



GN-236

100170



V Semester B.Sc. Examination, December - 2019
(CBCS) (Fresh) (2019-20 and Onwards)

STATISTICS-V

SAMPLING THEORY AND STATISTICAL QUALITY CONTROL

Time : 3 Hours

Max. Marks : 70

- Instructions:** (i) Answer **any five** questions from Section - A and **five** questions from Section - B.
(ii) Scientific calculators are allowed.

SECTION - A

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

5x5=25

1. What is a sample survey ? Explain the advantages of a sample survey over a complete enumeration.

2. In case of SRSWR, show that $E(s^2) = \sigma^2$

Where
$$s^2 = \frac{1}{n-1} \sum_{i=1}^n (y_i - \bar{y})^2$$

$$\sigma^2 = \frac{1}{N} \sum_{i=1}^N (Y_i - \bar{Y})^2$$

3. What is stratified random sampling ? Explain any two methods of allocating sample size in stratified random sampling.

4. What is systematic sampling ? Explain. In a linear 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 (SQC).

6. Discuss any five criteria to detect lack of control on a control chart.

7. Define 'Process Capability Ratio (PCR)'. Write the consequences of the following :

- (i) $PCR < 1$ (ii) $PCR = 1$ (iii) $PCR > 1$

8. Define AOQ. Obtain the expression for AOQ in a Single Sample Plan (SSP).

P.T.O.



SECTION - B

II. Answer any five of the following questions :

5x9=45

9. (a) What are questionnaire and schedule ? What precautions do you take while drafting a questionnaire ? Explain. 5+4
(b) Distinguish between Sampling and Non-sampling errors.

10. Explain SRSWOR and SRSWR. With usual notations, under SRSWOR, Prove that 9

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

Deduce the expression for standard error of estimate of population total (\hat{Y}) and write confidence limits for population total.

11. (a) Explain simple random sampling for proportions with usual notations, prove that $\hat{V}(\hat{A}) = N(N-n) \frac{pq}{n-1}$. 4+5
(b) Obtain an expression for sample size, while estimating population proportion in case of SRSWOR.

12. In stratified random sampling, show that the variance of the estimate of the population mean is minimum if n_h is proportional to $\frac{N_h S_h}{\sqrt{C_h}}$; $h=1, 2, \dots, L$ and hence obtain an expression for $V(\bar{y}_{st})$. 9

13. (a) In stratified random sampling, with usual notations, ignoring fpc, prove that $V_{\text{Ran}} \geq V_{\text{Prop}} \geq V_{\text{opt}}$ where optimum allocation is for a fixed sample size. 6+3

- (b) Discuss the advantages and disadvantages of systematic sampling.

14. (a) Derive the control limits for \bar{X} and S charts when process standards are unknown. 4+5
(b) Explain the construction of U - Chart.

15. (a) Distinguish between : 4+5
(i) AQL and LTPD
(ii) Producer's risk and Consumer's risk
(b) Obtain expressions for O.C and A T I of a Single Sampling Plan.



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V Semester B.Sc. Examination, December - 2019
(CBCS) (Fresh) (2019-20 and Onwards)

STATISTICS-VI

DESIGN AND ANALYSIS OF EXPERIMENTS



Time : 3 Hours

Max. Marks : 70

Instructions : (i) Answer **any five** questions from **section A** and **any five** questions from **section B**.

(ii) Scientific calculators are permitted.

SECTION - A

I. Answer **any five** questions from the following :

5x5=25

1. (a) Define Analysis of Variance (ANOVA). Mention the assumptions involved in ANOVA.
(b) What is Linear Model ? Explain fixed effect and random effect models in ANOVA.
2. Obtain expectation of error sum of squares in a two way classified data.
3. Describe (i) Randomization
(ii) Replication
(iii) Local Control.
4. What is Completely Randomized Design (CRD) ? Give a layout of CRD with four treatments A, B, C and D replicated 4, 3, 5 and 2 times respectively. Mention the merits of CRD.
5. Obtain the expression for relative efficiency of a RBD over CRD.
6. What are factorial experiments ? Explain the Yates method of obtaining factorial effect totals in a 2^3 factorial experiment.
7. Define contrast and orthogonal contrasts. In a 2^3 factorial experiment, Show that the main effects A and B are orthogonal contrasts.
8. What is meant by confounding ? Distinguish between complete and partial confoundings.

P.T.O.

**SECTION - B**

- II. Answer any five questions from the following :** **5x9=45**
9. (a) Explain Validity of F test in Analysis of Variance. **3+6**
(b) Obtain the expectation of treatment sum of squares in ANOVA for one-way classified data.
10. Explain the Analysis of Variance of a two-way classified data with multiple but equal number of observations per cell. **9**
11. Describe the analysis of Completely Randomized Design. **9**
12. Stating the assumptions, hypotheses to be tested, obtain the splitup of various sums of squares in RBD. Also setup the ANOVA table of RBD. **9**
13. What is missing plot technique ? Derive an expression for estimating a missing observation in Latin Square Design and write the corresponding ANOVA table. **9**
14. Explain the analysis of a 2^2 factorial experiment. **9**
15. Describe the procedure of analysing a 2^3 factorial experiment with three replicates where in, AB is confounded in replicate 1, AC is confounded in replicate 2 and BC is confounded in replicate 3. Write the ANOVA table by giving the relevant data layout. **9**

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