PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2025
(Fourth Semester)
Branch - **STATISTICS**
BASIC SAMPLING THEORY

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 entire collection of items or individuals under study is called_____. a) Sample b) Population c) Census d) Attribute	K1	CO1
	2	CSO differs from NSSO mainly because: a) CSO collects rainfall data b) CSO prepares national income and accounts statistics c) CSO conducts household surveys d) CSO manages census operations	K2	CO1
2	3	The unbiased estimator of the population total under SRS is_____. a) $N\bar{y}$ b) $n\bar{y}$ c) $\frac{\bar{y}}{N}$ d) $\frac{N}{n}\bar{y}$	K1	CO2
	4	The effect of the finite population correction factor is _____. a) To increase the variance estimate when sampling fraction is large b) To reduce the variance estimate when sampling fraction is large c) To have no effect on the variance estimate d) To make the estimator biased	K2	CO2
3	5	In optimum allocation, the number of samples drawn from the h^{th} stratum is proportional to_____ a)N_h b) N_hS_h c) $\sqrt{N_h}$ d)S_h^2	K1	CO3
	6	The main advantage of optimum allocation over proportional allocation is_____. a) It minimizes the cost of sampling b) It minimizes the variance of the stratified mean for a fixed n c) It requires less population information d) It is easier to implement always	K2	CO3
4	7	A key requirement for applying systematic sampling is that_____. a) The population must be ordered in some way b) The sample size must be very large c) Stratification must be possible d) Clusters must be defined	K1	CO4
	8	Circular systematic sampling is preferred when_____. a) The population has a circular or cyclical structure b) The population has no ordering c) Stratified sampling is impossible d) Clusters are not available	K2	CO4
5	9	The regression coefficient used in regression estimator is estimated from_____. a) Population means b) Sample data c) Auxiliary variable variance alone d) Random numbers	K1	CO5
	10	The variance of the regression estimator compared to the mean per unit estimator is smaller when a) The correlation coefficient between X and Y is high b) The correlation coefficient is low c) The auxiliary variable has no relation with study variable d) The auxiliary variable mean is unknown	K2	CO5

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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.	What are the principles of sample survey?	K2	CO1
		(OR)		
	11.b.	Explain the sampling and non-sampling errors.		
2	12.a.	Show that the SRSWOR the sample mean square is an unbiased estimate of the population mean square.	K3	CO2
		(OR)		
	12.b.	Explain the simple random sampling for attributes.	K2	
3	13.a.	What are the advantages of stratified random sampling?	K2	CO3
		(OR)		
	13.b.	Show that $Var(\bar{y}_{st})$ is minimum for fixed total size of the sample if $n_i \propto N_i S_i$.	K3	
4	14.a.	Prove that systematic sampling gives more precise than SRSWOR if $S^2_{wsys} \geq S^2$.	K3	CO4
		(OR)		
	14.b.	State the advantages and disadvantages of systematic sampling.	K4	
5	15.a.	Show that first approximation to the bias of the ratio estimators (R) is given by $B(R) = \frac{-Cov(\bar{x}.\hat{R})}{\bar{X}}$.	K3	CO5
		(OR)		
	15.b.	Explain the bias of regression estimator.	K5	

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	Explain the advantages of sampling over complete enumeration.	K5	CO1
2	17	Derive the simple random sampling without replacement the variance of the sample mean is $v(\bar{y}) = \frac{N-n}{N}\frac{s^2}{n}$.	K3	CO2
3	18	Describe the allocation of sample to different strata.	K6	CO3
4	19	If the population consists of linear trend, then prove that $Var(\bar{y}_{st}) \leq Var(\bar{y}_{sys}) \leq Var(\bar{y}_n)_R$.	K4	CO4
5	20	Derive the first approximation to the relative bias of the ratio estimator.	K4	CO5

Z-Z-Z END