



**UNIVERSITY OF ESWATINI
FINAL EXAMINATION PAPER**

**PROGRAMME: BSc ANIMAL SCIENCE
 BSc ANIMAL SCIENCE (DAIRY OPTION)**

COURSE CODE: ASC405/AS405

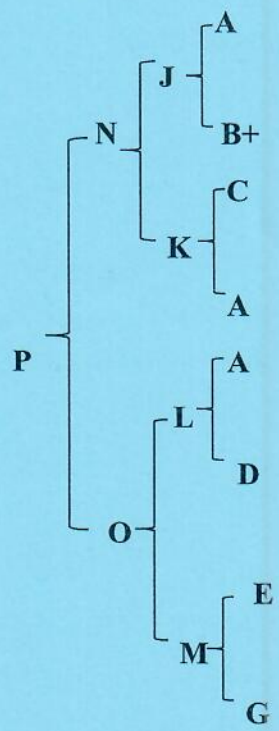
TITLE OF PAPER: ANIMAL BREEDING

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE
CHIEF INVIGILATOR**

Question 1



- (a) Organize this pedigree into an arrow diagram so that it can be used to determine relationships between animals. (7 Marks)
- (b) What are half sibs? List all the half sibs in the pedigree. (5 Marks)
- (c) What is an inbred? List all inbreds in this pedigree. (4 Marks)
- (d) What is the inbreeding co-efficient of P? (7 Marks)
- (e) Define additive genetic relationship and give an example. (2 Marks)

Question 2

After graduating for your BSc in Animal Science in 2019, you are tasked to lead a team of scientists to study the population of “Nzima” an indigenous chicken in the Tsunami affected province of Japan. The feather colour of the chickens vary from Red (dominant) to white (recessive). Assume the population is in Hardy-Weinberg equilibrium. You observed 336 red chickens and 64 white during your study.

- (a) The **Hardy-Weinberg** equilibrium name comes from two (2) scientists of the last century who contributed immensely in the field of population genetics. Who are these scientists? What are their nationalities and their areas of specialization? (2 Marks)
- (b) What is the frequency of the homozygous recessive genotype in the population? (2 Marks)
- (c) What is the allelic frequency of the dominant allele in the population? (2 Marks)

- (d) Of the observed chickens how many are heterozygous? (2 Marks)

You make another trip to Japan and at this time you observe 650 animals.

- (e) How many of the 650 animals would you expect to be red, assuming the population is still in Hardy-Weinberg equilibrium? (3 Marks)
- (f) How many of these red animals are homozygous for the dominant allele? (1 Mark)
- (g) How many of these 650 chickens would you expect to be white, assuming the population is still in Hardy-Weinberg equilibrium? (1 Mark)
- (h) As you observe the animals you count 200 white chickens and 450 red. Ensuring you use a clearly labelled table or equation by first stating both hypotheses, conduct a chi-square test to determine if your observations are significantly different from what you expect. Use $\alpha = 0.05$. (5 Marks)

Note: Ensure you use a clearly labelled table or an equation and both hypotheses are stated before any conclusion is made.

**** Back page has the tables and chi square values to make conclusion from.**

- (i) Is this population evolving or not? (1 Mark)
- (j) Define positive assortative mating and give one example. (2 Marks)
- (k) State the effects of positive assortative mating on gene, and genotypic frequencies in a population showing what proportions of each frequency is left after one generation of positive assortative mating. (4 Marks)

Question 3

- (a) Differentiate between adaptive value and estimated breeding value. (4 Marks)
- (b) Discuss in detail the mating of male to his daughters as a progeny test for recessive traits. (8 Marks)
- (c) What is animal breeding and how does it apply to animal production? (3 Marks)
- (d) "Breeding is gambling" Give two reasons why breeding is "a game of chance" (4 Marks)
- (e) Enumerate 3 reasons that make beef producers to consider crossbreeding rather than traditional straight-breeding programs for their enterprises. (6 Marks)

Question 4

- (a) Explain four (4) benefits of animal breeding in modern livestock production. (8 Marks)
 - (b) There are five basic crossbreeding systems available to the commercial beef producer. Briefly discuss the backcross system. (6 Marks)
- A herd of 200 cows has allele frequency of "F"=0.20 and "f"=0.80 at the low fat locus. At the same locus, a herd of 50 cows imported into the herd has a gene frequency of F=0.50 and f=0.50.**
- (c) What is the change in "F" after the migration event? (2 Marks)
 - (d) What are the new allele frequencies after the migration event? (3 Marks)
 - (e) Distinguish between qualitative and quantitative traits in livestock giving two examples of each. (6 Marks)

Question 5

Table 1 below presents 205 day lactation records from Luyengo dairy farm. Copy table 1 into your answer book, then answer the question below it.

Table 1: Lactation records from Luyengo dairy farm

Cow ear Tag	205 day yield (kg)	EBV
220	2800	
320	2755	
340	3300	
390	1800	
401	3000	
411	2005	
412	1800	
413	3000	
414	2550	
416	1650	

- (a) Calculate the EBV for each animal in the herd and write it in the empty space. The working must be clearly shown. **(10 Marks)**
- (b) Select best cows for breeding in the next season and list their ID's. **(3 Marks)**
- (c) Calculate the selection differential. **(2 Marks)**
- (d) If the heritability (h^2) for 205 day lactation yield is 0.35, what is selection response? **(5 Marks)**
- (e) What is the expected mean 205 day yield of progeny from the selected animals? **(5 Marks)**

Table A: Percentage points of the chi-square distribution

DF	$\alpha=0.10$	$\alpha=0.05$	$\alpha=0.025$	$\alpha=0.010$	$\alpha=0.005$
1	2.70554	3.84146	5.02389	6.63490	7.87944
2	4.60517	5.99147	7.37776	9.21034	10.5966
3	6.25139	7.81473	9.34840	11.3449	12.8381
4	7.77944	9.48773	11.1433	13.2767	14.8602
5	9.23635	11.0705	12.8325	15.0863	16.7496
6	10.6446	12.5916	14.4494	16.8119	18.5476
7	12.0170	14.0671	16.0128	18.4753	20.2777
8	13.3616	15.5073	17.5346	20.0902	21.9550
9	14.6837	16.9190	19.0228	21.6660	23.5893
10	15.9871	18.3070	20.4831	23.2093	25.1882