



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**

**FOURTH YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE
DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL EXTENSION
EDUCATION**

**2019/2020 ACADEMIC YEAR
SPECIAL/RESIT**

COURSE CODE: AHT 3224

COURSE TITLE: Principles of Plant Breeding

EXAM VENUE: **STREAM: BSc. Agricultural Extension**
Education

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

- 1. Answer ALL questions in section A and ANY other 2 Questions in section B.**
- 2. Candidates are advised not to write on question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A [30 MARKS]

Answer ALL questions from this Section

1. What is the general philosophy underlying any breeding programme? **[2 MARKS]**

2. Distinguish between private sector plant breeder and public sector plant breeder **[2 MARKS]**

3. Distinguish between self-fertilization vs cross-fertilization? **[2 MARKS]**

4. Explain asexual reproduction **[2 MARKS]**

5. Distinguish between pure-line cultivars vs open-pollinated cultivars **[2 MARKS]**

6. Describe the TWO stages of hybrid cultivar development **[5 MARKS]**

7. EXPLAIN the two ways hybrid varieties helped seed companies to have an in-built economic protection **[5 MARKS]**

- (a) Describe FIVE steps that must be taken in disease resistance breeding scheme **[10 MARKS]**

SECTION B (40 MARKS)

Answer ANY TWO questions in this section

8a. Outline the steps in pedigree method of plant breeding [10 MARKS]

8b. Describe the following post-breeding scheme processes before release of a variety [10 MARKS]

- (a) Breeders seed:
- (b) Foundation seed:
- (c) Certified seed:

9a. As a plant breeder, you were given four inbred parents (A, B, C, and D) of maize. EXPLAIN FIVE types of hybrids you could produce for each of the following: [10 MARKS]

- (a) Single-cross hybrids:
- (b) Three way-cross hybrids:
- (c) Double-cross hybrids:

9b. Give one example of a crop propagated through each of the following methods [5 MARKS]

- (a) Budding and grafting:
- (b) Leafy cuttings:
- (c) Leafless stem cuttings:
- (d) Lateral shoots:
- (e) Tubers:

10. A barley breeder crossed two parents tall, six-row ($TTSS$) and short, two-row (tts). The F_1 hybrid he obtained had the genotype $TtSs$. He selfed the F_1 (i.e. $TtSs \times TtSs$). [20 MARKS]

- (a) What are the gametes produced by the F_1 ?

- (b) Draw a Punnet Square Table to determine all the possible outcomes from the cross $TtSs \times TtSs$
- (c) How many possible genotypic outcomes are there?
- (d) What are the genotypic frequencies of each of the comes?
- (e) Describe the GENOTYPES of each of the possible outcomes. Remember Tall (T) is dominant over short (t), and Six-row (S) is dominant over Two-row (s).
- (f) If the alleles do not show dominance, what are the possible phenotypes?
- (g) Does a conventional breeder rely on phenotypes or genotypes during selection? What about a molecular breeder?
- (h) Assuming you are the breeder; and you are tasked with developing genotypes with resistance to lodging. Would you select for tall or short plants? Explain your answer