JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS 2018/2019
THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR SCIENCE IN ACTUARIAL SCIENCE, BIOSTATISTICS AND STATISTICS.

STA 2303:DESIGN AND ANALYSIS OF SAMPLE SURVEYS

DATE:DECEMBER 2018   TIME: 2 HOURS

INSTRUCTIONS: *Attempt Question One and any other Two Questions.*

QUESTION ONE (30 MARKS)

(a) Differentiate between:

   (i) Cluster sampling and Quota sampling.   [2 marks]
   (ii) Purposeful sampling and Snow-ball sampling.   [2 marks]

(b) List any two ways you minimize sampling errors.   [2 marks]

(c) A study of 250 households in Narok showed that a household spent on average shilling 4500 on food.

   (i) What is the population of interest in this study? .   [1 mark]
   (ii) Describe the sampling technique associated with this study. [3 marks]
   (iii) Is 4500 a parameter or a statistic?.   [1 mark]

(d) Show that the sample mean is unbiased estimator for the population mean.   [3 marks]

(e) State and explain general principles of sample survey.   [3 marks]

(f) State three methods that a statistician may use to draw a random sample from a population [3 marks]

(g) A person's job was to estimate the number of leaks of a 500 kilometer long pipe. She decided to put the numbers $1, 2, 3, \ldots, 500$ in a hat. She then withdrew 5 numbers from the hat. The numbers were $4, 45, 101, 440, 463$. She then meticulously inspected every part of the pipe for a three kilometer section of the piping i.e, drove 4 kilometers from the start and checked the next kilometer of piping thoroughly. Then she drove 45 kilometers from the start and checked the next three kilometers of piping thoroughly, and so on.

(i) Describe the type of sampling technique employed. [3 marks]

(ii) Another surveyor wished to use the numbers 45, 145, 245, 345 and 445 respectively. Describe this sampling technique. [3 marks]

(h) Give a clear account of survey management. [4 marks]

QUESTION TWO (20 MARKS)

(a) Suppose there are only five students in an advanced statistic class whose scores are as follows: 70, 78, 80, 80, 98.

(i) Develop a single-valued distribution of these scores. [2 marks]

(ii) Compute and list down the total number of possible samples of two from the sample of five. [3 marks]

(iii) Develop the frequency distribution of $\overline{X}$ (X bar) using samples in (ii). [3 marks]

(b) A company employs 24 executives, 75 managers, 7 team leaders, and 194 clerical staff. A consultant investigating work practices requires a sample of 25 employees to interview regarding work satisfaction. Explain how you would select the sample. [4 marks]

(c) Enumerate and explain for sources of each of the following errors:

(i) Sampling errors. [4 marks]

(ii) Non-sampling errors. [4 marks]

QUESTION THREE (20 MARKS)

(a) Describe the Cluster sampling procedure. [3 marks]

(b) The following are the numbers of departmental stores in 15 cities: 35, 17, 10, 32, 70, 28, 26, 19, 26, 66, 37. If we want to select 10 stores using cities as clusters and selecting within clusters proportional to size, how many stores from each city should be chosen? (use a starting point of 10) .[6 marks]

(c) Describe simple random sampling procedur. [5 marks]

(d) Highlight six factors that determine the choice of a sampling design for a given study. [6 marks]

QUESTION FOUR (20 MARKS)

(a) Investigate between $var(\overline{y}_w)_{Neyman}$ and $var(\overline{y}_w)_{SRSWOR}$. [10 marks]

(b) All the farms in a country are stratified by farm size and mean number of hectares of wheat per farm in each stratum, with the following results

Farm size(hectares)	No. of farms	Mean wheat (hectares)	Standard deviation
0 − 20	368	2.7	2.1
21 − 40	425	8.1	3.6
41 − 60	389	12.1	3.9
61 − 80	316	16.9	5.1
81 − 100	174	20.8	6.1
101 − 120	98	25.2	6.5
121+	138	31.8	9.1

For a sample of 100 farms, compute the sizes in each stratum under stratified simple random sampling with;

[10 marks]

(i) Proportional allocation

(ii) Neyman Allocation