THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF AGRICULTURE

FIRST SEMESTER EXAMINATION

AG 413 PLANT BREEDING

4th YEAR BSAG

June, 2020

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES:

1. You have 10 minutes to read the paper. You must not begin writing during this time.

2. The examination paper has two parts:

   Part A: Short Answer Questions .....…20 Marks

   Part B: Conceptual Questions.....……60 Marks

   Total.....……..….....….80 Marks

3. Answers must be written in the book provided. No other written materials will be required.
4. Rulers, calculators and correction fluids are required in the examination room. Notes and text books are not allowed.
5. Write your name and student number clearly on the front page of your answer book and examination attendance slip. **DO IT NOW**.
6. **Total marks = 80**.

Part A. Short Answer Questions

Answer all of the questions provided in this section.

Question One (3 + 2 = 5 Marks)

Plant introduction is the simplest form of plant improvement.

a) Define Secondary Introduction, and

b) Give two examples of agricultural crops that were brought into the country as secondary introductions.

Question Two (5 Marks)

List five (5) undesirable effects of plant breeding programs.

Question Three (5 Marks)

Out of the three principles that make selection effective in breeding work, explain why "selection works because some individuals are favoured in reproduction at the expense of others"?

Question Four (5 Marks)

Briefly describe a four-way cross, and indicate the level of contribution (%) each parent makes in the genetic make-up of any of the resulting progenies.

Part B. Conceptual Questions

Answer all the questions provided in this section.

Question Five (10 + 10 = 20 Marks)

Yield improvement is the most important objective of most breeding programs. Such an improvement can be achieved by improving the two components of yield, namely Biomass and Partition:

a) Briefly discuss, with an aid of an example, how yield increments can be achieved by improving a crop's biomass; and

b) Briefly discuss, with an aid of an example, how yield increments can be achieved by improving partitioning in a crop.

Question Six (10 + 2 + 8 = 20 Marks)

i) Outline the procedure you would use in conducting a breeding program using the Mass Selection method to breed either one of these crops for the objective:

   a) To improve grain quality in rice (*Oryza sativa*: Poaceae); or

   b) To improve corm yield in taro (*Colocasia esculenta*: Araceae).

ii) Which of these two breeding programs is more likely to take a shorter time to develop a variety?

iii) Provide a scientific basis for your answer to (b).

Question Seven (10 + 10 = 20 marks)

a) What is the genetic basis on which seedless fruits can be generated by manipulating the chromosome number of a plant?

b) Briefly describe the steps one would take to develop seedless watermelons.

END OF EXAM-