UGANDAMARTYRS UNIVERSITY
NKOZI

UNIVERSITY EXAMINATIONS
May 2016

FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS & STATISTICS

THIRD YEAR END OF SEMESTER TWO FINAL ASESSMENT

SAMPLING THEORY
STAT3201

DATE: 3rd April 2016

TIME: 5:00 – 5: 00 Pm

DURATION: 3HRS

Instructions:

1. *Carefully read through ALL the questions before attempting*
2. ***ANSWER FOUR (4) QuestionsONLY.*** *(Each question carries equal marks)*
3. *No **names** should be written anywhere on the examination book.*
4. *Ensure that your **ID number** is indicated on all pages of the examination answer booklet.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*
7. *Do not write anything on the questions paper.*

QUESTION 1

(a) Define the following terms as applied sampling theory

(i) Statistics

(ii) Sample

(iii) Sampling unit

(iv) Sample survey

(v) Sampling design**05 Marks (@ 1 Mark)**

(b) Distinguish between probability sample and non-probability sample. In each case give the examples.**(10 Marks)**

© A SRS of 10 farmers selected from an Enumeration Area with the population of 100 farmers gives the following data

Farmer (i)	1	2	3	4	5	6	7	8	9	10
No. of Fields (Yi)	2	4	1	3	3	2	4	3	1	2

Determine

(i) average number of fields per farmer and its standard error**(05 Marks)**

(ii) Proportion of farmers with less than 3 fields and its standard error.**(05 Marks)**

QUESTION 2

Explain the following terms as applied to sampling theory

(i) Ratio estimator

(ii) The classical ratio estimator of the population mean

(iii) Regression estimator

(iv) Sample correlation coefficient **08 Marks (@ 2 Marks)**

(b)A complete census of the value of manufacturing shipments was taken in 2011. The following table gives the value of shipments in each of a SRS of the value of 10 shipments drawn from the

value of 30 shipments. The problem is to estimate the total value of the shipments in 2012. The value of 2011 total (X) is assumed to be known. Its value is Shs. 20.0 billions

The table below gives the value of shipments in 2011 and 2012

Value in 2011 (xi)	0.3	1.1	0.5	0.4	1.0	0.7	0.2	0.3	2.4	0.1
Value in 2012 (yi)	0.1	0.6	0.8	0.6	1.0	0.8	0.9	0.8	2.7	0.2

Determine

(i) The ratio estimate for the total**(07 Marks)**

(ii) Variance and the standard error of the estimate**(10 Marks)**

QUESTION 3

(a)(i) Distinguish between sampling and non-sampling errors**(02 Marks)**

(ii) How are sampling errors usually controlled?**(04 Marks)**

(b) (i) Distinguish between precision and accuracy**(02 Marks)**

(ii) Non-sampling errors fall in different classes. Which are these classes?**(04 Marks)**

(iii) What are the main causes of non-sampling errors in sample surveys? **(06 Marks)**

© A malariometer was carried out in Uganda in 2013. The objective of the survey was to estimate the general rate of incidence of malaria in the infant population (less than five years). When the age distribution of the sample was checked against the latest census results, it was discovered that the proportion of children under one year was significantly lower in the sample, probably because mothers were afraid to expose their babies to the blood testing procedure. What kind of error, if any, may result from this situation? How do you think this would influence the estimated average rate of malaria infection?**(07 Marks)**

QUESTION 4

a) State the limitations of SRS design**(04 Marks)**

(b) (i) What is estimation?**(02 Mark)**

(ii) Identify and give brief explanation of population parameters commonly used in estimation**(06 Marks)**

© A simple random sample of 2 fields is selected from 5 fields belonging to a household with sizes as follows

Field	1	2	3	4	5
Size (Acres)	156	649	86	164	253

Calculate (i) Population mean**(04 Marks)**

(ii) Population variance and standard error.**(09 Marks)**

QUESTION 5

(a) List all different methods that can be used to determine samples from a population.**(10 Marks)**

(b) What is design effect and when can this be used?**(05 marks)**

© In a sero-behavioural survey of financial year 2013/2014 conducted in Uganda, the following was considered to be the determinants.

1. The current estimated prevalence of HIV/AIDS, which is 6.4%
2. Design effect assumed to be 2 from the standard practice
3. From previous studies, the response rate was estimated to be 80%
4. Taking a confidence level of 95%, and the relative error to be 2.4 % for the national sample size. **(Z-critical =1.96)**

REQUIRED

Estimate the sample size in this study. **(10 Marks)**

QUESTION 6

i) What is an estimator?**(01 Mark)**

(ii) List desirable properties of estimators**(03 Marks)**

(b) Distinguish between the following

(i) Population and sample **(02 Marks)**

(ii) Sample design and Survey design**(02 Marks)**

© An enumerator is assigned to a well-defined area. His instruction is to visit and interview 50 households out of which 10 should be single or two-member households, 20 with 3 or 4 members, and the balance taken out of the bigger households. Do you consider this lead a random sample?**(05 Marks)**

d) (i) What is a sampling frame and how important is it in survey sampling?**(04 Marks)**

(ii) When should a sampling frame be declared adequate?

(03 Marks)

(e) List the basic principles of a sample survey design.

(05 Marks)

END