(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

(MAIN CAMPUSES)

UNIVERSITY EXAMINATIONS 2023/2024 ACADEMIC YEAR

FIRST YEAR FIRST END OFSEMESTER EXAMINATIONS

FOR THE BACHELOR OF SCIENCE IN EPIDEMIOLOGY AND BIOSTATISTICS

COURSE CODE: HEM 415

COURSE TITLE: GENETIC EPIDEMIOLOGY AND STATISTICS

DATE: 7/12/2023 **TIME: 11.00-1.00 PM**

INSTRUCTIONS:
ANSWER ALL QUESTIONS IN SECTION A, AND ANY TWO IN SECTION B

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over

SECTION A: ATTEMPT ALL THE QUESTIONS IN THIS SESSION (40 MARKS)

1. Define the following terms (4 marks)
   a. Single Nucleotide Polymorphism:
   b. Linkage Disequilibrium:
   c. Ascertainment bias:
   d. Genotype:
2. Note down Mendel's Law of Inheritance (4 marks)
3. Illustrate a schematic representation of meiotic division (4 marks)
4. In an ideal situation when mating is random in a large population with no disruptive circumstances, both genotype and allele frequencies will always remain constant. Mention **FOUR (4)** factors that can make this statement change (4 marks)
5. The Foxes colour can be due to traits specific to combinations of genes. This colour can be affected by? (4 marks)
6. Differentiate between the following: (4 marks)
   a) Homozygous alleles and heterozygous alleles
   b) Trisomy and monosomy
7. Use the following information to answer;

Class	Observed	Expected
Cr-Ms-	181	156.9
Cr-msms	33	52.3
crcrMs-	35	52.3
crcrmsms	30	17.4

   I. Calculate χ^2 due to segregation at Ms locus (2 marks)
   II. Calculate joint segregation or linkage χ^2L (2 marks)
8. In order to do a quantitative trait locus analysis what are some of the important aspects to remember? (4 marks)
9. Fill in the following table with if B represents black and b represents brown:

Genotype group			
Model	BB	Bb	bb
B is dominant			
B is recessive			
B is co-dominant			

10. The genetic distance between the two genes is 10cM that has 17 individuals out of it 5 are recombinants. Calculate the LOD score in this population and if the linkage should be included. (4 marks)

SECTION B: ANSWER ANY OF THE TWO QUESTIONS IN THIS SESSION (30 MARKS)

1. a) Differentiate between the two main types of chromosomal abnormalities. (5 marks)

b) Discuss FIVE (5) major types of structural abnormalities. (10 marks)

2. a) Name FIVE (5) important features of double helix model of DNA (5 marks)

b) Discuss FIVE (5) genetic components that does not follow strict Mendelian Laws of Inheritance (10 marks)

3. a) Discuss briefly the models that explains the interaction of gene and environment in genetics? (5 marks)

b) Use the following information to answer the questions below. In a scenario involving two traits in pea plants; seed color (yellow or green) and seed shape (round and wrinkled)

I. Show the crossing over of F1 generation (4 marks)

II. What is the phenotypic ratio of the F2 offspring? (6 marks)