QP 179

V Semester B.Sc. Examination, March/April 2022
(CBCS) (2019 – 20 and Onwards)
(F+R)
STATISTICS – V
Sampling Theory and Statistical Quality control

Time : 3 Hours Max. Marks : 70

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

2) Scientific calculators are permitted.

SECTION – A

Answer **any five** of the following questions. **(5×5=25)**

1. What are the different sources of errors in a sample survey ? Explain.
2. Obtain an expression for sample size while estimating population mean in case of SRSWOR.
3. What is stratified random sampling ? Mention its advantages. Explain proportional and optimum allocation.
4. What are the merits and demerits of systematic sampling ?
5. Describe the steps involved in the construction of charts for mean and standard deviation.
6. Discuss the advantages of control charts for variables and control charts for attributes.
7. Briefly explain the construction of 'P' Chart.
8. Describe single and double sampling plan.

SECTION – B

Answer **any five** of the following. **(5×9=45)**

9. a) Describe the advantages of sampling over complete enumeration.

   b) Show that in SRSWOR, the probability of selecting a specified unit of the population at any given draw is equal to the probability of selecting it at the first draw. **(4+5)**

P.T.O.

10. a) In SRSWOR the variance of the sample mean is given by

$$V(\bar{y}) = \left(\frac{1}{n} - \frac{1}{N}\right)S^2.$$

b) What is sampling with and without replacement. **(7+2)**

11. a) Explain SRS for proportions. Prove that sample proportion is an unbiased estimator of population proportions.

b) With usual notations obtain the expression for $V(\hat{A})$, where $\hat{A} = NP$. Also write confidence limits for the total no. of units possessing the given attribute in the population. **(4+5)**

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. **9**

13. a) With usual notations prove that in linear systematic sampling variance of sample mean is given by $V(\bar{y}_{sys})\frac{N-1}{N}S^2 - \left(\frac{n-1}{N}\right)KS^2_{wsys}$.

b) Prove that systematic sample mean is more precise than the mean of SRSWOR if $S^2_{wsys} \geq S^2$. **(5+4)**

14. a) Explain the main tools of statistical quality control.

b) Distinguish between
   i) Defect and defective
   ii) Action limits and warning limits. **(5+4)**

15. a) Distinguish between
   i) AQL and LTPD
   ii) Producer's risk and consumer's risk.

b) Write expression for ASN and ATI in double sampling plan. **(5+4)**