NATIONAL UNIVERSITY OF LESOTHO

FACULTY OF AGRICULTURE

DEPARTMENT OF ANIMAL SCIENCE

B.Sc. AGRICULTURE (ANIMAL SCIENCE)

ANS2506: QUANTITATIVE GENETICS AND ANALYSIS OF TRAITS

SUPPLEMENTARY EXAMINATION

AUGUST, 2023 MARKS: 100 TIME: 3:00 HOURS

INSTRUCTIONS:

1. **ANSWER ALL QUESTIONS**
2. **YOU ARE ALLOWED TO USE A CALCULATOR**
3. **SHOW ALL YOUR WORKING WHERE CALCULATIONS ARE INVOLVED**
4. **NUMBER EACH QUESTION APPROPRIATEELY**

Question 1

a) Define the following terms as used in animal breeding and give examples where possible:

i. Phenotype. [2]
ii. Independent gene effects. [2]
iii. Single source of information. [2]
iv. Recombination. [2]
v. Collateral relatives. [2]
vi. Pleiotropic effect. [2]
vii. Additive value. [2]

b) Compare and contrast between simply-inherited and polygenic traits. [10]

Question 2

a) Write short notes on the following:

i. Regulation of cell proliferation. [4]
ii. Mitosis. [4]
iii. Mendelian inheritance. [6]

b) When breeders receive data on some characteristics, he or she runs some basic statistical analyses to be familiar with the data. In relation to this, briefly explain these basic statistical analyses. [10]

Question 3

Given the data on weaning weights (kg) and grease fleece weights (kg) simulated for 10 sheep,

Weaning weights (X)	**Grease fleece weights (Y)**
66.6	2.2
67.5	2.4
54.0	1.7
53.3	1.8
65.2	2.3
62.6	2.8
55.4	1.9
54.1	1.8
57.2	2.0
59.2	2.1
Total 595.1	21.0

calculate the following:

i. Variance for both traits. [8]
ii. Covariance. [4]
iii. Correlation coefficient. [2]

Question 4

a) Describe each element of a selection index equation in statistical terms. [6]

b) Define producing ability and clearly outline its significance in animal production. [6]

c) How would information about the heritability of the traits help you make decisions about animal management? [9]

Question 5

a) Define producing ability and clearly outline its significance in animal production. [5]

b) With the following data on records of lengths taken by horses at the finish in their first two races:

Lengths taken		
Horse #	Race # 1	Race # 2
1	0.0	0.0
2	4.5	3.0
3	9.0	10.5
4	4.0	0.0
5	13.0	9.5
6	5.5	7.0

i. Calculate repeatability for lengths taken from this admittedly smaller sample. [10]
ii. Is the first race performance a good indicator of the second race performance and why? [2]