



**ALUPE UNIVERSITY
COLLEGE**

... Bastion of Knowledge ...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, RESEARCH AND STUDENT AFFAIRS**

SCHOOL OF EDUCATION AND SOCIAL SCIENCES

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY AND POLICY MANAGEMENT

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

**FIRST YEAR FIRST SEMESTER REGULAR-SUPPLIMENTARY
EXAMINATION**

FOR THE DEGREE OF BACHELOR OF EDUCATION

~~MARKING GUIDE~~

COURSE CODE: PSY 110

COURSE TITLE: QUANTITATIVE TECHNIQUES IN EDUCATION

DATE: 6/09/2023

TIME: 9-11PM

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**
- THIS PAPER CONSISTS OF 7 PRINTED PAGES PLEASE TURN OVER**

PSY 110: QUANTITATIVE TECHNIQUES IN EDUCATION

STREAM: BED

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

- i. Answer Question **ONE** and any other **Two**
- ii. Do not write on the question paper

QUESTION ONE

- a) Using examples, differentiate between
 - i. Open set and open-closed set (2mark)
 - ii. Equivalent sets and equal sets (2mark)
 - iii. Singular matrix and square matrix (2mark)
 - iv. Natural numbers and positive integers (2mark)
- b) Explain the following terms as used in statistics (3marks)
 - i. Quartiles
 - ii. Deciles
 - iii. Percentiles
- c) State four properties of a square matrix (4marks)

d) **Proof:** Given $\text{Log}_b y = \frac{\log_a y}{\log_a b}$

But $x = \text{Log}_b y$

Therefore $\text{Log}_b^y = \frac{\log_a y}{\log_a b}$ (4marks)

- e) The following distribution gives the pattern of overtime work per week done by 100 employees of a company. Calculate median of the distribution

Overtime hours	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
No. of employees	11	20	35	20	8	6

(5marks)

f) Find the Geometric mean (G.M) of the following data: x_n : 1, 2, 3, 4, 5, 6
(2marks)

g) State four methods of finding the trend of a time series. (4marks)

QUESTION TWO

a) From the quadratic formular; $x = \frac{-b \pm (b^2 - 4ac)^{1/2}}{2a}$
or
 $x = \frac{-b - (b^2 - 4ac)^{1/2}}{2a}$

Describe the nature of the solutions when the discriminant:

- i. is positive
- ii. is zero
- iii. is negative -a pair of complex solutions (6marks)

b) using factorization, solve the equation; $5x^2 + 6x + 1 = 0$ (4marks)

c) solve the following systems of equation using the row reduction method
 $3x + y - z = 9$
 $2x - 2y + z = -3$
 $x + y + z = 7$ (10marks)

QUESTION THREE

a) State the principle of inclusion-exclusion as applied to sets (2marks)

b) Given that a set $S = \{A, MO, LU, JU, RO, LIN, D, JO, MI\}$

$$C = \{MO, LU, JU\}$$

$$A = \{RO, JU, LIN\}$$

Find

- i. $S - (C \cup A)$ (2marks)
- ii. $S - (C \cap A)$ (2marks)
- iii. Show that $n(C \cup A) = n(C) + n(A) - n(C \cap A)$ (4marks)
- c) All lecturers of Qs are either members of the music club or science club. 18 lecturers are members of both, 21 belong to the music club, 23 belong to the science club. How many lecturers are there in the club? (4marks)
- d) In the year 2008, *Executive magazine* surveyed the presidents of the 500 largest corporations in the United States. Of these 500 people, 310 had degrees (of any sort) in business, 238 had undergraduate degrees in business, and 184 had graduate degrees in business. How many presidents had both undergraduate and graduate degrees in business? (6marks)

Let $S = \{\text{presidents with an undergraduate degree in business}\}$

$T = \{\text{presidents with a graduate degree in business}\}$

Then

$S \cup T = \{\text{presidents with at least one degree in business}\}$

$S \cap T = \{\text{presidents with both undergraduate and graduate degrees in business}\}$. From the data given we have

$$n(S) = 238, n(T) = 184, n(S \cup T) = 310$$

By the inclusion-exclusion principle we have $n(S \cup T) = n(S) + n(T) - n(S \cap T)$

$$310 = 238 + 184 - n(S \cap T)$$

$$\therefore n(S \cap T) = 112$$

QUESTION FOUR

The table below shows the length in cm of 80 plants of a particular species of tomato:

Length	152-156	157-161	162-166	167-171	172-176	177-181
Frequency	12	14	24	15	8	7

- a. Using Assumed mean of 169, and a constant $c=5$ where $t = (x-169)/c$, draw a frequency distribution table for this distribution. (4mark)