11531

Reg. No. | | | | | | | | |

V Semester B.Sc. Degree Examination, April - 2022

STATISTICS

Sampling Theory and Statistical Quality Control

Paper : V

(CBCS Scheme 2020-21 Onwards) (F+R)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. Answer any **five** questions from Section-A and **five** questions from Section -B.
2. Scientific calculators are allowed.

SECTION - A

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

1. What is sampling? Explain the advantage of a sample survey over a complete enumeration.
2. What is simple Random sampling? Distinguish between SRSWOR and SRSWR. Prove that sample mean is an unbiased estimator of the population mean in case of SRSWR.
3. With usual notations, prove that $V_{opt} \leq V_{prop} \leq V_{ran}$, when f.p.c is ignored.
4. What is systematic sampling? Explain. In a systematic sampling, prove that systematic sample mean is an unbiased estimator of the population mean, if N = nK.
5. What is statistical quality control? State the objectives of statistical quality control (SCSC).
6. Explain the construction of S-Chat.
7. Define process capability Ratio (CPR). Write the consequences of the following.
   i. PCR < 1.
   ii. PCR = 1
   iii. PCR>1
8. Define :
   a. AOQ.
   b. ASN.
   c. ATI.
   d. OC function.

[P.T.O.

SECTION - B

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

9. a) What are questionnaire and schedule? What precautions do you take while drafting a questionnaire? Explain.

   b) What are sampling and Non - Sampling error. Explain. **(5+4)**

10. a) Under SRSWOR, with usual notation, obtain an experssion for the variance of estimate of the population total given that $V(\bar{y}) = \frac{N-n}{N}\frac{S^2}{n}$.

    b) In SRSWOR, prove that $E(S^2) = S^2$. **(4+5)**

11. a) With usual notation, show that $V(P) = \frac{N-n}{N-1}.\frac{Pcs}{n}$. Also obtain $V(\tilde{A})$.

    b) Obtain an expression for the sample size while estimating population proportion. **(4+5)**

12. a) Explain

    i. Proportional allocation.

    ii. Optimum allocation.

    b) Show that in a stratified Random sampling $V(\bar{y}_{st})$ is minimum for a fixed sample size if n_n is proporational to $N_n S_n$ for all n = 1,2,.....L. **(3+6)**

13. a) Explain circular systematic sampling.

    b) Prove with usual notations, the variance of mean of a systematic sample is

    $$V(\bar{y}_{sy}) = \frac{N-1}{N}S^2 - \frac{K(n-1)}{N}S^2_{wsy}$$ **(3+6)**

14. a) Derive the control limits for $\bar{X} - R$ charts when process standards are not specified.

    b) Explain the construction of U-Chart. **(4+5)**

15. a) For the sampling plan (N,n,C) derive the expression for OC function and producer's risk.

    b) Explain double sampling plan. **(5+4)**

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Reg. No. | | | | | | | | |

V Semester B.Sc. Degree Examination, May - 2022

STATISTICS

Design and Analysis of Experiments

CBCS Scheme (2020-21 & Onwards) (F+R)

Paper : VI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Answer any **five** questions from Section-A and any **five** questions from Section -B.

SECTION - A

I. Answer any **FIVE** questions from the following. **(5×5=25)**

1. What is analysis of variance (ANOVA)? State its need. Mention the assumptions involved.
2. Obtain the expectations of treatment sum of square (TrSS) in ANOVA for one way classified data.
3. Explain three basic principles of experimental design.
4. What do you mean by Latin square design (LSD)? Give the layout of (5×5) LSD. Mention the advantages of LSD over complete randomized design (CRD).
5. Write a note on efficiency of a design.
6. What is factorial experiment (FE)? Write down the various treatment combinations under 2^2 and 2^3 F.E.
7. Define contrast and orthogonal contrasts in a 2^3 F.E. Show that the main effects A and B are orthogonal contracts.
8. What is meant by confounding? Distinguish between partial and complete confounding.

SECTION - B

II. Answer any **FIVE** questions from the following. **(5×9=45)**

9. Describe ANOVA for a one - way classified data. **(9)**
10. Explain ANOVA for two - way classified data with interaction effect. **(9)**

[P.T.O.

11. What is randomized block design (RBD)? Discuss the role of basic principles of experimental design in RBD. Write the lay out of a RBD with five treatment and five blocks. Also write down the corresponding ANOVA table. (9)

12. Describe the analysis of Latin square design (LSD). (9)

13. a) Obtain the expression for relative efficiency of a RBD over CRD.

    b) Obtain the expression for estimating missing observation in RBD. (4+5)

14. a) Explain the Yates' method of obtaining factorial effect totals in a 2^3FE.

    b) For a 2^3 factorial experiment derive an expression for interaction effects AB and ABC. (5+4)

15. Describe the procedure of analysing a 2^3 factorial experiment with three replications where in AB is confounded in replication I, AC is confounded in replication II and BC is confounded in replication III. Write the ANOVA table by giving the relevant data layout. (9)