

Seat No. : \_\_\_\_\_

# AC-133

April-2023

B.Sc., Sem.-VI

## 308 : Statistics (Sampling Techniques)

Time : 2:30 Hours]

[Max. Marks : 70

1. (a) Show that SRSWOR provides more efficient estimate of  $\bar{y}$  relative to SRSWR. 7  
(b) Show that for SRSWOR, sample variance is an unbiased estimate of population variance. 7

OR

- (a) Show that for SRSWOR, sample mean is an unbiased estimate of population mean. 7  
(b) Derive variance for SRSWOR. 7

2. (a) Prove that for stratified random sampling the variance of estimate  $\bar{y}_{st}$  is  
$$\sum_{h=1}^l W_h^2 \frac{S_h^2}{n_h} (1-f_h). \quad 7$$
  
(b) Obtain  $V(\bar{y}_{st})$  under Neyman Allocation. 7

OR

- (a) Write short notes on “relative precision of stratified random sampling and simple random sampling”. 7  
(b) Explain stratified random sampling in detail. 7

3. (a) Derive variance of the mean of systematic sampling. 7  
(b) Prove that a systematic sample has same precision as a corresponding stratified random sample with 1 unit per stratum if  $\rho_{wst} = 0$ . 7

OR

- (a) Prove that the mean of systematic sample is more precised than mean of simple random sample if  $S_{wsy}^2 > S^2$ , where  $S_{wsy}^2 =$  variance among units that lies within the systematic sample. 7  
(b) If the population consists of linear trend, give the relationship between variance of stratified sampling, simple random sampling and systematic sampling. 7

4. (a) Write a note on two stage sampling. 7  
 (b) If  $n$  units and  $m$  subunits from each chosen unit are selected by SRS then,

$$V(\bar{y}) = \frac{N-n}{N} \frac{S_1^2}{n} + \frac{M-m}{M} \frac{S_2^2}{mn} \quad 7$$

**OR**

- (a) Explain : Sub sampling is regarded as incomplete sampling. 7  
 (b) Show that in two stage sampling : 7

$$V(\hat{\theta}) = V_1 [E_2(\hat{\theta})] + E_1 [V_2(\hat{\theta})]$$

5. Attempt any **seven** : 14

- (1) Give the formula of Finite Population Correction if the sample of size  $n$  is drawn from population of size  $N$ .
- (2) How many possible sample of size  $n$  can be drawn from population of size  $N$  without replacement ?
- (3) In which sampling method, probability of drawing a unit at each selection remains same ?
- (4) Define simple random sampling with replacement.
- (5) Give the formula of  $\bar{y}$  and  $\bar{y}_h$  for stratified random sampling
- (6) Give the confidence limits for population mean and population total for stratified random sampling.
- (7) When the systematic random sampling is more precised than the simple random sampling ?
- (8) When the systematic random sample is having the same precision as corresponding stratified random sample ?
- (9) Write two drawbacks of systematic sampling.
- (10) Explain what is sub sampling.
- (11) When two stage sampling reduces to a single stage sampling ?
- (12) What is the appropriate sampling procedure, when an investigator wants a sample containing  $m$  units which possess a rare attribute ?