

THE UNIVERSITY OF NEW ENGLAND

**EXAMINER INFORMATION FORM**

UNIT NAME : GENE 422

PAPER TITLE: Genetic Evaluation and Breeding program design

PAPER NUMBER: First and only

TIME ALLOWED: 3 (THREE) hours plus fifteen minutes reading time

**IS THIS PAPER TO BE WITHHELD FROM THE CANDIDATES AND LIBRARY REFERENCE AFTER THE EXAMINATION ?**

**NO**

We certify that we have checked the attached examination question paper and that it is correct in all respects. It is in order for printing.

SIGNATURE OF EXAMINER:..... DATE:

PRINT NAME: **Julius van der Werf**

EXAMINER'S UNE EXTENSION: **2092** HOME TELEPHONE: 752442

(This information is required in case any urgent queries about papers arise)

SIGNATURE OF HEAD OF DEPARTMENT or nominee:

.....

DATE: .....

# THE UNIVERSITY OF NEW ENGLAND

UNIT NAME: **GENE 422**

PAPER NUMBER: **First and only**

PAPER TITLE: **Animal Genetics and Breeding**

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

TIME ALLOWED: **3 (THREE) hours plus fifteen minutes reading time**

NUMBER OF PAGES IN PAPER: **3 (THREE)**

NUMBER OF QUESTIONS ON PAPER: **11 (ELEVEN)**

NUMBER OF QUESTIONS TO BE ANSWERED: **11 (ELEVEN)**

Stationery per candidate:  X 6 leaf A4 books  x 12 leaf A4 books

x rough work books

Graph Paper : **NIL** (Number of Sheets)

Pocket calculators permitted : **YES** (Silent type)

Mathematical tables permitted: **YES**

Other aids required: **NIL**

INSTRUCTIONS FOR CANDIDATES:

TEXTBOOKS OR NOTES PERMITTED: **NO**

THE UNIVERSITY CONSIDERS IMPROPER CONDUCT IN EXAMINATIONS TO BE A SERIOUS OFFENCE. PENALTIES FOR CHEATING ARE EXCLUSION FROM THE UNIVERSITY FOR ONE YEAR AND/OR CANCELLATION OF ANY CREDIT RECEIVED IN THE EXAMINATION FOR THAT UNIT.

## EXAM GENETICS 422

### SECTION A

**16 marks. Answer both questions, try to be brief.**

1.[8 marks.]

Discuss advantages and disadvantages of a 'desired gains approach' when defining breeding objectives in animal improvement.

2. [8 marks]

Consider that a fixed number of breeding cows are available to be used as mates in a progeny test program. What factors affect the decision on how many young bulls to progeny test? Briefly describe how you would go about making this decision.

### SECTION B

**16 marks. Answer both questions.**

1 [8 marks]

Explain the difference between a genetic map and a physical map of an organism's genome. What units of measurement are used for each type of map.

3. [8 marks]

In what situation is the positional cloning strategy utilised (as opposed to the functional or candidate cloning strategy). Explain the main limitation to using the positional cloning approach to identify (clone) a major gene affecting a quantitative trait. How can you prove that the candidate identified gene has a direct effect on the trait, rather than an effect due to linkage with another gene.

## SECTION C

**36 marks. Answer all four questions.**

1.[10 marks]

Contrast the terms parent selection and progeny selection. Describe a situation when parent selection is more optimal and describe also a situation where progeny selection is preferred. Situations should be discussed in relation to the properties of the EBV that are used as criteria for selection.

2. [10 marks]

Discuss to what extent you agree with the following statements:

- “Males should have a progeny test before they are selected as sires of sires (i.e. as nucleus sires) “.
- “Once progeny tested, we don’t expect the EBV of a ram to change anymore in future genetic evaluations”

3.[10 marks]

Given are the phenotypic values and the EBV’s for weaning weight of the following two young bulls.

	<u>Phenotype</u>	<u>EBV</u>	
Red Rocket	250 Kg		-5
Super Dooper	220	+18	

The EBV’s are based on Breedplan. The owner of the two animals wonders why his better animal does not have the higher EBV. Discuss with the farmer some reasons why this could happen. What questions would you ask him, and what arguments could you give him to explain the situation.

4. [10 marks]

Show graphically why it is much easier to increase merit in two traits that are positively correlated than it is in two traits that are negatively correlated. Discuss an example. Also discuss in which circumstances the optimal selection strategy would be most sensitive to a change in economic weights.

## SECTION D

**24 marks.**

1. [10 marks]

A farmer wants to buy a ram and he is told this ram has a M1M2 genotype for an M-marker. He/She asks you advice and wants to know how valuable this marker-genotype information is. What advice would you give the farmer, and what kind of information would you search for in the literature to be able to give a proper advice here.

2. [10 marks]

Describe why an open nucleus breeding scheme might be expected to give more response to selection than a closed nucleus breeding scheme of the same total size. Use a diagram to help illustrate your answer.

3. [8 marks]

Dominance and Epistasis are two types of genetic interaction that can affect the expression of heterosis. Write down for each of these what effect they are likely to have on heterosis expression (either favourable or unfavourable). Support your choices with brief explanations. [Consider Epistasis in this context as the interaction between unlinked genes that are related in function.]