KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ANIMAL SCIENCE
SECOND SEMESTER 2024/2025
[JANUARY – APRIL, 2025]

ANSC 241: QUANTITATIVE GENETICS AND ANIMAL BREEDING

STREAM: Y2 S2 **TIME: 2 HOURS**

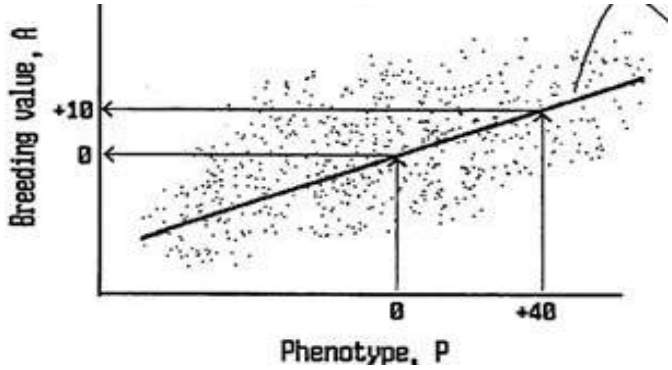
DAY: THURSDAY, 9:00 - 11:00 A.M. **DATE: 17/04/2025**

INSTRUCTIONS:
1. Do not write anything on this question paper.
2. Answer question ONE in section A (Compulsory) and any other TWO questions from section B.

SECTION A (30 MARKS)

1. Citing relevant examples distinguish the following:
   (a) Breed and species (3 marks)
   (b) Genetic value and Breeding value (3 marks)
   (c)Direct markers and Linked markers (3 marks)
   (d) Direct selection and indirect selection (3 marks)
2. Molecular genetics techniques aim to locate and exploit gene loci, which have a major effect on quantitative traits (hence QTL – Quantitative Trait Loci). Several QTL are already known to exist. Identify these QTL with their respective role. (6 marks)
3. (i) State the Hardy-Weinberg equilibrium law (2 marks)
   (ii) In a monogenic trait with two alleles A and a. The animals will have one out of the three genotypes possible: A/A, A/a or a/a. Consider a population of 4000 animals, AA individuals=1000, Aa =2000 and aa =1000 for which we want to calculate the allele frequencies for a single locus that shows incomplete dominance. Because there is incomplete dominance, we can distinguish the heterozygote from both homozygotes.
   a. Calculate the genotypic frequencies (3 marks)
   b. Determine the allele frequencies (2 marks)

4. In the figure below, breeding value (A) and phenotype (P) are given, show how the heritability is derived and estimate the heritability (5 marks)



SECTION B (40 MARKS)

5. (a) Using appropriate illustrations distinguish between closed and open nucleus breeding schemes (6 marks)

(b)Discuss why cross breeding is important in animal breeding (14 marks)

6. (i) Outline the procedure for designing and evaluating a breeding programme (6 marks)

(ii) Explain the steps involved in setting up a typical breeding program (7 marks)

(iii) What are the functional merits of Best Linear Unbiased Prediction–BLUP (6 marks)

7. (a) Discuss the causes of genetic change in a population (10 marks)

(b) Discuss the consequences of inbreeding in a herd of cattle (10 marks)