



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SMA 576: SAMPLING APPLICATIONS

DATE: WEDNESDAY, 28TH MARCH 2012

TIME: 2.00 P.M – 5.00 P.M

INSTRUCTIONS

Answer Question ONE and any other TWO questions ONLY.

- Q1 (a) Enumerate reasons why sampling becomes necessary in any study.
- (b) Give the three major stages of a survey design.
- (c) Briefly explain how systematic sampling is carried out and obtain the variance of the population mean estimate.
- (d) (i) What is the difference between target and sampled population?
(ii) Explain the difference between cluster sampling and stratified sampling
- (e) A population has size $N=5$ where the values of characteristic X for the units are 3, 12, 5, 11 and 9. A sample of size $n=3$ is to be selected for estimating the population mean $\bar{Y}$.
- (i) List the possible samples with their corresponding means.
- (ii) Verify that the sample mean $\bar{y}$ is an unbiased estimator of the population mean.
- (iii) Verify that the sample variance is an unbiased estimator of the population variance S^2 where

$$S^2 = \frac{\sum_{i=1}^N (Y_i - \bar{Y})^2}{N - 1}.$$

- Q2 (a) Explain what simple random sampling is and give at least two sample selection techniques for a simple random sample.
- (b) The following observations are assumed to be from a normal population: 22, 19, 10, 11, 17, 9, 4, 13, 28, 6 and 3.
- (i) Estimate the population mean.
- (ii) Determine the 95% confidence bounds for the population mean.
- (c) (i) Explain what probability proportional (PPS) to size sampling is and give an illustration of how such sampling can be carried out.
(ii) Suppose a population is of size $N=4$ with values X : 2, 4, 5, 59. If a sample of size $n=2$ is to be selected through PPS, list the possible estimates of the population total.

- Q3 (a) Briefly explain how systematic sampling is carried out and obtain the variance of the population mean estimate.
- (b) Describe the method of determining the sample size required to achieve sampling precision and accuracy in surveys.
- (c) Explain what two stage cluster sampling is and show how the variance of the estimate is obtained.

- Q4 (a) Discuss the implications of nonresponse in surveys.
- (b) Give the circumstances under which stratification become necessary in surveys
- (c) A population has four strata with corresponding sizes, means and standard deviations as given below.

	N_h	Y_h	S_h
Stratum 1	18000	10	4
Stratum 2	25000	25	3
Stratum 3	66000	3	2
Stratum 4	11000	20	5

- (i) Obtain the population mean and the variance.
- (ii) Find the proportional and Neyman allocation if a stratified sample of size 1,000 is to be drawn to estimate the population mean.