

Duration : 2 hrs .

Max Marks :60

N.B. : 1) All questions are compulsory.

2) Figures to the right indicate marks for each question.

3) Use of calculators is allowed.

Q. 1 Attempt any 2 of the following

- a) i) Define 1) Standard error 2) Minimum Variance Unbiased Estimator (04)
 ii) Write short note on Random number table method. (04)
- b) Show that, In Simple random sample probability of given element each selected in the sample is n/N . This probability is true for both WR and WOR. (08)
- c) Explain three principles of Sampling techniques. (08)
- d) i) What is optimum sample size? Explain with the help of graph. (04)
 ii) Write uses of sample survey. (04)

Q. 2 Attempt any 2 of the following

- a) Find value of n_i for which cost is minimum for fixed variance $V(\bar{y}_{st})$. (08)
- b) Derive formula for sample sizes for samples to be drawn from various strata under proportional allocation and find variance of \bar{y}_{st} under proportional allocation. (08)
- c) Show that in usual notations, $V_{prop}(\bar{y}_{st}) \geq V_{opt}(\bar{y}_{st})$. (08)
- d) Describe the stratified random sampling procedure and write its advantages? (08)

Q. 3 Attempt any 2 of the following

- a) Prove that sample mean of linear regression estimator is an unbiased estimator of population mean. (08)
- b) Prove that, In regression estimator of population mean, the value of constant b which minimizes $V(\bar{y}_{lr})$ is $b = S_{XY} / S_X^2$ and minimum variance at b is given by (08)

$$V(\bar{y}_{lr}) = \frac{(N-n)}{Nn} (1 - \rho) S_y^2$$

- c) Show that \hat{R} is an approximately unbiased estimator for R then further prove that population mean of ratio estimator is an unbiased estimator of \bar{Y} . (08)
- d) Prove that regression estimator is better than ratio method assuming some condition. (08)

Q. 4 Attempt any 2 of the following

- a) In SRS, sample mean is an unbiased estimator of population mean. (06)
- b) Describe the method of allocation. (06)
- c) Define i) Optimality ii) Auxilliary variable. (06)
- d) Define Ratio estimator and write uses of regression estimation method. (06)