



MAASAI MARA UNIVERSITY
REGULAR UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR
SCHOOL OF BUSINESS AND ECONOMICS
BACHELOR OF SCIENCE IN ECONOMICS,
BACHELOR OF SCIENCE IN FINANCIAL
ECONOMICS, BACHELOR OF SCIENCE IN
ECONOMICS AND STATISTICS, BACHELOR OF
SCIENCE IN AGRICULTURAL ECONOMICS AND
RESOURCE MANAGEMENT AND BACHELOR OF
SCIENCE IN AGRIBUSINESS MANAGEMENT

FIRST YEAR SECOND SEMESTER

COURSE CODE: ECO 1205-1

COURSE TITLE: APPLIED STATISTICS

DATE: TIME:

INSTRUCTIONS:

Answer **Question One** and any other **Two Questions**

QUESTION ONE

- a. Differentiate between the following terms.
- Parameter and Statistic. **(2 marks)**
 - Type I error and Type II error. **(2 marks)**
 - Unbiased Estimator and Efficient Estimator. **(2 marks)**
- b. A construction firm was charged with inflating the expense vouchers it files in conjunction with construction contracts with the government. The contract states that a certain type of Job should average \$ 1,150. In the interest of time, the directors of only 12 government agencies were called on to enter the court testimony regarding the firm 's vouchers. If a mean of \$1275 and a standard deviation of \$ 235 are discovered from the testimony, would a 95% Confidence Interval support the firm 's legal case? Assume voucher amounts are normal. **(4 marks)**
- c. Diameter of a steel ball bearing produced on a semi-automatic machine is known to be distributed normally with mean 12 cm and standard deviation 0.1 cm. If we take a random sample of size 10 then find;
- Mean and variance of sampling distribution of mean. **(2 marks)**
 - The probability that the sample mean lies between 11.95 cm and 12.05 **(3 marks)**
- d. Electric CFL manufactured by company A have mean lifetime of 2400 hours with standard deviation 200 hours, while CFL manufactured by company B have mean lifetime of 2200 hours with standard deviation of 100 hours. If random samples of 125 electric CFL of each company are tested, find the probability that the CFLs of company A will have a mean lifetime at least 160 hours more than the mean lifetime of the CFLs of company B. **(3 marks)**
- e. Give any two benefits of sampling distributions in research. **(2 marks)**

QUESTION TWO

- a. The per capita income of a certain country is known to be normally distributed with a variance of 0.3 million. A random sample of 10 residents from the country were selected to determine their per capita income. Determine the probability that the variance in per capita income for the sample will be;
- At most 0.0577 million. **(2 marks)**
 - At most 0.6340 million. **(2 marks)**
 - Between 0.9 million and 0.4893 million. **(3 marks)**
- b. Suppose that X is a random variable with mean μ and variance σ^2 . Let $x_1, x_2, x_3, \dots, x_n$ be a random variable of size of size n from the population represented by X . Show that the sample mean \bar{X} and sample variance S^2 are unbiased estimators of μ and σ^2 respectively. **(8 marks)**

QUESTIONTHREE

It is believed that the population size of a town is directly related to the number of crimes. The table below shows the distribution between number of crimes recorded and the number of crimes in the respective town.

Population in '000	50	65	72	80	68	82
Number of crimes in '000	5	7.5	8.3	9.5	8.0	9.6

- Determine Pearson coefficient of correlation between population size and number of crimes and comment on the relationship. **(5 marks)**
- Fit a linear regression model to predict the number of crimes in town based on the population size, hence interpret the results. **(8 marks)**
- Using the model in (ii), predict the number of crimes expected when the population size of the town is 69000. **(2 marks)**

QUESTIONFOUR

Consider a butter fat production for cow during a 305 day milk production period following the birth of a calf. Let X and Y equal the butterfat production in such cows on a farm in Narok and Limuru respectively. Twelve observations of X and Sixteen observations of Y given as illustrated below;

Observations of X	Observations of Y
649 657 714 877 975 468	699 891 632 815 589 764 524 727
567 849 721 791 874 405	597 868 652 978 479 733 549 790

Assuming that the distribution butterfat in both locations is normally distributed.

- Using 90% level of confidence, calculate the confidence interval for the ratio of the two variances. **(7 marks)**
- Find confidence interval for the difference between means in butterfat content of cows in Narok and those in Limuru on using 95% confidence interval assuming equal but unknown variances. **(5 marks)**

- c. A manufacturer of electronic calculators is interested in estimating the fraction of defective units produced. A random sample of 800 calculators contain 10 defectives. Compute a 99% confidence interval for the fraction of defective units. **(3 marks)**