

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATION
RESIT/SUPPLEMENTARY / SPECIAL EXAMINATIONS
EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE**

MATH 341: SAMPLING METHODS**STREAMS:****TIME: 2 HOURS****DAY/DATE: THURSDAY 04/11/2021****2.30 P.M - 4.30 P.M.****INSTRUCTIONS**

- Answer all questions

Question 1

- a) Differentiate between the following statistical terms
- | | | |
|------|--|-----------|
| i) | A sample and a population | [2 marks] |
| ii) | A statistic and a parameter | [2 marks] |
| iii) | A standard error and a standard deviation | [2 marks] |
| iv) | Sampling frame and sampling units | [3 marks] |
| v) | Simple random sampling and Stratified sampling | [4 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]
- d) 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	2.25	3.24	3.61	2.89	1.96

variance					
----------	--	--	--	--	--

- 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 [5 marks]

Question 2

Secondary schools in a certain locality are to be samples with the aim of estimating the mean performance in National Examinations. The schools are stratified into a rural stratum and an urban stratum. A school in the urban stratum is presumed to score about four times as higher as a school in the rural stratum. The stratum standard deviation S_n is expected to be proportional to the square of the stratum mean there are 600 schools in the urban stratum and 800 schools in the rural stratum. How would you distribute a sample of 150 between the two strata? [5 marks]

- (b) A sampler proposes to take a stratified random sample. He expects his field costs to be of the forms $\sum_{h=1}^L C_h n_h$. His advances estimates of relative quantities are as follows:

Stratum	W_n	S_n	C_n
1	0.4	10	Kshs 400
2	0.6	20	Kshs 900

- (i) Find the values of $\frac{n_1}{n}$ and $\frac{n_2}{n}$ that minimize the total field cost for a given value of $var(\bar{y}_{st})$ [5 marks]
- (ii) Find the sample size required under this optimum allocation to make $var(\bar{y}_{st}) = 1$. Ignore finite population correction. [4 marks]
- (iii) Determine the total field cost for this optimum allocation. [5 marks]

a) 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)
-