

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2024
(Fourth Semester)

Branch – STATISTICS

BASIC SAMPLING THEORY

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 1 = 5)

- 1 Which of the following is a non sampling error?
(i) Response error (ii) Substitution error
(iii) faulty demarcation of sampling units (iv) Faulty selection of sample
- 2 Simple random sampling is
(i) Probability sampling (ii) Non probability sampling
(iii) Mixed sampling (iv) Judgement sampling
- 3 The sampling fraction is
(i) N/n (ii) $1/N$ (iii) n/N (iv) $1-n/N$
- 4 In proportional allocation the size of the sample from the strata is proportional to
(i) Population size (ii) Sample size
(iii) Strata size (iv) Sampling fraction
- 5 Regression method of estimation is used to increase---
(i) variance (ii) error
(iii) precision (iv) accuracy

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

- 6 a Write the standard error of the following: Sample mean, Sample proportion, Sample correlation coefficient and sample median.
OR
b Compare sampling and Complete census methods.
- 7 a Explain the methods of selecting a simple random sample.
OR
b In srsWOR, prove that the sample mean is an unbiased estimate of the population mean.
- 8 a Explain proportional allocation and optimum allocation.
OR
b Write the principal advantages of stratified random sampling.
- 9 a Write a table for k possible systematic samples together with their means by clearly explaining the notations.
OR
b Prove that $Var(\bar{y}_{sys}) = \frac{N-1}{N} S^2 = \frac{k(n-1)}{N} S^2_{wsy}$
- 10 a Explain the need for ratio estimation.
OR
b. Prove that $V(\hat{Y}_R) = \frac{N^2(1-f)}{n} \sum_{i=1}^n \frac{(y_i - R x_i)^2}{N-1}$.

Cont...

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

11 a Explain the principles of sample survey.

OR

b Explain sampling errors with examples.

12 a How will you determine the sample size for obtaining estimate with specified coefficient of dispersion.?

OR

b By explaining the notations for simple random sampling of attributes prove that $S^2 = \frac{NPQ}{N-1}$ and $s^2 = \frac{npq}{n-1}$.

13 a. Derive an expression for the optimum sample size for fixed variance under Neyman's allocation.

OR

b Prove that $var(\bar{y}_{st})_{Ney} \leq Var(\bar{y}_{st})_P$

14 a If the population has a linear trend prove that

$$Var(\bar{y}_{st}) \leq Var(\bar{y}_{sys}) \leq Var(\bar{y}_n)_R$$

OR

b Prove that $Var(\bar{y}_{sys}) = \frac{nk-1}{nk} \frac{S^2}{n} [1 + (n-1)\rho]$.15 a Prove that $E\left(\frac{r-R}{R}\right) = \frac{1}{\bar{X}^2} * \frac{N-n}{Nn} * S_x^2 - \frac{(N-n)}{Nn} \rho S_x S_y$.

OR

b Prove that $V(\bar{y}_{lr}) = \frac{1-f}{n} [S_y^2 - 2b_0 S_{yx} + b_0^2 S_x^2]$.

Z-Z-Z

END