Kasarani Campus
Off Thika Road
P. O. Box 49274, 00101
NAIROBI
Westlands Campus
Pamstech House
Woodvale Grove
Tel. 4442212
Fax: 4444175

KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS, 2024/2025 ACADEMIC YEAR
THIRD YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE (MATHEMATICS)

KMA 2315: DESIGN AND ANALYSIS OF SAMPLE SURVEY

DATE: 9TH DECEMBER, 2024
TIME: 8:30AM-10:30AM

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE: COMPULSORY (30 MARKS)

a) From a list of 3042 name and addresses, a simple random sampling of 200 names showed on investigation 38 wrong addresses.
   i) Estimate the total number of address needing correction in the list **(3 Marks)**
   ii) Find the estimate error of this estimate **(3 Marks)**

b) All farms in a county are satisfied by farm size and the mean number of hectare wheat per farm in each stratum with the following results;

$Farm\ size$	$No.of\ farms(N_h)$	$mean\ wheat(\overline{y_h})$	$std\ deviation$
$0-20$	368	2.7	2.1
$21-40$	425	8.1	3.6
$41-60$	316	16.9	5.1
$61-80$	98	25.2	6.5

For a sample of 100 farms, compute the sample size of each stratum and satisfied simple random sampling under;
   i) Proportion allocation **(5 Marks)**
   ii) Neymann allocation **(5 Marks)**

c) A random sample of five chicken was taken and weighted from a total of 150 chicken. The total weight of 150 chicken of the beginning of the study was 255kg.

$Pre(x)$	$post(y)$
1.54	2.87
2.0	3.42
1.79	2.79
1.52	3.0
1.67	2.48

   i) Evaluate the ratio estimate of the mean current weight **(4 Marks)**
   ii) Obtain its standard error **(5 Marks)**

iii) Obtain the ratio regression estimate of the mean current weight, compare it with estimate in (i) **(3 Marks)**

d) Draw a simple random sampling without replacement of 6 from a population of size 500 given the following sample.
2954,6641,3992,9792,7969,5911,3170,5624,3170,4169,9524,1545,7203,5356,1340,2693 **(2 Marks)**

QUESTION TWO: (20 MARKS)

a) A random sample of six unpaid medical claim was drawn from records at a Kiriri University which has a total population of 400 unpaid medical claims. The objective was to estimate the amount of money owned by the university. The sample values for the amount owned was obtained in Ksh as follows; 340, 2380, 3310,5820,1100,1690.
   i) Estimate variance of the sample mean **(5 Marks)**
   ii) Estimate the amount of money owned by the university **(3 Marks)**
   iii) Estimate standard error of total amount of money owned **(5 Marks)**

b) In a simple random sample of size 100 from a population of size 500, there are 37 units in class.
   i) Find the total number of units in class **(3 Marks)**
   ii) Find the 5% confidence limit for the proportion. i.e. $C.I = \hat{P} \pm Z_{\propto/2} \times S \in \hat{P}$ **(4 Marks)**

QUESTION THREE: (20 MARKS)

A stratified population has S strata, the stratum of size N_h the mean $\overline{y_h}$ and variance ${S_h}^2$ of some variable y are as follows;

$Stratum$	N_h	$\overline{y_h}$	${S_h}^2$
1	117	7.3	1.31
2	98	6.9	2.03
3	74	11.2	1.13
4	41	9.1	1.96
5	45	9.6	1.74

a) Calculate the overall population mean and the variance **(8 Marks)**

b) For a satisfied simple random sampling of size 80 determine the appropriate strata sample size under;
   i) Proportional allocation **(6 Marks)**
   ii) Neymann allocation **(6 Marks)**

QUESTION FOUR: (20 MARKS)

a) Consider the following data collected from 8 clusters selected using $SWRWOR$ out of a total of 110 each with 6 elements.

Cluster	y_{ij}
1	15,5,4,3,9,10
2	5,5,3,6,8,4
3	13,5,4,2,3,7
4	10,2,3,3,4,6
5	5,10,5,11,7,9
6	3,4,4,9,11,12
7	8,910,6,5,14
8	4,3,5,6,6,16

i) Estimate population mean **(5 Marks)**

ii) Estimate population total **(4 Marks)**

iii) Standard error of population mean **(6 Marks)**

b) Consider population consisting of 430 units. By complete enumeration it was found that $\overline{Y}$=19, $S^2 = 85.6$, these being true values with simple random sampling without replacement, how many units must be taken to estimate $\overline{Y}$ within 10% apart from a chance of 1 in 20. **(5 Marks)**

QUESTION FIVE: (20 MARKS)

In agricultural production a wide large of input categorized as material input, service input etc are required. Suppose that the total cost of agricultural input used by the farmers last year was Kenya pound 141.7 million. The estimate of the total cost of input used by the farmers this year is to be evaluated. The data for the total cost of a random sample of R input is given below in millions of Kenya pound from the population of 35 input.

$Input$	$previous\ year\ (x_i)$	$current\ year\ (y_i)$
$Fertilizers$	21.1	32.9
$Fuel$	14.5	16.1
$Spares$	2.9	3.0
$Seeds$	17.6	16.8
$Stationary$	0.2	0.2
$Tractor\ hire$	2.7	2.9
$Office\ services$	1.6	1.9
$Inspection\ services$	0.05	0.08
$Planning$	0.002	0.002
$Inoculation$	0.04	0.05
$Insurance$	0.6	0.6
$Transport$	3.3	3.6

i) Evaluate the ratio estimate for the total cost **(7 Marks)**

ii) Evaluate its standard error **(6 Marks)**

iii) Obtain the regression estimate for the total cost **(7 Marks)**