

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

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

ANBG 851: PREDICTION OF BREEDING VALUES

STREAMS: MSc. ANGB

TIME: 2 HOURS

DAY/DATE: TUESDAY 18/4/2023

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

- i. Attempt ALL questions
- ii. You can use a computer program e.g. R or MS Excel to do computations
- iii. Show your working

SECTION A: 20 marks

1. Breeding values are estimated by regressing true breeding value on phenotypic performance and μ as shown below.

$$\hat{A} = b_p(p - \mu)$$

- a. What is the regression coefficient (b_p) for an estimate based on a single record on an individual. (5 marks)
- b. Write out the selection index for estimating a breeding value for a cow based on own-performance record and dams performance record. Explain the terms in the index. (5 marks)
2. Use the information provided to:
 - a. Estimate the breeding value of the sire. (4 marks)
 - b. Determine the accuracy of the estimated breeding value. (3 marks)
 - c. Predict the performance of a future daughter to the sire. (3 marks)

mean of 25 progeny = 250 kg; $h^2 = 0.30$, population mean = 200kg

SECTION B: 40 MARKS

3. In a dairy cattle breeding program bulls are evaluated based on the information shown below:

- Dam performance
- Mean performance of 20 paternal half sibs
- Mean performance of 100 daughters

- a. Write the index for the bull and explain the terms. (5 marks)
 - b. Calculate the accuracy of breeding value estimate using the above information. (5 marks)
 - c. Discuss the advantages of using Best Linear Model Prediction (BLUP) rather than selection index (BLP) and in breeding values estimation. (5 marks)
 - d. Write out and explain the terms in the BLUP linear model and the so-called Least Squares Equations corresponding to the model. (5 marks)
4. The table below presents milk yield for cows reared in two herds. Use the information to answer the questions that follow.

Cow	Sire	Herd	Production (kg)
4	1	1	7000
5	2	1	6600
6	3	1	6800
7	3	1	7200
8	2	2	8000
9	2	2	8300
10	3	2	8900

- a. Describe the linear model for the data. (5 marks)
- b. Construct the mixed model matrices and estimate breeding values for sires. (15 marks)

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