 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

SECOND SEMESTER – NOVEMBER 2012

# ST 2813 - SAMPLING THEORY

Date : 03/11/2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

SECTION – A

Answer ALL questions: (10 x 2 = 20 marks)

1. What are the two types of Sampling Designs? Give an example for each type.

2. Define the following terms:

(i) Inclusion Indicator

(ii) First and Second order inclusion probabilities.

3. Derive ∏i and ∏ij for Simple Random Sampling Design.

4. In Balanced Systematic Sampling, when the population is linear, show that the expansion

estimator estimates the population total without any error.

5. In Two-Phase Sampling, derive the approximate bias of the Ratio Estimator.

6. Distinguish between a parameter and a statistic and give an example for both.

7. List all possible Modified Systematic Samples of size 6 when the population size is 30.

8. In Simple Random Sampling Design, show that  is unbiased for .

9. Describe Random Group Method of sampling and write the estimator for population

total under this method.

10. Show that the ratio estimator is a particular case of the regression estimator.

SECTION – B

Answer any FIVE questions. (5 x 8 = 40 marks)

11. Show that the property of unbiasedness depends on the sampling design.

12. Explain Lahiri’s Method of sampling. Show that this method is a PPS sampling

method.

13. In PPSWOR sampling scheme, explain why Desraj ordered estimator is used instead

of Horwitz-Thompson estimator. Check whether or not Desraj ordered estimator is

unbiased for population total.

14. Discuss Warner’s Randomized Response Technique for estimating the proportion of

individuals possessing a sensitive characteristic.

15. Explain the unit drawing mechanism for Simple Random Sampling Design. Prove

that the mechanism implements the design.

16. If the population is linear, then show that ŶLSS is more efficient than ŶSRS.

17. In Midzuno Sampling Design, prove that the estimated variance of ŶHT is always

non-negative.

18. Find the estimated variance of ŶDR.

SECTION – C

Answer any TWO questions. (2 x 20 = 40 marks)

19 (a) Obtain V( ŶHT ) and v( ŶHT ) under any sampling design. (16)

(b) Define Midzuno sampling design and write its unit drawing mechanism. (4)

20 (a) Derive the expression for ∏i and ∏ij under MSD. (8)

(b) If SRS is used in both the phases of Two-Phase Sampling, then suggest , Ŷ, and

d when (i) the second phase sample is a subsample of the first phase sample,

(ii) the second phase sample is independent of the first phase sample. (12)

21 (a) Obtain ŶST , V(ŶST) , and v(ŶST ) under the design (i) SRSWOR , (ii) PPSWR. (10)

(b) Derive the approximate bias and MSE of the estimator ŶR and deduce their expressions

under (i) SRSWOR, (ii) PPSWR, (iii) Midzuno Sampling. (10)

22 (a) In Double Sampling, prove that Hansen-Hurwitz estimator Ŷdhh is unbiased for Y

and hence find its variance. (10)

(b) In Two-Stage Sampling, with SRS in both the stages, derive E(ŶTS) and V(ŶTS) . (10)

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