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... Bastion of Knowledge...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

UNIVERSITY EXAMINATIONS

2019 /2020 ACADEMIC YEAR

THIRDYEAR SECONDSEMESTER REGULAR EXAMINATION

**FOR THE DEGREE OF BACHELOR OF SCIENCE (APPLIED STATISTICS WITH
COMPUTING)**



COURSE CODE: STA 319

COURSE TITLE: SAMPLING THEORY AND METHODS I

DATE: 4TH NOVEMBER, 2020

TIME: 1400 – 1700 HRS

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES

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REGULAR-MAINEXAM**STA 319: SAMPLING THEORY AND METHODS I****STREAM: ASC****DURATION: 3 Hours****INSTRUCTION TO CANDIDATES**Answer **ALL** questions from section A and any **THREE** from section B.**SECTION A [31 Marks]. Answer ALL questions.****QUESTION ONE [15 MARKS]**

- a) Define simulation of data and discuss any three advantages of simulating data [4 marks]
- b) Give the difference between;
- Complete enumeration and sample enumeration [2marks]
 - Statistic and Parameter [2 marks]
 - Descriptive and inferential statistics [2 marks]
- c) Give any five advantages of sampling over complete enumeration [5marks]

QUESTION TWO [16 MARKS]

- a) Write an R code that generates the means of the Poisson distribution by sampling from a gamma distribution [3 marks]
- b) A population of size 1000 is divided into 3 strata with their sizes and standard deviations given in the following table

Strata	1	2	3
Size	250	400	350
Standard Dev.	6	8	12

If a sample of size 80 is to be drawn from the population, determine the sample sizes in case of;

- Proportional allocation [4mks]
 - Optimum allocation [4mks]
- c) Show that SRSWOR (simple random sampling without replacement) is more efficient than SRSWR (simple random sampling with replacement) based on the estimator \bar{y} . [5 marks]

SECTION B [39 Marks] Answer any THREE questions]**QUESTION THREE [13 MARKS]**

- a) What is the difference between survey and questionnaire? [2marks]
- b) Discuss any three methods used in drawing a simple random sample [6marks]

c) Show that the probability of drawing a sample in simple random sampling without replacement (SRSWOR) is given by $P(u_1, u_2, \dots, u_n) = \frac{1}{\binom{N}{n}}$ [5 marks]

QUESTION FOUR [13 MARKS]

- a) Why is it necessary to obtain ethics approval before conducting a study? [2 marks]
- b) Explain any three ethical considerations to be made before conducting a research [6 marks]
- c) Show that the probability of drawing a sample in simple random sampling with replacement (SRSWR) is given by $P(u_1, u_2, \dots, u_n) = \frac{1}{N^n}$ [5 marks]

QUESTION FIVE [13 MARKS]

- a) Write brief notes on sample bias [5 marks]
- b) Show that the sample arithmetic mean \bar{y} is an unbiased estimator of \bar{Y} is under SRSWOR (simple random sampling without replacement) and SRSWR (simple random sampling with replacement) [8 marks]

QUESTION SIX [13 MARKS]

- a) Why do you set.seed when drawing samples from random number generator? [2 marks]
- b) A researcher intends to simulate 3,000,000 points from a mixture of two normal groups with the means separated by 2 and the variance of the second group thrice the size of the first. The first group should be twice the size of the second. Write a R code to;
- i) Simulate the data for the two groups [4 marks]
 - ii) Combine the two groups [2 marks]
 - iii) Plot a histogram of all the two datasets [5 marks]

QUESTION SEVEN [13 MARKS]

A group of BSc Statistics students at Alupe University College intend to conduct a survey on University Student Satisfaction.

- a) Describe the steps involved in questionnaire design [4marks]
- b) Develop a simple questionnaire at most 3 questions on demographics and at most 5 questions on satisfaction with possible answers for each question. [9 marks]