

CHUKA



UNIVERSITY

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**EXAMINATION FOR THE AWARD OF DEGREE OF
DOCTOR OF PHILOSOPHY IN BOTANY (PLANT PATHOLOGY AND BOTANY
MICROBIOLOGY AND BIOTECHNOLOGY)**

BOTA 973: POPULATION GENETICS AND BIOINFORMATICS

STREAMS: PHD

TIME: 3 HOURS

DAY/DATE: FRIDAY 24/04/2020

8.30 AM – 11.30 AM

INSTRUCTIONS:

- Answer any Three Questions
- Use calculators and statistical tables is allowed
- Do not write anything on the question paper

QUESTION ONE (20 MARKS)

- (a) Given the following pedigree (figure 1), construct a table showing the coefficient of relationship between each individual. [10 marks]

Figure 1: Relationship between different individuals.

- (b) Discuss the genetic mode of inheritance. [10 marks]

QUESTION TWO (20 MARKS)

- (a) Using a hypothetical locus, derived the equations for estimating additive and dominance genetic variance. [10 marks]
- (b) The following data (Table 1) was obtained from a cross of two cultivars of rice.
Table 1: Mean and variance in number of spikelets in a cross of two cultivars rice

Genotype	Number of individuals analysed	Mean	Variance (σ^2)
P ₁	20	24.5	79
P ₂	20	25.9	62
F ₁	20	24.3	67
F ₂	650	25.3	143
BC ₁ (F ₁ x P ₁)	20	24.4	133
BC ₂ (F ₁ x P ₂)	20	24.8	81

- (i) Using the equations derived in part (a) above compute the genetic variance and degree of dominance for number of spikelets in rice (Table 1) [6 marks]
- (ii) Calculate heritability for the number of spikelets in rice (Table 1) [4 marks]

QUESTION THREE (20 MARKS)

- (a) Discuss genome annotation, giving a workflow. [10 marks]
- (b) Discuss gene prediction methods. [10 marks]

QUESTION FOUR (20 MARKS)

- (a) Discuss factors causing change in genetic structure. [10 marks]
- (b) Discuss population genetic selection models. [10 marks]
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