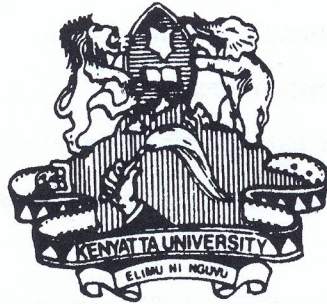




KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2009/2010
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF
SCIENCE

SMA 564: SAMPLE SURVEYS

DATE: Friday 9th April 2010

TIME: 9.00a.m – 12.00p.m

INSTRUCTIONS:

ANSWER ANY THREE QUESTIONS

- Q1. a) Discuss with examples the circumstances which lead to sampling with varying inclusion probabilities.
- b) i) Define the Horvitz-Thompson estimator of the population mean $\bar{y}$ and derive its variance.
- ii) Give two unbiased estimators of the variance of the Horvitz-Thompson estimator and give condition of their validity.
- c) Show that the Horvitz-Thompson estimator is the best unbiased estimator in the class of estimators of the form.

$$Ts = \sum_{i \in x} B_i y_i$$

where B_i is a coefficient associated with observation Y_i , $i \in s$.

- d) Describe Midzuno's sample selection technique and derive the first order inclusion probability.

- Q2. a) Describe the variance estimation method
- i) Using independent random groups
 - ii) Dependent random groups
- b) Describe the balance-half sample techniques in variance estimation.
- c) Suppose there are three strata where the following observations have been made.
- St 1 (5, 2) Stv 2 (8, 12) Stv 3 (1, 7) each stratum is of size 25.
- Assuming simple random sampling without replacement was applied in selecting the samples,
- i) Obtain all possible half samples.
 - ii) Estimate from the sample the population total
 - iii) Estimate the variance of the estimator of population total.
- Q3. a) i) Describe the concept of self-weighting in survey designs.
- ii) Give two designs that achieve self weighing.
- b) i) Describe the process of double sampling for stratification.
- ii) Give the estimator of the population mean under (i) above, and derive its variance.
- c) In repeated sampling, describe the composite estimator and derive its variance.
- Q4. a) Describe the various types of non-response.
- b) i) Suppose a simple random sample of size n is selected without replacement and r units responded while m ($r + m = n$) did not. Derive the bias under a fixed population model.
- ii) Derive the bias in (i) under population weighted estimation.
- c) Define sample weighing estimation and give the sample weighted estimation.

- Q5. a) Briefly describe
- i) Panel (Longitudinal) survey designs.
 - ii) Repeated cross-section survey designs.
- b) Simple random samples of size n each are selected on two occasions with a common subsample of size m . Let $\bar{y}_1, \bar{y}_2$ be the sample means for the two occasions respectively. Assume that population variance $s_1^2 = s_2^2 = s^2$. Assuming a positive correlation between observations on the same subject between the occasions obtain
- $$V\left(\frac{\bar{y}_1 + \bar{y}_2}{2}\right) \text{ and } V(\bar{y}_1 - \bar{y}_2)$$
- and give the optimal conditions for the variance in relation to the common sample.
- c) Describe Brewers sample selection method.

END.