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| **CHUKA** |  | **UNIVERSITY** |

**UNIVERSITY EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN PLANT BREEDING**

**AGRI 821: BREEDING METHODS**

**STREAMS: MSc. (Y1S1) TIME: 3 HOURS**

**DAY/DATE: THURSDAY 08/04/2021 8.30 A.M. – 11.30 A.M.**

**INSTRUCTIONS**

* **Answer question ONE and ANY TWO other questions.**
* **Use calculator and mathematical tables is allowed.**
* **Do not write anything on the question paper**

**Question one (20 marks): compulsory**

A maize breeder conducted a study on heritability of resistance to the spotted stem borer (Chilo partellus) in maize (Zea Mays L.) genotypes and got the following results (Table 1).

Table 1: Number of plants affected by the stem borers.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variety | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
| MG001  MG092  MG004  MG010  MG104 | 27  17  21  33  19 | 13  13  17  59  13 | 13  11  13  21  23 | 15  17  27  41  33 |

1. Use the above data to calculate the heritability of angular leaf spot. (17 marks)
2. Explain what the results in (a) above mean to a plant breeder. (3 marks)

**Question two (20 marks**)

1. i) Explain composite interval mapping (CIM) as used in the QTL mapping.(7 marks)

ii) Write down the general CIM statistical model. (3 marks)

1. Detail a scheme of a genomic selection (GS) in a given breeding program, giving advantage of GS over marker assisted selection. (10 marks)

**Question three (20 marks**)

1. With an aid of diagram, describe the two types of association mapping. (15 marks)
2. Discuss factors affecting disequilibrium. (5 marks)

**Question four (20 marks)**

A breeding program has two types of varieties for wheat, one resistant to leaf rust but poor yield (Variety A) and the other susceptible to leaf rust but high yield (Variety B). Advice on how a breeder can improve variety B for resistance to leaf rust.

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