



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA
FIRST SEMESTER EXAMINATION, APRIL 2023

COURSE NO: MA 473

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COURSE NAME: SAMPLE SURVEY THEORY

CLASS: MA IV

TIME: 3 HOURS

Name: _____

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Answer all Questions in PART I and any One(1) from PART II

PART I

1. Prepare a flow chart for questionnaire research.
2. State the four (4) main methods of data collection.
3. Define the following as applied in sample survey theory
 - (a) Sampling methods
 - (b) Selection bias
 - (c) Sampling error
 - (d) Sampling fraction
 - (e) Sampling design
4. State three (3) indicators used to check the quality of survey results.
5. A sample design can be described by two factors name them.
6. Distinguish between proportionate and disproportionate stratification.
7. State the difference between strata and clusters.
8. State six (6) factors that influence sample size.
9. Distinguish between ratio and regression estimation.
10. State three (3) factors that cause non-sampling errors.
11. When is cluster sampling technique best to be used?
12. State the two (2) types of cluster sampling and explain them.
13. Explain multi-stage sampling technique.
14. Why do we use ratio estimation?
15. What are the sources of non-sampling error?

PART II

Answer any One (1) Question

Question 1

(a) Show that in Simple Random Sampling Without Replacement (SRSWOR) of size n , the estimate of the variance of \bar{y} , $V(\bar{y})$ is given by

Estimate of $V(\bar{y}) = \frac{N-n}{nN} S^2$ where

$$S^2 = \frac{1}{n-1} \sum (y_i - \bar{y})^2$$

(b) At the end of every academic year, the UMaT organizes an innovation fair to a sample of 36 third graders. The university system has 20,000 third graders, half boys and half girls. The results of last year's innovation fair are shown in the table below.

Stratum	Mean Score	Standard Deviation
Boys	70	10.27
Girls	80	6.66

This year, the research plan is to use a stratified sampling technique with one stratum consisting of boys and girls. Use the above information to find:

- i. Maximize precision, how many sampled students should be boys and that of girls.
- ii. What is the mean reading achievement level in the population?
- iii. Compute the confidence interval.
- iv. Find the margin of error (Assume a 95% confidence level).

Question 2

A village in the western north region depends on yield per hectares. Below table gives detailed information about the village.

$Y_i = \text{Tons of grams harvested in village } i$

$X_i = \text{Hectares of village } i, n = 24, T_x = 21875.6$ $N = 576$

$B = \text{average yields in tons per village}$

$\bar{Y}_i = \text{average yields in ton per village}$

$T_y = \text{total yields in tons}$

Village i	Y_i	X_i	Village i	Y_i	X_i
1	112	30.2	13	105.7	30.8
2	129.1	36.1	14	80.5	21.7
3	208.2	60.8	15	163.0	49.2
4	158.5	44.4	16	98.7	28.0
5	110.2	29.8	17	137.8	37.8
6	123.3	34.9	18	141.2	38.6
7	157.7	41.6	19	152.5	42.8
8	154.2	42.8	20	142.5	39.0
9	98.7	25.8	21	136.7	37.6
10	112.7	34.7	22	153.2	43.2
11	125.5	35.1	23	93.0	26.1
12	60.3	15.8	24	179.8	48.3

Find the

i. estimated variance of B .

ii. 95% confidence interval for the errors of estimation.

Good Luck !!!!!

Examiner: Dr B. Odoi