks: **100**

Special Requirements: **Calculator**

Examiner's Name: **Mr. D Dube**

INSTRUCTIONS

1. Answer **all** questions in Section A
2. Answer **three** questions in Section B

MARK ALLOCATION

QUESTION	MARKS
SECTION A	**40**
SECTION B	**60**
TOTAL ATTAINABLE MARKS	**100**

SECTION A: Answer ALL questions in SECTION A.

Question 1

a) Briefly explain the following terms
   i. Plant introduction (2)
   ii. Selection intensity (2)
   iii. Germplasm (2)
   iv. Biosafety (2)
b) Briefly explain three main objectives of plant breeding during climate change era. (6)
c) Explain the procedure of hybrid seed production using male sterile lines in maize crop (6)

Question 2

a) Discuss methods used to create genetic variability in a plant breeding program (6)
b) Distinguish between pure line selection and mass selection in crop improvement (6)
c) Briefly explain different types of germplasm materials used in Crop breeding (6)
d) Interpret the meaning of the symbols (A/B//C) as used in Plant Breeding (2)

SECTION B: Answer THREE questions in SECTION B

Question 3

a) Explain how molecular markers can be used in a breeding program for disease resistance? Give suitable examples. (15)
b) Explain the process of varietal release for a newly developed sorghum variety. (5)

Question 4

a) Briefly describe the various modes of reproduction prevalent in cultivated plants and discuss their significance in plant breeding. (12)
b) A farmer in Insiza wants to grow genetically modified (GM) cotton resistant to bollworm. As a crop scientist what advice would you give the farmer on the potential benefits and risks of Genetically Modified Bt cotton? (8)

Question 5

a) Highlight procedure for hybridization in cross pollinated crops (10)
b) Explain the meaning of Broad sense heritability= 0 and Broad sense heritability =1, giving suitable examples. (4)

c) Describe the steps involved in evaluating maize germplasm for fall army worm resistance. (6)

Question 6

Discuss the differences between the pedigree-selection breeding procedure and the backcross breeding procedure.
(20)

Question 7

As an assistant plant breeder you are working on developing a maize hybrid variety for higher yield. The yield data obtained after evaluating the developed variety in multi-locational trials is as follows:

Parent A: 4 tonnes per hectare

Parent B: 6 tonnes per hectare

Current best yielding commercial variety: 10 tonnes per hectare

Newly developed F1 hybrid variety: 8 tonnes per hectare

Using the above information answer the following questions

a) Calculate mid-parent heterosis (4)
b) Calculate heterobeltosis (4)
c) Calculate economic heterosis (4)
d) What is the type of cross? Give reason for your answer. (3)
e) Can this new developed variety be released if the only objective for breeding was higher yields, support your answer with relevant reasons. (5)

END OF EXAMINATION PAPER