LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2017**

ST 3505/ST 3504/ST 3502 – SAMPLING THEORY

Date: 04-11-2017   Dept. No.   Max. : 100 Marks

Time: 09:00-12:00

PART - A

Answer ALL the Questions   (10X2=20 Marks)

1.   In what situations sampling is inevitable?
2.   What is unbiasedness?. Give an example.
3.   State the demerits of simple random sampling.
4.   How will you determine the sample size?
5.   State any two merits of stratified random sampling?
6.   If the samples are drawn independently in different strata, find $V(\bar{y}_{st})$.
7.   Discuss Circular systematic sampling.
8.   In what situations systematic sampling is preferred over other sampling procedures?
9.   What are the disadvantages of systematic sampling?
10.   Write the uses of Auxiliary information.

PART - B

Answer any FIVE questions.   (5X8=40 marks)

11.   What are the different sources of non-sampling errors? Describe the methods of controlling them.
12.   In simple random sampling without replacement show that the sample mean is an unbiased estimate of the population mean. Also obtain variance of the sample mean.

13. Prove that in stratified random sampling $\text{var}(\bar{y}_{st}) = \sum_{i=1}^{K}\left(\frac{1}{n_i} - \frac{1}{N_i}\right)p_i^2 S_i^2$.

14.   Obtain the relative efficiency of the estimate of the population mean in systematic sampling over SRSWOR.

15.   Describe ratio estimation.

16.   Explain the methods of drawing simple random sampling.

17.   Compare Regression estimator with Ratio estimator and Post- stratified estimator in SRSWOR.

18. Write the advantages and disadvantages in using statistical packages.

PART – C

Answer any TWO questions   (2X20=40 marks)

19.   (a). Explain briefly Design-Organization–and execution of
        sample surveys.
        (b). Prove that in SRSWOR the variance of the sample mean
        is $\text{var}(\bar{y}_R) = \left(\frac{N-n}{nN}\right)S^2$.

20.   (a). With usual notations prove that
$$\mathrm{var}(\overline{X}_{opt}) \leq \mathrm{var}(\overline{X}_{prop}) \leq \mathrm{var}(\overline{X}_{ran)}.$$

(b). If the population consists of a linear trend then prove that
$$\mathrm{var}(\overline{y}_{st}) \leq \mathrm{var}(\overline{y}_{sys}) \leq \mathrm{var}(\overline{y}_{ran}).$$

21.   (a). Prove that the Regression estimate is more precise than the
        Ratio estimate.

(b). Find the bias and mean square error of Y_R .

22. (a). Compare SRSWR with SRSWOR.
    (b). Describe the two types allocations in stratified sampling.

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