



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

SECOND SEMESTER – APRIL 2017

16PST2MC03/ST 2816 - SAMPLING THEORY

Date: 24-04-2017
01:00-04:00

Dept. No.

Max. : 100 Marks

SECTION - A

Answer all the questions.

(10 X 2 = 20)

1. Define Inclusion Indicator and Define Inclusion Probabilities.
2. Show that $E_p[I_i(s)] = \pi_i$
3. Show that cumulative total method is a PPS selection method.
4. Write the unit drawing mechanism in Midzuno Sampling Design.
5. Describe the Linear Systematic Sampling Scheme.
6. Given the sample size $n=4$ and the population size $N=16$. Write all possible samples under balanced systematic sampling scheme.
7. Define Ratio Estimation.
8. Show that \hat{Y}_{LR} is a particular case of \hat{Y}_R if $\beta = R$.
9. Define Multi stage sampling.
10. What is meant by Non Response? Mention the types of Non-Response techniques.

SECTION - B

Answer any five questions.

(5 X 8 = 40)

11. Under a given sampling design, show that one can find more than one unbiased estimator for a given parameter.
12. Show that under SRS,
$$v\left(\hat{Y}_{SRS}\right) = N^2 \frac{N-n}{Nn} \frac{1}{n-1} \sum_{i \in S} \left(Y_i - \bar{Y}\right)^2$$
 where $\bar{Y} = \frac{1}{n} \sum_{i \in S} Y_i$
13. Show that $v(\hat{Y}_{DR}) = \frac{1}{n(n-1)} \sum_{i=1}^n (t_i - \bar{t})^2$
14. Establish that Lahiri's method of sample selection is PPS selection method.
15. Show that the sample mean is unbiased for population mean in Modified Systematic sampling for linear population and show that its variance is zero.
16. Derive $V(\hat{Y}_{STR})$ under Neyman allocation.
17. Discuss about Double Sampling and find the Bias and Mean Square Error of \hat{Y}_{RD} .
18. Explain in detail Warner's Model and find the estimated variance of $\hat{\pi}_A$

SECTION - C

Answer any two questions.

(2 X 20 = 40)

19. a) Derive the variance of Horvitz Thompson Estimator and also write its Yates Grundy form. (12)
- b) Obtain the unit drawing mechanism for SRS and derive the first order and second order Inclusion probabilities in Simple Random Sampling. (8)

20. Find the first order and second order inclusion probability under Midzuno sampling Design and hence show that $V(\hat{Y}_{HT})$ is nonnegative for all s receiving positive probability. (20)
21. a) Develop Yates Corrected Estimator (10)
b) Explain Simmons Randomized response Technique and find the estimated variance of $\hat{\pi}_A$ when π_Y is unknown. (10)
22. a) Obtain Hartley – Ross unbiased ratio type estimator for population total. (10)
b) Explain multistage sampling and find the variance of \hat{Y}_{TS} . (10)

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