MATH 341

CHUKA   UNIVERSITY

UNIVERSITY EXAMINATIONS

THIRD YEAR RESIT EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND STATISTICS, BACHELOR OF SCIENCE IN MATHEMATICS, BACHELOR OF ARTS IN ECONOMICS AND MATHEMATICS

MATH 341: SAMPLING METHODS 1

STREAMS: "AS ABOVE"   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 02/02/2021   **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS: Answer ALL questions

QUESTION ONE (30 MARKS)

a) Differentiate between the following statistical terms

    i)   A sample and a population

    ii)   A statistic and a parameter

    iii)   A standard error and a standard deviation

    iv)   Sampling frame and sampling units   (8 marks)

b) Consider a population with the following elements; 48,24,12,36, 48,60. Choose samples of size 2 and size 4, without replacement. Analyse the samples and comment on your results   (11 marks)

c) Differentiate between the terms equal allocation and proportional allocation as used in stratified sampling.   (2 marks)

a) The following data was extracted from a demographic journal.

stratum	1	2	3	4	5
Stratum size	90	30	60	120	100
Stratum mean	6	10	12	8	
Stratum variance	2.25	3.24	3.61	2.89	1.96

i) If the entire population mean is 9.8, determine the missing stratum mean and hence the population standard deviation (5 marks)

ii) For a stratified random sample of 162 elements, determine the sample size of the 4th stratum under Neyman allocation (4 marks)

QUESTION TWO

A stratified population was found to have 5 strata. The stratum sizes, means and variances were displayed as shown.

Stratum	size	Mean	Variance
A	41	9.1	1.96
B	74	11.2	1.13
C	117	7.3	1.31
D	45	9.6	1.74
E	98	6.9	2.03

i) Calculate the overall population mean and the population variance (10 marks)

ii) For a stratified random sample of size 80, determine the appropriate stratum sample sizes under proportional allocation (5 marks)

iii) Show that the mean for the stratum means is an unbiased estimator of the population mean (5 marks)

QUESTION THREE

a) A survey was conducted to the yield of wheat in Nakuru county. A sample of 10 farms from a total of 100 was taken with a probability proportional to the area under wheat crop with replacement method. The total areas under wheat (x) was 484.5 hectares. The sample selected using Lahiri's method was

Area under wheat crop x_i	4.8	4.1	1.3	5.2	6.9	2.0	6.3	5.2	4.2	6.0
Yield of crop y_i	22	19	6	25	54	4	45	28	29	44

Estimate the average yield per farm with its standard error.   (10 marks)

b) A sub county has 10 secondary schools having 150, 230, 345, 125, 420, 260, 124, 326, 282 and 198 students. Explain clearly how you would select a sample of 4 schools in the sub county with probability proportional to the number of students in the schools using Lahiri's method and cumulative total method if sampling is done with replacement

(10 marks)