

2020

( Held in 2021 )

STATISTICS

( Major )

Paper : 5.2

( Sample Survey )

Full Marks : 42

Time : 2 hours

*The figures in the margin indicate full marks  
for the questions*

GROUP—A

( Marks : 21 )

1. Fill in the blanks : 1×2=2

(a) If \_\_\_\_\_, it is known as Neyman's formula for optimum allocation.

(b) If \_\_\_\_\_ is the population parameter and  $t$  is the underlying statistic, then  $B(t)$   $E(t)$  is known as \_\_\_\_\_.

2. Answer the following questions in brief :  $2 \times 2 = 4$

(a) Mention the important random sampling number series along with the different tests for randomness generally applied to these series.

(b) Obtain an unbiased estimate of the population mean in systematic sampling.

3. Answer any three questions from the following : 5×3=15

(a) Discuss the steps involved in the planning stage of a large scale sample survey.

(b) If a random sample of size  $n$  is drawn without replacement from a finite population of size  $N$  with mean \_\_\_\_\_ and variance \_\_\_\_\_, show that the covariance between any two members of the sample is  $\frac{2}{N-1}$ .

(c) Explain the concept of linear and circular systematic sampling methods with examples.

( 3 )

- (d) What are the methods of selecting a probability proportional to size (pps) sample with replacement? Explain them clearly.
- (e) What do you mean by a two-stage sampling procedure? Explain with an example.

GROUP—B  
( Marks : 21 )

4. Answer any *three* questions from the following (symbols have their usual meanings) :  $7 \times 3 = 21$
- (a) (i) If the variance of the estimated population total in SRSWOR is  $\frac{N(N-1)}{n} S^2$ , then what will be the variance of the unbiased estimate of population mean? 2
- (ii) How does a sample survey differ from a complete census? Explain in detail. 5
- (b) Explain the purpose of stratification in sample survey. What are the different types of allocations of sample sizes used in stratified random sampling? Explain why these are necessary.  $2+5=7$

( 4 )

- (c) Explain the probability proportional to size sampling procedure. What are the methods of selecting a sample from the population, according to the above-said technique? Discuss them with examples.  $2+5=7$
- (d) (i) If  $r$  is the intra-class correlation coefficient between the units of the same systematic sample, what conclusion will you draw if  $\frac{1}{nk-1}$ ? 2
- (ii) Justify the following statement : 5  
“For estimation of population mean, a systematic sample will yield better results relative to simple random sampling without replacement only if the units within the same systematic sample are heterogeneous.”
- (e) Find the variance of the sample estimate of the population mean in a two-stage sampling procedure where first-stage units are of equal size. 7

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