 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - STATISTICS

SECOND SEMESTER – APRIL 2012

# ST 2813 - SAMPLING THEORY

Date : 21-04-2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**Part A**

**Answer all the Questions: (10 X 2 = 20)**

1. Define mean square error of an estimator T. When does it reduce to variance?
2. Define first and second order inclusion probabilities.
3. Suggest an unbiased estimator for population proportion under SRSWOR.
4. Explain modified systematic sampling.
5. When ratio estimator is better than the expansion estimator?
6. Write the formula for nh under Neyman allocation.
7. Explain cumulative total method.
8. What is the need for regression estimator?
9. Let V denote the distinct units drawn in SRSWR. Suggest an unbiased estimator for population mean and write the variance based on V- distinct units.
10. Show that is unbiased for y for the populations with linear trend when k is odd.

**Part B**

**Answer any Five questions: (5 X 8 = 40)**

1. Obtain V[Ii(s)] , Cov [Ii(s), Ij(s)]
2. Explain Midzuno’s scheme. Specify a method to draw a sample using Midzuno’s scheme and show that it actually implements the scheme.
3. Obtain the unbiased estimator and its variance for the population total when SRSWOR is used in both the stages of the two-Stage sampling method.
4. Obtain the bias and mean square error of the regression estimator.
5. Explain Warner’s method of randomized response method.
6. Suggest an unbiased estimator for the population total when PPSWR is used in all the strata. Obtain the variance of the estimator and an unbiased estimator of the variance.
7. Show that unbiasedness depends on the sampling design.
8. Explain the need for circular systematic sampling and the problems involved.

**Part C**

**Answer any two Questions: (2 X 20 = 40)**

1. a) Show that Horvitz - Thompson is unbiased for the population total. Obtain the variance of the estimator in the Yates- Grundy form.
2. Obtain the variance Of .

(12 + 8)

1. a) Show that

Vran ≥ Vprop ≥ Vopt

1. Explain Balanced systematic sampling. Show that is unbiased and write the variance of the estimator

(12 + 8)

1. a) Show that Desraj estimator is unbiased in PPSWOR and obtain its variance.
2. Derive Murthy’s estimator when n=2.

(12 + 8)

1. a) Obtain the bias of the Jackknife ratio estimator.
2. Obtain the bias and mean square error of the combined ratio estimator and separate ratio estimator in stratified random sampling. (12 + 8)

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