

2017

STATISTICS

[General]

PAPER – IV(A+B)

Full Marks : 45

Time : 2 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

[OLD SYLLABUS]

GROUP – A

(ANOVA, Design of Experiments)

Answer any two questions from Q. Nos. 1 to 4 :

1. Work out the analysis of variance for a two-way classified data (one observation per cell). State the assumptions made.

8 × 2

6 + 2

(Turn Over)

2. Define 'experimental error'. What are its main sources ? What methods are adopted to increase the accuracy of an experiment ? 1 + 3 + 4

3. If y_{ij} is the observation from plot in the i th block to which j th treatment is applied and

$$E(y_{ij}) = \mu + a_i + \tau_j$$

where μ is the average effect, a_i and τ_j are fixed effects of i th block and j th treatment respectively ($i = 1, 2, \dots, b$) ($j = 1, 2, \dots, v$), obtain estimate of a_i and τ_j . Analyse the data obtained from the above design and compare it with completely randomised design. 6 + 2

4. Give the expressions for the total effect, the main effect, SS-due to an effect and the standard error of an effect for a 2^2 -experiment. 8

Answer one from the Q. Nos. 5 and 6 : 7×1

5. In a randomised block design three varieties of wheat A, B, C were tested for their yield. Each of five blocks were divided into three plots, and plots of each block were assigned at random to the three varieties. Perform the analysis of variance of the data obtained from the experiment. 7

6. How is the efficiency of a design measured? Derive the expression to measure the efficiency of a Latin Square Design over a Randomised Block Design. State the assumptions used in the derivation. 7

GROUP – B

(Sample Survey)

Answer any two questions from Q. Nos. 7 to 10 :

8 × 2

7. Discuss the basic principles of sample survey. What are the advantages of sample survey over complete enumeration? 8
8. Prove that, in SRSWOR, the variance of the sample mean is given by

$$\text{Var}(\bar{y}_n) = \frac{S^2}{n} \cdot \frac{N-n}{N}, \text{ where}$$

N = Number of units in the population

n = Sample size

S² = Mean square for the population. 8

9. What are random sampling numbers ? Outline the different random number series and explain how these are used to select a simple random sample. 1 + 7
10. Describe the procedure of stratified random sampling. Under what conditions is stratified random sampling preferred to simple random sampling and why ? Point out a situation suitable for use of stratification and clearly explain the basis of stratification. 3 + 2 + 3

Answer any one question from Q. Nos. 11 and 12 : 6 × 1

11. Explain the following terms in brief : 6
- (a) Non-sampling Error
 - (b) Simple Random sampling with replacement
 - (c) Sample Survey.
12. How would you estimate the population proportion in case of SRSWOR ? Check unbiasedness of the estimator used. 6
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