

T. Y. B. Sc. Examination-Mar./Apr. 2016
Statistics Paper – 303
(Sampling Technique and Design of Experiment)

Code:-8969

Time :- 3 hours

Marks : 75

Instructions:- 1) There are five compulsory questions in this Q. Paper.

2) All question carry equal marks.

3) Statistical Tables will be provided on request.

- Q1 a) Define the term: Sampling. Simple random sampling. 08
(i) Show that Sample mean is an unbiased estimator of population mean
(ii) Derive an unbiased estimator of population total for simple random sampling without replacement
- b) Define simple random sampling .If (x_i, y_i) are a pair of variates defined on every unit in the population and (\bar{x}, \bar{y}) are the corresponding means from a SRS of size n , then covariance is: 07

$$\text{Cov}(x_i - \bar{x})(y_i - \bar{y}) = \frac{N-n}{nN} \cdot \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})(y_i - \bar{y})$$

OR

- Q1 a) (i) prove that (in usual notation) 12
$$V(\bar{y}) = \frac{s^2}{n} (1 - f)$$

(ii) Determine the sample size for population mean when coefficient of variation and confidence coefficient are given.
- b) From a list of 3042 names and addresses a sample of 200 names show an investigation of 38 wrong addresses. Estimate the total number of addresses needing correction in the list and find the S.E. of the estimate. 03

- Q2 a) Define stratified random sampling. Show that in Stratified random sampling, sample mean is unbiased estimator of population mean. 06
- b) If f , p. c. is ignored then prove that: 09

$$V_{\text{opt.}} \leq V_{\text{prop.}} \leq V_{\text{ran}}$$

OR

- Q2 a) Explain the method of taking systematic sample. What are the advantages of systematic sampling. 06

- b) Prove that (in usual notations) for systematic sampling 09

$$V(\bar{y}_{sy}) = \frac{N-1}{N} S^2 - \frac{k(n-1)}{N} S_{wsy}^2$$

Hence show that systematic sampling is more precise than SRS if and only if

$$S_{wsy}^2 > S^2$$

- Q3 a) Define the following Terms: 09
(i) experimental unit, (ii) yield, (iii) treatments,
(iv) blocks, (v) experimental error, (vi) extraneous factors.
- b) Explain C.R.D., covering definition, model, lay-out, advantages and disadvantages. 06

OR

- Q3 a) Discuss with suitable illustrations the role of Randomization, Replication and Local control in Design of Experiments. 07
- b) Describe Missing Plot Technique in the design of experiment. State its advantages, why this technique is not applicable in CRD? 08
- Q4 a) Derive the formula for estimating missing yields of Two Plots (of different treatment of different block) in R.B.D. Also state ANOVA for such a design. 09
- b) Explain Latin square design covering definition, model, lay-out, advantages and disadvantages. 06

OR

- Q4 a) What is Factorial Experiment. Explain main effects and interaction effects in 2^2 factorial experiments. Also give its complete analysis. 06
- b) Explain Yate's Method for 2^2 factorial experiments. 09
- Q5 a) Define Treatment Contrast and Orthogonal Contrast with illustration of each. 06
- b) Explain main effects and Interactions for 2^3 Factorial Experiment. Give analysis of such design. 09

OR

- Q5 a) Explain Yate's Method for 2^3 factorial experiments. 09
- b) What is confounding? Define total and partial confounding (illustration of each). 06