LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2023**

UST 3501 – SAMPLING THEORY

Date: 02-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A

Answer ALL the Questions

1.	**Answer the following questions**		**(5 x 1 = 5)**
a)	Sampling distribution	K1	CO1
b)	Equal allocation	K1	CO1
c)	Cluster Sampling	K1	CO1
d)	Mean Square Error	K1	CO1
e)	Regression estimator	K1	CO1
2.	**Fill in the blanks**		**(5 x 1 = 5)**
a)	Stratified Sampling belongs to the category _____sampling.	K1	CO1
b)	A function of variates for estimating a parameter is called an _____.	K1	CO1
c)	An unordered sample of size 'n' can occur in _____ways.	K1	CO1
d)	Var($\overline{y_{st}}$) is minimum for fixed _____.	K1	CO1
e)	The Standard error is _____.	K1	CO1
3.	**Match the following:**		**(5 x 1 = 5)**
a)	Stratified Sampling - Same size	K2	CO1
b)	SRSWOR -parameter	K2	CO1
c)	Equal allocation - any value	K2	CO1
d)	Estimator - restricted sampling	K2	CO1
e)	Population Constant - $\binom{N}{n}$	K2	CO1
4.	**True or False**		**(5 x 1 = 5)**
a)	The difference between a sample statistic and the corresponding parameter is called sampling error.	K2	CO1
b)	The standard error increases as the sample size increases.	K2	CO1
c)	Ratio estimators are not biased.	K2	CO1
d)	Systematic sampling is better than random sampling.	K2	CO1
e)	Neymans optimum allocation provides better estimates.	K2	CO1

SECTION B

Answer any TWO of the following **(2 x 10 = 20)**

5.	A population of size 800 is divided into 3 groups. There sizes and standard deviations are given below. Stratum I II III Size 200 300 300 Standard deviation 6 8 2 Stratified random sample of size 120 is to be drawn from the population. Determine the size of samples from the 3 groups to be selected by, (a)Proportional allocation (b)Optimum allocation method.	K3	CO2
6.	Explain Linear and Circular Systematic sampling in detail.	K3	CO2
7.	Explain in detail about the types of sampling.	K3	CO2
8.	Define confidence limits and give the lower and upper confidence limits for population mean.	K3	CO2

SECTION C

Answer any TWO of the following questions **(2 x 10 = 20)**

9.	(i)Explain stratified sampling in detail. (5+5) (ii)Prove that $\overline{y_{st}}$ is an unbiased estimator of population mean $\overline{Y_N}$ i.e.,$E(\overline{y_{st}})=\overline{Y_N}$	K4	CO3
10.	**(i)** Give the difference between SRSWR and SRSWOR. **(5+5)** (ii) Discuss in detail about the principle steps involved in the planning and execution of a sample survey.	K4	CO3
11.	(i) State and prove variance of the estimated mean under systematic sampling **(8+2)** (ii)What is Sampling and non-sampling error?	K4	CO3
12.	(i)Prove that $Var_{SRSWR}(\overline{y}) \geq Var_{SRSWOR}(\overline{y})$ **(5+5)** (ii)Explain Ratio estimation under Stratified Random Sampling.	K4	CO3

SECTION D

Answer any ONE of the following in 250 words **(1 x 20 = 20)**

13.	Considering the population, 2,5,8,13 (i)Calculate the population mean and the population standard deviation (ii)Construct a sampling distribution of the sample mean when random samples of size 2 are selected from the population. (a)With replacement and (b) Without replacement. Find also the mean and standard error of the distribution in each case.	K5	CO4
14.	State and Prove the approximate Bias and Mean Square Error of the ratio estimator.	K5	CO4

SECTION E

Answer any ONE of the following question: **(1 x 20 = 20)**

15.	Show that $v(\overline{y_{st}})$ is minimum for fixed total size of the sample n, if $n_i \propto N_i S_i$	K6	CO5
16.	(i) In SRSWR the sample variance is an unbiased estimator of population variance $E(s^2)=\sigma^2$. Prove. **(10+10)** (ii)Explain Lahiri's Method and Cumulative Total method with example.	K6	CO5

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