CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN BOTANYU AND DOCTORATE OF PHILOSOPHY IN ZOOLOGY

ZOOL 941:   POPULATION GENETICS

STREAMS: PhD (ZOOLOGY) & PhD (ZOOLOGY)   **TIME: 3 HOURS**

DAY/DATE: MONDAY 6/08/2018   **2.30 P.M - 5.30 P.M.**

INSTRUCTIONS:
- **Answer ANY THREE Questions.**
- **Use of 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 coefficients of relationship between each individual.   [10 Marks]
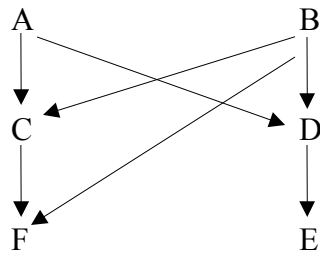

Figure 1: Relationship between different individuals.

(b) Discuss the genetic modes of inheritance.   [10 Marks]

QUESTION TWO [20 MARKS]
(a) Using a hypothetical locus, derive the equations for estimating additive and dominance genetic variance.   [10 Marks]

(b) The following data (Table 1) was obtained from across of two cultivars of rice.

Table 1: Mean and variance in number of spikelets in a cross of two cultivars of rice

Genotype	Number of individuals analyzed	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. (Table1.)   [4 Marks]

QUESTION THREE [20 MARKS]
Discuss natural selection models used in population genetics.

QUESTIONFOUR [20 MARKS]
Discuss factors causing change in genetic structure.
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