JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF   SCIENCE ACTUARIAL

2ND   YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR

MAIN REGULAR

COURSE CODE: SAS 201

COURSE TITLE:SAMPLE SURVEYS

EXAM VENUE: STREAM:

DATE: EXAM SESSION:

TIME: 2.00 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE (COMPULSORY) –(30 MARKS)

a) By first defining the terms *sample* and *census* as used in survey sampling, give reasons why sampling may be preferred to a census and briefly describe the methods of sampling. (3mks)
b) Briefly explain the phrase *sampling frame* as used in survey sampling and give its importance in the study of finite populations? (2mks)
c) Give the advantages and also the disadvantages of personal interviews as a method of collecting data. Conclude by giving a personal opinion regarding these face to face or personal interviews as a method of data collection. (6mks)
d) Using the random number generator table in Cambridge press SMP, explain how you will select a sample of ten people from a group of 100 people (6mks)
e) Suppose the population mean is known and it is required that the sample mean should not differ from it by more than a specified amount of absolute error estimation which is a small positive quantity given a level of significance , obtain an appropriate sample size assuming SRSWOR and that N is large enough.   (5marks)
f) A population of 1000 is divided into 4 strata. The sizes of the strata and variances are given as follows.

strata	A			B			C			D		
size	1	8	0	2	5	0	2	7	0	3	0	0
variance	2		5	6		4	1	2	1	1	6	9

A stratified sample of size 100 is to be drawn from the population. Determine the sample sizes in case of

     i.   Proportional allocation.

    ii.   Optimum allocation   (6marks)

g) Distinguish clearly between multistage sampling and systematic sampling.   (4marks)

QUESTION TWO (20 MARKS)

a. The following table gives values for two variables x and y sampled from a population of 64 households.

x	50	59	60	62	64	60	58	69	66	67	61	67	68	72	74	71
y	30	31	32	33	36	33	29	38	34	36	33	38	36	41	40	42

    i.   It is suggested that the ratio estimator could be applied in analysis of this data. Briefly explain when the Ratio Estimation may be used in sample surveys.
                                                                                      (5marks).
    ii.   Obtain the following estimates from the data
        a)
        b)
        c) (15 marks)

QUESTION THREE(20 MARKS)

a. Let   be variance based on sample observations of . Show that under SRSWOR, where (10marks)

b. A population consists of five members 2,3,8,11,6. Consider all possible samples of size two which can be drawn without replacement. Show that
   i.   is unbiased for
   ii.   (10 marks)

QUESTION FOUR (20 MARKS)

a. A population consists of $N = 6$ observations: $X_i = 3, 9, 4, 5, 6, 12$,. One wishes to obtain simple random samples of size $n = 4$. Obtain all possible simple random samples such that $\hat{V}(\bar{x}) = \frac{N-n}{Nn}S^2$ and verify that $\bar{x}$ is unbiased for $\bar{X}$ (10marks)

b. A population of forty eight observations was recorded as follows.

9 8	102	4 2	7 6	3 8	2 0	8 8	6 4	5 3	4 2	3 4	2 0
120	7 8	6 2	4 7	3 5	3 6	4 4	8 0	7 2	7 6	5 0	5 8
3 0	2 9	4 6	5 3	100	112	8 2	7 4	6 0	5 6	4 3	4 4
1 0	1 8	6 5	5 1	3 4	3 6	6 9	7 7	8 5	8 9	4 0	5 0

   i.   Come up with two strata, the smaller being of size 16.
   ii. A sample size of 12 is to be used in this stratification from the entire population. Obtain and   (10 marks)

QUESTION FIVE (20 MARKS)

a) A population consists of $N = 6$ observations: $X_i = 3, 9, 4, 5, 6, 12$,. One wishes to obtain simple random samples of size $n = 4$. Obtain all possible simple random samples such that $\hat{V}(\bar{x}) = \frac{N-n}{Nn}S^2$ and verify that $\bar{x}$ is unbiased for $\bar{X}$ (10marks)

b) Show that stratified random sampling with proportional allocation is more efficient than SRSWOR when   and   are considered negligible.   (10marks)