

Name

FINAL YEAR B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2005**Part III—Group (vii)—Statistics (Main)****Paper V—SAMPLE SURVEY AND DESIGN OF EXPERIMENTS**

Time : Three Hours

Maximum : 65 Marks

*Not more than 13 marks will be awarded from each unit.***Unit I**

1. Define : (i) Sampling unit ; (ii) Sampling frame. (2 marks)
2. State the need for sampling methods. (2 marks)
3. Show that in simple random sampling without replacement the sample mean \bar{y} is an unbiased estimate of the population mean \bar{Y} . (4 marks)
4. What are non-sampling errors ? Mention their sources. (4 marks)
5. Prove that under SRSWOR $E(s) = S^2$. (7 marks)
6. Show that the ratio estimate is biased. Derive the expression for bias term. (7 marks)

Unit II

7. Explain the term : Strata. (2 marks)
8. Mention any *two* advantages of stratified sampling method. (2 marks)
9. If in every stratum the sample estimate \bar{y}_h is unbiased then prove that \bar{y}_{st} is an unbiased of the population mean \bar{y} . (4 marks)
10. Explain the following with examples :—
 - (a) Linear Systematic Sampling Method.
 - (b) Circular Systematic Sampling Method.
 (4 marks)
11. If $\hat{y} = N \bar{y}_{st}$ is the estimate of the population total y then show that $V(\hat{y}_{st}) = \sum N h (N_h - n_h) \frac{S_h^2}{n_h}$ (7 marks)
12. Obtain the expression for sample size n_i for i th stratum under optimum allocation in stratified random sampling assuming a cost function. (7 marks)

Turn over

Unit III

13. Define analysis of variance. Also mention the assumptions under analysis of variance. (2 marks)
14. What is meant by local control? (2 marks)
15. State the conditions under which every linear parametric function is estimable. (4 marks)
16. Explain briefly the technique of analysis of variance for one-way classified data. (4 marks)
17. Develop analysis of variance for a two-way classification with, one observation per cell starting with a suitable linear model. (7 marks)
18. Define the Gauss-Markov model $(Y, X\beta, \sigma_G^2)$ where G is a known positive definite matrix and explain how it can be reduced to the standard Gauss-Markov set up $(Y, X\theta, \sigma^2 I_n)$. (7 marks)

Unit IV

19. Explain a completely Randomized Design. (2 marks)
20. Define Graeco Latin Square. Give an example. (2 marks)
21. What is meant by Randomized Block Design? Mention the situations in which a Randomized Block Design is considered as an improvement over a completely Randomized Design. (4 marks)
22. Explain the procedure of obtaining the estimate of one missing observation in a Randomized Block Design. (4 marks)
23. Compare the relative efficiency of Latin Square over Randomized Block Design and completely Randomized Design. (7 marks)
24. What is a Latin Square Design? Give the statistical analysis of a $m \times m$ Latin square design. (7 marks)

Unit V

25. What is meant by Crude Death Rate? (2 marks)
26. Name different types of fertility rates. (2 marks)
27. State the meanings of various columns of a life table. (4 marks)
28. What purpose is served by standardised death rates, and explain how they are calculated? (4 marks)
29. Write an explanatory note on the functions of vital statistics. (7 marks)
30. Describe the various approaches to compute Net Reproduction Rates. (7 marks)