

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE OF SCIENCE IN ANIMAL SCIENCE

ANBG 850: DESIGN OF GENETIC IMPROVEMENT PROGRAMS

STREAMS: MSc. ANBG

TIME: 3 HOURS

DAY/DATE: TUESDAY 18/4/2023

2.30 P.M. – 5.30 P.M.

INSTRUCTIONS:

Attempt ALL questions

SECTION A: 20 MARKS

- Describe the following selection criteria giving their strengths and weaknesses.

- Mass selection
- Progeny testing

(8 marks)

- A breeding program was designed to improve 3 month body weight in an indigenous chicken population. In the program a cock was mated to 10 hens. Each hen produced 5 chicks. Each chick was evaluated based on the following information:

- Own 3 month body weight
- 3 month body weights for half and full siblings
- Sire 3 month body weight

Selection was per generation (i.e., parents were allowed to produce only a single batch of offspring). Each generation 5 cocks and 50 hens were selected. h^2 and phenotypic standard deviation for the trait are 0.25 and 1.8kg, respectively. Determine the response to selection for the program.

(12 marks)

SECTION B: 20 MARKS

3. A breeding program was established to improve meat yield in rabbits. Traits in the breeding goal were slaughter weight (SW) and litter size (LS) with the following parameters

Trait	μ	σ_p	h^2
SW	5kg	0.4kg	0.30
LS	6 offspring	1 offspring	0.10

The breeding population consists of 200 dams mated to 20 sires each generation, each female getting 6 offspring on average. However, due to limited housing capacity, only 800 born are kept (i.e., only 4 offspring from the 6 born by each female) and become selection candidates (on average 2 males and 2 females per dam). Generation interval is 0.5 years in males and 0.7 years in females.

- Calculate the response to selection (per year) for body weight, assuming selection is for body weight only (i.e., ignoring litter size) and based on own performance records. What is the expected mean body weight for this population in 5 years?
(7 marks)
 - To increase response to selection the breeder considers keeping only 1 male offspring and three (3) female offspring from each dam (again 4 offspring in total.) Determine if this would increase response compared with a above.
(6 marks)
 - To increase response to selection, the breeder decides to use information on both SW and LS and to use all available information on full sibs and half sibs. To calculate the expected response to selection the breeder uses selection index theory. Summarize the information sources available for each candidate for both traits and give dimension of the P and G matrices separately for male and female selection candidates.
(7 marks)
4. Consider a breeding program with discrete generations in pigs. The breeding goal consists of two traits i.e., growth rate (kg/day) and litter size (no. of piglets/litter). Economic values are KES 80 per kg/day for growth rate and KES 12 per piglet per litter.

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Each generation 40 boars and 200 sows are selected as parents of the next generation.

Each boar is mated to 5 sows to produce the next generation of selection candidates.

Each sow produces 4 male and 4 female offspring. Out of the 4 male offspring, 2 are randomly taken as selection candidates and the other two are immediately culled after birth. All the four female offspring are considered as selection candidates. As a consequence, selected proportions are 25% in females and 10% in males and selection intensities are 1.271 and 1.755 in females and males, respectively.

Growth is recorded on all selection candidates and litter size on all female selection candidates. Generation interval is 1.7 years in both sexes.

- a. Give the selection index for the males and explain all the terms in the index.
(5 marks)
- b. For female candidates only. List the amount of full and half-sib information that a female candidate has for each trait.
(7 marks)
- c. Give and explains entries in the P and G matrices for female selection candidates.
(8 marks)

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