



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

SEPTEMBER – DECEMBER 2019 TRIMESTER

FACULTY OF ARTS AND SOCIAL SCIENCES

DEPARTMENT OF SOCIAL SCIENCES

REGULAR PROGRAMME

**SSO 303: ADVANCED SOCIAL STATISTICS/SDS 311: STATISTICAL
TECHNIQUES**

Date: DECEMBER 2019

Duration: 2 Hours

INSTRUCTIONS: Answer Questions ONE and any other TWO Questions

- Q1. a) The makers of Duracell batteries want to demonstrate that their size AA battery lasts on an average of at least 45 minutes longer than Duracell's main competitor, the Energizer. Two independent random samples of 100 batteries of each kind are selected. The sample average lives for Duracell and Energizer batteries are found to be $\bar{X}_1=308$ minutes and $\bar{X}_2=254$ minutes respectively. Assume $\sigma_1=84$ minutes and $\sigma_2=67$ minutes. Is there any evidence to substantiate Duracell's claim that its batteries last, on average, at least 45 minutes longer than Energizer of the same size?
(6 Marks)

- b) Suppose that you are a quality assurance officer and you have received complaints from customers concerning the products of your institution. Explain the steps you would follow to conduct a Statistical enquiry to verify if the customer's claims are valid or not.

(10

Marks)

- c) Distinguish between consistency and efficiency in reference to properties of a statistical estimator.

(4 Marks)

d) Find and explain the regression equation of X and Y and the coefficient of correlation from the following data:
 $\sum X_i = 60$, $\sum Y_i = 60$, $\sum X_i Y_i = 1150$, $\sum X_i^2 = 4160$, $\sum Y_i^2 = 1720$ and $N = 10$.

(10

Marks)

Q2. a) An institution wants its entire staff to be computer literate. Three institutions A, B and C are available. From past experience, 14 people who underwent training from the institutions were evaluated as follows: -

| | | | | | |
|---|---|---|---|---|---|
| A | 3 | 4 | 2 | 4 | 2 |
| B | 4 | 5 | 4 | 6 | |
| C | 6 | 6 | 6 | 4 | 3 |

- i) State the appropriate null and alternative hypothesis for determining whether a difference exists in the training offered. (4 Marks)
- ii) Construct the relevant ANOVA table and test the null hypothesis at $\alpha = 0.05$ (8 Marks)
- b) Outline the steps followed in hypothesis testing (6 Marks)
- c) Distinguish between one tailed test and two tailed test (2

Marks)

Marks)

Q3. a) In an opinion survey regarding a certain political issue there was some question as to whether or not the eligible voters under 25 years of age might view the issue differently from those over 25 years. 1500 individuals of those over 25 years were interviewed and 1000 of those under 25 years were interviewed with the following results

| | Opposed | Undecided | Favour | Total |
|----------|---------|-----------|--------|-------|
| Under 25 | 400 | 100 | 500 | 1000 |
| Over 25 | 600 | 400 | 500 | 1500 |
| Total | 1000 | 500 | 1000 | 2500 |

Test the null hypothesis that there is no evidence of difference of opinion due to the different age grouping; take $\alpha = 0.05$

(10 Marks)

- b) Why would a researcher prefer sampling to census

(6 Marks)

- c) Using a relevant example distinguish between type I error and type II error (4

Marks)

Q4. The time it takes an international telephone operator to place an overseas phone call is normally distributed with mean 45 seconds and standard deviation 10 seconds.

- i) What is the probability that my call will go through in less than 1 minute? (2 Marks)
- ii) What is the probability that my call will get through in less than 40 seconds? (2 Marks)
- iii) What is the probability that I will have to wait more than 70 seconds for my call to go through? (3

Marks)

- a) Discuss probability and nonprobability sampling techniques (8

Marks)

- b) Discuss the procedure of selecting a good sample (5 Marks)

(5 Marks)

Q5. a) Given the following data

| Class | frequency |
|-----------|-----------|
| 20 – 40 | 5 |
| 41 – 60 | 7 |
| 61 – 80 | 15 |
| 81 – 100 | 10 |
| 101 – 120 | 22 |
| 121 – 140 | 12 |
| 141 – 160 | 8 |
| 161 – 180 | 4 |

- i) Calculate the Mean, Median and Mode. (8 Marks)
- ii) Find the Standard Deviation of this distribution. (4 Marks)

Explain how raw data is prepared for analysis

(8 Marks)

END