

THE NATIONAL UNIVERSITY OF LESOTHO

FACULTY OF AGRICULTURE

BACHELOR OF SCIENCE IN AGRICULTURE (ANIMAL SCIENCE)

ANS4503: APPLIED ANIMAL BREEDING

FIRST SEMESTER FINAL EXAMINATION

JANUARY 2024

MARKS: 100

TIME: 3:00 HOURS

INSTRUCTIONS:

- 1. Answer All Questions**
 - 2. You are allowed to use a calculator**
 - 3. Show all your workings where calculations are involved**
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Question 1

a) Define the following terms as used in Animal breeding:

- i. Maternal heterosis. [2]
- ii. Effective population size. [2]
- iii. Quazi-Quantitative trait. [2]
- iv. Bottleneck effect. [4]

b) Given the following alleles at the J locus: J, J¹, j, and j¹, list all possible:

- i) Homozygous combinations. [2]
- ii) Heterozygous combinations. [3]

Question 2

A Merino sheep farmer in the mountains of Lesotho observed that the recessive allele w for black wool has become established in his flock of 1,024 and that about 1 out of every 256 sheep expresses the trait.

i) The farmer wishes to know how many of the normal sheep carry the recessive allele. Assuming the population is randomly mated and all genotypes have the same reproductive fitness, what is this proportion? [10]

ii) How many of the remaining 1,020 animals having white wool can be expected to be homozygous? [10]

Question 3

a) A breeding policy is supposed to clearly lay out guidelines and strategies for conservation and utilization of animal genetic resources. In respect to this, briefly write about livestock breeding policy and give examples where possible. [8]

b) As an officer in the Department of Livestock, how would you assist the farmer to select the best performing dairy cows based on the performance data the farmer kept (Table 1) and convince him/her that the selected cows are indeed the best. [15]

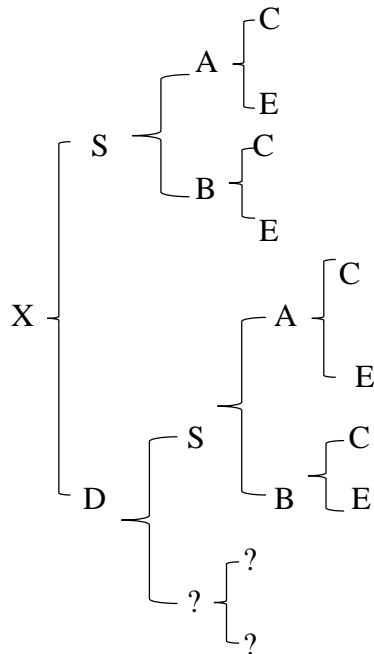
Table 1 Dairy cows' performance data

Traits	Independent culling levels	Dairy cows			
		A	B	C	D
Milk yield	30L	60	37	28	40
% fat	3.1%	3.0	3.1	4.2	2.9
% protein	3.0%	2.9	3.0	3.1	2.8
Service per conception	2	2	1	3	4

Question 4

a) Mating animals that are closely related to each other by ancestry is not a recommended practice. Briefly explain why farmers should avoid mating such animals. [8]

b) Given the following pedigree information, use the Path method to calculate the inbreeding level of an individual X. [15]



Question 5

a) Technologies of molecular biology can be used to genetically engineer animals in order to improve their suitability for agricultural applications. In this context, briefly explain how hormones with follicular stimulating ability in conjunction with embryo transfer can be used to genetically improve the reproductive rate of animals. [9]

b) A ram was bred to eight of his daughters to see if he carries any undesirable alleles. Four daughters produced twins, three produced singles and one produced triplets. All lambs were normal. How confident are we that the ram does not carry any undesirable genes? [10]