25STP103

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch - **STATISTICS**

SAMPLING THEORY AND METHODS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The stratification of population should be done such a way that (a) strata are homogeneous (b) strata are heterogeneous (c) stratum size is equal (d) stratum size is unequal.	K1	CO1
	2	The criterion for allocation of sample size in different strata is (a) minimizing cost (b) minimizing variance (c) both a and b (d) either a or b	K2	CO1
2	3	When the population units are arranged on an area or a plane, the appropriate sampling procedure is (a) Linear systematic sampling (b) circular systematic sampling (c) one dimensional sampling (d) two-dimensional systematic sampling	K1	CO2
	4	If a systematic sample of 14 objects from a population of 448 objects, what would be the interval size? (a) 32 (b) 448 (c) 28 (d) 13	K2	CO2
3	5	Which of the following statements is TRUE about cluster sampling? (a) It is non-probability sampling (b) Each individual in the population has an equal chance of being selected (c) It reduces the time and cost of data collection (d) It divided the population into overlapping groups	K1	CO3
	6	Horvitz-Thompson estimator is (a) an unbiased estimator of the population total (b) the biased estimator of the population total (c) an unbiased estimator of the population mean (d) the biased estimator of the population mean	K2	CO3
4	7	What are the first stage units in two stage sampling? (a) The elements that are sampled in the second stage of the sampling (b) The clusters of the population that are selected in the first stage (c) The characteristics that are used to divided the population (d) The final elements that are selected for the sample.	K1	CO4
	8	What are units selected in the first stage of a two-stage sampling? (a) secondary units (b) sub units (c) elements (d) primary units	K2	CO4
5	9	Define difference estimator (a) $\bar{y} + (\bar{X} - \bar{x})$ (b) $\bar{y} + (\bar{X} + \bar{x})$ (c) $\bar{y} - (\bar{X} - \bar{x})$ (d) $\bar{y} - (\bar{X} + \bar{x})$	K1	CO5
	10	Give the bias of regression estimator. (a) cov $(\bar{x}, b)$ (b) - cov $(\bar{x}, b)$ (c) cov $(\bar{x}, \bar{y})$ (d) - cov $(\bar{x}, \bar{y})$	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the Neyman allocation of sample size in a stratified sampling.	K4	CO1
		(OR)		
	11.b.	Explain and give the optimum number of strata in stratified sampling.	K4	
2	12.a.	Explain the sampling procedures in systematic sampling.	K4	CO2
		(OR)		
	12.b.	Derive the sampling variance of the population mean in systematic sampling with interval k.	K3	
3	13.a.	Derive the mean and variance of sample mean in cluster sampling.	K4	CO3
		(OR)		
	13.b.	Derive the optimum cluster size in cluster sampling.	K3	
4	14.a.	Discuss three stage pps sampling.	K2	CO4
		(OR)		
	14.b.	Explain the scheme of two stage sampling with equal first stage units and write the expression for variance of the estimate of population mean.	K4	
5	15.a.	Derive the variance of difference estimator.	K3	CO5
		(OR)		
	15.b.	Derive the condition under which ratio estimator is superior to mean per unit.	K3	

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Discuss about the "Stratified random sampling is always superior to simple random sampling." Criticize.	K5	CO1
2	17	Verify that a systematic sample mean is a more efficient estimator of the population mean than a simple random mean, but less efficient than a stratified random sample mean in a population with linear trend.	K5	CO2
3	18	Test that the simple arithmetic mean of cluster means with unequal cluster size is not an unbiased estimator. Also obtain its bias and variance.	K5	CO3
4	19	Suppose n fsu's are selected with pps, wr, and from each selected fsu, m ssu's are selected with simple random sampling, wor. Give an unbiased estimator the of he population total Y and derive an unbiased estimator of the sampling variance of the estimator,	K5	CO4
5	20	Compare regression estimator with mean per unit and ratio estimator.	K4	CO5

Z-Z-Z END