

Duration : 2 hrs 30 min

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) Define i) Sampling error ii) Minimum Variance Unbiased Estimator (08)
 iii) Standard Error iv) Simple random sampling
- b) Show that probability of selecting any given unit of the population in the sample at any draw is constant and it is $1/N$. further this probability is independent at any draw. (08)
- c) In SRSWOR, If sample mean is an unbiased estimator of population mean then find variance of estimate. (08)
- d) i) Write short note on Lottery method. (04)
 ii) Write functions of NSSO. (04)

Q. 2 Attempt any 2 of the following

- a) 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)
- b) Describe the stratified random sampling procedure. How it is different than simple random sampling ? (08)
- c) Show that in usual notations, $V_{SRSWOR}(\bar{y}_{st}) \geq V(\bar{y}_{st})_{prop.}$ (08)
- d) Derive the formula for sample size for various strata when cost function is $C = a + \sum_{i=1}^k c_i n_i$ notation and which minimize $V(\bar{y}_{st})$ for fixed cost. (08)

Q. 3 Attempt any 2 of the following

- a) Find variance of unbiased estimator of linear regression. (08)
- b) Show that $\hat{Y}_R$ is approximately an unbiased estimator of Y_R . (08)
- c) Define Ratio method of estimation and Derive the relation between ratio and regression estimator. (08)
- d) Define Auxilliary variable and find variance of $\hat{R}$ i.e $V(\hat{R})$. (08)

Q. 4 Attempt any 2 of the following

- a) If sample proportion is an unbiased estimator of population proportion, then find $V(p)$ for SRSWR. (06)
- b) i) Show that SRSWOR is better method than SRSWR. (04)
 ii) Define SRSWR. (02)
- c) Define Strata and Find variance of stratified mean $V(\bar{y}_{st})$. (06)
- d) Write uses of Ratio and Regression method. (06)