PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Fourth Semester)

Branch - **STATISTICS**

STATISTICAL INFERENCE - I

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	If an estimator converges in probability to the true parameter value, it is called (a) Efficient (b) Consistent (c) Unbiased (d) Minimum variance	K1	CO1
	2	The variance of any unbiased estimator cannot be less than (a) Sample variance (b) Fisher Information (c) Cramér–Rao lower bound (d) Expectation value	K2	CO1
2	3	The Neyman–Fisher Factorization Theorem provides a criterion for (a) Consistency (b) Sufficiency (c) Unbiasedness (d) Efficiency	K1	CO2
	4	The Rao–Blackwell Theorem is used to (a) Improve an estimator using a sufficient statistic (b) Find CR bound (c) Test efficiency (d) Estimate bias	K2	CO2
3	5	MLEs are generally (a) Biased but consistent (b) Unbiased but inefficient (c) Both unbiased and efficient (d) None of these	K1	CO3
	6	The minimum chi-square method minimizes (a) $\Sigma(O-E)^2/E$ (b) $\Sigma(E-O)^2$ (c) $\Sigma(O/E)$ (d) $\Sigma E/O$	K2	CO3
4	7	The Bayesian estimator uses (a) Only sample data (b) Prior and posterior distributions (c) Only likelihood (d) CR inequality	K1	CO4
	8	The posterior distribution is proportional to (a) Likelihood × Prior (b) Likelihood / Prior (c) Prior / Likelihood (d) None of these	K2	CO4
5	9	The sign test is based on (a) Number of positive and negative differences (b) Ranks of observations (c) Variance of differences (d) Chi-square	K1	CO5
	10	The χ^2 test for goodness of fit compares (a) Means (b) Observed and expected frequencies (c) Variances (d) Medians	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.	State and interpret the Cramér–Rao Inequality.	K2	CO1
		(OR)		
	11.b.	What is a minimum variance bound estimator (MVBE)?		
2	12.a.	State Neyman's Factorization Theorem.	K3	CO2
		(OR)		
	12.b.	Explain the idea of Rao–Blackwellization.		
3	13.a.	List the properties of MLEs	K4	CO3
		(OR)		
	13.b.	Differentiate between minimum and modified minimum chi-square estimators.		
4	14.a.	Explain the concept of prior and posterior in Bayesian estimation.	K5	CO4
		(OR)		
	14.b.	Explain about the level of confidence?		
5	15.a.	Explain the purpose of the Wilcoxon signed rank test.	K5	CO5
		(OR)		
	15.b.	Explain the procedure of run test.		

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	Given a random sample from $N(\mu, \sigma^2)$, find the unbiased estimator of μ and verify if it attains the CR bound.	K5	CO1
2	17	State and prove the Rao–Blackwell theorem, and explain its importance in obtaining MVUEs.	K3	CO2
3	18	Compare the method of moments and maximum likelihood method in terms of bias and efficiency.	K3	CO3
4	19	Explain the concept of Bayesian estimation with a simple illustration.	K2	CO4
5	20	Explain the procedure for the χ^2 test for goodness of fit and its interpretation.	K5	CO5

Z-Z-Z END