terms of intra cluster correlation coefficient. [10]

7. What is two-stage sampling ? Show that in two-stage sampling in the case of equal first stage units, if units are selected at each stage by SRSWOR, an unbiased estimator of $v(\bar{y})$ is given as follows ?

$$\overline{v(\overline{y})} = \left(\frac{1}{n} - \frac{1}{N}\right) S_b^2 + \frac{1}{N} \left(\frac{1}{m} - \frac{1}{M}\right) S_w^2; \text{ where symbols}$$

have usual meanings. [10]

UNIT-IV

- Define ratio method of estimation. Find the bias of ratio estimator and also under first approximation derive its variance. [10]
- 9. Define regression method of estimation. Derive the expression for bias and show that : [10]

 $V(\overline{y_{tr}}) = \frac{N-n}{Nn} S_y^2 (1-\rho^2)$

6398/100

(4)

Question Paper Code : 6398

M.A./M.Sc. (Semester-II) Examination, 2018

BIO-STATISTICS

[First Paper]

SAMPLING THEORY

Time : Three Hours]

[Maximum Marks: 70

- Note : Answer five questions in all attempting one question from each Unit. Question No. 1 is compulsory and would carry 30 marks. Rest all questions carry 10 marks each. (Non-scientific calculators are allowed).
- 1. Attempt all parts : [3x10=30]
 - (a) State and prove the relationship between bias, mean square error and variance of an estimator.
 - (b) Discuss various procedures of selecting a random sample.
 - (c) Briefly describe various steps in a sample survey.
 - (d) When is it appropriate to use probability proportional to size sampling ? Illustrate with an example
- 6398/100 (1) [P.T.O.]

- (e) Define systematic sampling. What are its advantages and disadvantages?
- (f) What should be the size of the sample if a simple random sample from a population of 4000 items is to be drawn to estimate the percent defective within 2 percent of the true value with 95 percent probability ? It is known the true rate is unlikely to exceed 30%.
- (g) What do you understand by interpenetrating subsampling ?
- (h) What is the difference between multistage and multiphase sampling ?
- State the conditions under which ratio estimator becomes an optimum estimator.
- (j) What do you understand by Snowball Sampling?Illustrate with the help of an example.

UNIT-I

What is simple random sampling ? For simple random sampling with or without replacement, show that probability of selecting any unit in any draw is the same.
6398/100 (2)

For SRSWR, show that s² is an unbiased estimator of σ^2 . [10]

 For SRSWOR, show that sample proportion p is an unbiased estimator of population proportion P, give the expression for its variance and also derive the unbiased estimator of variance. [10]

UNIT-II

- 4. For stratified random sampling, show that $\overline{y_{st}}$ is an unbiased estimator of \overline{Y} . For sampling without replacement, derive the expression for its variance. Also give the expression for variance in case of proportional allocation. [10]
- How are various types of errors involved in collection, processing and analysis of data classified ? Discuss in detail. [10]

UNIT-III

6. Define cluster sampling. Show that for case of equal clusters and if clusters are selected by SRSWOR, sample mean \overline{y}_n is an unbiased estimator of population mean \overline{y} and derive the expression of its variance in 6398/100 (3) [P.T.O.]