CS – 172

42

V Semester B.Sc. Examination, March 2023
(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 from Section –* ***A*** *and* ***any five*** *questions from Section –* ***B***.
2) *Scientific calculator is* ***allowed***.

SECTION – A

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

1) Distinguish between Sampling errors and Non sampling errors.
2) Obtain an expression for sample size while estimating population mean in case of SRSWOR.
3) Discuss proportional and optimum allocation in stratified random sampling.
4) What is systematic sampling ? In a linear systematic sampling prove that systematic sample mean is an unbiased estimator of the population mean.
5) Derive the control limits for $\bar{X}$ and S chart, when process standards are unknown.
6) Discuss any five criteria to detect lack of control on control chart.
7) Briefly explain the construction of control limits for 'np' chart.
8) Define AQL and LTPD.

SECTION – B

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

9) a) Explain principle steps in conducting a sample survey.
   b) Explain the advantages of sample survey over a complete enumeration. **(4+5)**

10) a) Prove that $N\bar{y}_n$ is an unbiased estimator of population total in SRSWOR.
   b) Compare the variances of SRSWR and SRSWOR. **(4+5)**

P.T.O.

11) a) Explain the simple random sampling for proportions and with usual notations find the expression for $V(\hat{A})$

where $\hat{A} = Np$

$p =$ proportion of sampled units possessing the given attribute.

b) Obtain the expression for sample size while estimating population proportions in simple random sampling. **(4+5)**

12) In stratified random sampling show that the variance of the estimate of the population mean is minimum if n_h is proportional to $\frac{N_h S_h}{\sqrt{C_h}}$ $h = 1 \ldots l$

and hence obtain the expression for $V(\bar{y}_{st})$. **9**

13) a) With usual notations prove that in linear systematic sampling variance of sample mean is given by

$$V(\bar{y}_{sys}) = \frac{(N-1)S^2}{N} - \frac{(n-1)K}{N} S^2_{wsys} .$$

b) Discuss advantages and disadvantages of systematic sampling. **(5+4)**

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

b) Explain the construction of control limits for 'U' chart. **(4+5)**

15) a) Explain :

i) Producer's risk

ii) Consumer's risk

iii) AOQ

iv) ASN.

b) Obtain the expression for O.C. and ATI of a Single Sampling Plan (SSP). **(4+5)**