



UG – 097

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V Semester B.Sc. Examination, March/April 2021  
(CBCS) (Fresh) (2019 – 20 and Onwards)

STATISTICS – V

Sampling Theory and Statistical Quality Control

Time : 3 Hours

Max. Marks : 70

**Instructions :** 1) Answer **any five** questions from Section – A and **five** questions from Section – B.

2) Scientific calculators are **allowed**.

SECTION – A

Answer **any five** of the following questions.

(5×5=25)

1. Describe the advantages of sampling over complete enumeration.
2. Obtain the expression for sample size while estimating population mean in case of SRS WOR.
3. Prove that  $v(\bar{y}_{st})$  is minimum for fixed total size of the sample if  $n_h \propto N_h S_h$  [ $h = 1 \dots l$ ].
4. What are the merits and demerits of systematic sampling.
5. What do you mean by “Quality” ? What are the objectives of quality control ?
6. Derive the control limits for Range (R) chart.
7. Briefly explain the construction of control limits for ‘np’ chart. Distinguish between defect and defective.
8. Explain :
  - i) Producer’s risk
  - ii) Consumer’s risk
  - iii) AOQ
  - iv) ASN
  - v) ATI.



P.T.O.



## SECTION – B

Answer any five of the following questions.

(5×9=45)

9. a) Explain different types of sampling.

b) What are different sources of errors in a sample survey ? Explain.

(4+5)

10. With usual notations under SRSWOR, prove that

$$i) E(\bar{y}) = \bar{Y}$$

$$ii) V(\bar{y}) = \frac{N-n}{N} \frac{S^2}{n}$$

Deduce the expression for standard error of estimate of population total write the confidence limits for population total.

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11. a) Explain simple random sampling for proportions.

b) With usual notations, obtain the expression for  $V(A)$ . Also write confidence limits for the total no. of units possessing the given attribute in the population.

(3+6)

12. Obtain the unbiased estimator of the population mean in case of stratified random sampling and derive its variance and deduce it under proportional and optimum allocation.

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13. a) With usual notations under stratified random sampling prove that

$$V_{(opt)} \leq V_{(prop)} \leq V_{(ran)} \text{ where optimum allocation is for a fixed sample size.}$$

b) With usual notations prove that in linear systematic sampling variance of

$$\text{sample mean is given by } V(\bar{y}_{sys}) = \frac{(N-1)S^2}{N} - \frac{(n-1)}{N} k \cdot S_{wsys}^2. \quad (5+4)$$

14. a) Discuss the advantages and disadvantages of control charts for variables and control chart for attributes.

b) Obtain control limits for 'C' chart.

(5+4)

15. a) Find the expression for 'OC' curve in single sampling plan.

b) Write expression for ASN and ATI in double sampling plan.

(5+4)