LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

SECOND SEMESTER – NOVEMBER 2016

ST 2816 - SAMPLING THEORY

Date: 08-11-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

SECTION – A

Answer all the questions. (10 X 2 = 20)

1. What are the types of sampling design and give an example for each.
2. Define first and second order Inclusion Probabilities and give an example for each.
3. Name any two methods of PPS selection.
4. Write the procedure to select a sample of size n in Midzuno sampling Design.
5. Describe the Linear Systematic Sampling Scheme and write its probability sampling design.
6. List all possible balanced systematic samples of size 4 when N = 12.
7. Explain about Ratio Estimator.
8. Describe Multi stage Sampling.
9. What is Non response? Name any two Non response techniques?
10. State the difference between Simmon's model and Warner's model.

SECTION- B

Answer any five questions. (5 X 8 = 40)

11. Show that

    i) Under the sampling design P(.), any statistic $\hat{T}(.)$ satisfies the relation

    $$MSE(P:\hat{T}) = V_p(\hat{T}) + [B_p(\hat{T})]^2$$

    ii) For any i= 1,2,…N, $V_p[I_i(s)] = \pi_i(1-\pi_i)$

12. State the unit drawing mechanism for implementing SRSWOR design and prove that this mechanism implements the design.

13. Show that $v(\hat{Y}_{DR}) = \frac{1}{n(n-1)}\sum_{i=1}^{n}(t_i - \bar{t})^2$

14. Derive the formula for n_h under Optimum Allocation and derive V ($\hat{Y}_{st}$) under Neyman Allocation.

15. For population with linear trend, verify whether or not $\hat{Y}_{LSS}$ is more efficient than $\hat{Y}_{SRS}$.

16. Explain multistage sampling and find the variance of $\hat{Y}_{Ts}$.

17. Discuss about Double Sampling and find the Bias and Mean Square Error of $\hat{Y}_{RD}$.

18. Explain Warner's randomized response technique find the estimated variance of $\hat{\pi}_A$.

SECTION- C

Answer any two questions. (2 X 20 = 40)

19. a) Define Hurwitz Thompson Estimator and Derive the estimated variance of HT Estimator. **(12)**

b) Show that under SRS,

$$v\left(\hat{\bar{Y}}SRS\right) = N^2\left(\frac{N-n}{Nn}\right)\frac{1}{n-1}\sum_{i\in s}\left(Y_i - \hat{\bar{Y}}\right)^2 \text{ where } \hat{\bar{Y}} = \frac{1}{n}\sum_{i\in s}Y_i$$ **(8)**

20. Derive the first and second order inclusion probabilities in Midzuno sampling and show that the Yates–Grundy estimator is nonnegative. **(20)**

21. a) Develop Yates Corrected Estimator. **(10)**

b) Show that $\hat{Y}_{HHE}$ is unbiased for Y and

Also show that $v(\hat{Y}_{HHE}) = \frac{1}{n(n-1)}\sum_{i=1}^{n}(\frac{y_i}{p_i} - \hat{Y}_{HHE})^2$ **(10)**

22. a) what is auxillary information and Find the approximate Bias and Mean Square Error of regression estimator of Y. **(12)**

b) Explain in detail Non-Response techniques. **(8)**

****