NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF TECHNICAL TEACHER EDUCATION

Programme: BACHELOR OF EDUCATION HONOURS DEGREE

SUPPLEMENTARY EXAMINATION

Course:	Genetics	TTE 1137
Part/year:	I	January 2011
Time:	3 hours	100 marks

Instructions

1. Answer any **FOUR [4]** questions.
2. Questions maybe answered in any order
3. All questions carry **[25 marks]** each

1(a) Each of the following F_2 phenotypic ratios of offspring may result from crossing two F_1 individuals each heterozygous for two autosomal genes. Explain with the aid of examples the phenomena underlying each ratio:

(i) 15:1 (5 marks)

(ii) 9:7 (5 marks)

(iii) 9:3:4 (5 marks)

(b) Using examples briefly describe the different allelic interactions that lead to deviations from the classical Mendelian observations. (10 marks)

2(a) The frequency of newborn infants homozygous for the recessive lethal allele is about 1 in 25 000. Calculate the expected frequency of the carriers of this allele in the population. (5 marks)

2(b) In Tuli cattle the genotype C^RC^R is phenotypically red, C^RC^W is roan (a mixture of red and white) and C^WC^W is white. A population of Tulis found in Gwanda district had 728 red, 924 roam and 215 white animals. Use an appropriate statistical test to determine if this cattle population is in Hardy-Weinberg equilibrium. (20 marks)

3. In maize a variety homozygous for recessive gene *a (green), d (dwarf),* and *rg (normal leaves)* was crossed to a variety homozygous for their dominant alleles *A (red), D (tall)* and *Rg (ragged*

leaves). Offspring of this cross were then backcrossed to homozygous recessive plants, the progeny of this back cross are listed below:

Phenotype	**Number**
A D Rg	265
a d rg	275
A D rg	24
a d Rg	16
A d rg	90
a D Rg	70
A d Rg	120
a D rg	140

(a) Which of the above phenotypic classes represent crossovers between:

(i) *a* and *d*? (2 marks)

(ii) *d* and *rg*? (2 marks)

(iii) *a* and *rg*? (2 marks)

(b) Propose a linkage map with distances between these genes. (15 marks)

(c) Calculate the degree of interference for this cross. (4 marks)

4. Write an essay on aneuploidy and euploidy and briefly discuss their role in agricultural and medical genetics.

5. Describe the different probability rules that are used in genetic analysis, illustrate your answer with appropriate examples.

6. Write short notes on the following:

(i) Expressivity and penetrance. (10 marks)

(ii) Narrow sense and realised heritability. (10 marks)

(iii) Sex influenced and sex limited traits (5 marks)

END OF EXAMINATION