22STP207N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2025
(Second Semester)

Branch - **STATISTICS**

ESTIMATION 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	An estimator is considered to be the best if its distribution is: (a) Continuous (b) Discrete (c) Normal (d) Concentrated about the true parameter value	K1	CO1
	2	If an estimator T_n of population parameter θ converges in probability to θ as n tends to infinity is said to be: (a) sufficient (b) efficient (c) consistent (d) unbiased	K1	CO1
2	3	Crammer-Raw inequality with regard to the variance of an estimator provides (a)upper bound on the variance (b) lower bound on the variance (c) asymptotic variance of an estimator (d) None of the above	K1	CO2
	4	*A* minimum variance unbiased estimator T_n is said to be unique if for any other estimator T_n^* (a) $Var(T_n) = Var(T_n^*)$ (b) $Var(T_n) \leq Var(T_n^*)$ (c) both (a) and (b) (d) neither (a) not (b)	K2	CO2
3	5	Method of minimum Chi-squre for the estimation of parameters utilizes: (a) Chi-square distribution function (b) Pearson's Chi-square statistic (c) Contingency table (d) All the above	K1	CO3
	6	Modified minimum Chi-square differs from minimum Chi-square in respect of: (a) numerator of Chi-square statistic (b) denominator of Chi-square statistic (c) basic approach (d) None of the above	K1	CO3
4	7	Pitman estimator for locations usually posses: (a) smallest mean square error (b) symptotic property (c) a property of complete statistic (d) all the above	K2	CO4
	8	Main feature of Bayes' approach in the estimation of parameter is: (a) to consider the parameter a random variable (b) specification of the prior distribution (c) both (a) and (b) (d) neither (a) nor (b)	K2	CO4
5	9	Confidence region tentamounts to estimation of: (a) Confidence interval for a parameter of a distribution (b) Confidence interval for two or more parameters of a population distribution (c) both (a) and (b) (d) neither (a) nor (b)	K1	CO5
	10	The most pragmatic approach for determining (1-α) % confidence interval is to find out (a) zero width confidence interval (b) equal tail confidence coefficient interval (c) a confidence interval such that the combined area of both the tails is equal to α (d) none of the above	K1	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.	Discuss the importance of Fisher information in finding a sufficient statistic.	K3	CO3
		(OR)		
	11.b.	If T_n is a consistent estimator of parameter θ and g is a continuous function then show that $g(T_n)$ is a consistent estimator of $g(\theta)$.		
2	12.a.	State and prove Lehmann – Scheffe Theorem for convex loss function.	K4	CO4
		(OR)		
	12.b.	State and establish Bhattacharya Inequality.		
3	13.a.	Describe the method of moments and illustrate with an example.	K4	CO3
		(OR)		
	13.b.	Obtain the Maximum Likelihood estimators of the parameters of a normal distribution.		
4	14.a.	Find the Bayes Estimator of parameter p of a Binomial Distribution with X successes out of n trials given that the prior distribution of p is a Beta distribution with parameter α and β.	K5	CO4
		(OR)		
	14.b.	Write a note about Prior Distribution Protector Distribution Pitman Estimator		
5	15.a.	Let $X_1, X_2, \ldots, X_n$ be a random sample of size n from $N(\mu, \sigma^2)$ obtain $(1-\alpha)\%$ confidence interval for σ^2 using the large sample behavior of MLE.	K4	CO3
		(OR)		
	15.b.	Examine the confidence interval for the parameter 'O' of an exponential distribution.		

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	State and Establish Neyman-Fisher Factorization theorem.	K4	CO4
2	17	Derive Chapman – Robbin's inequality, using covariance inequality.	K5	CO5
3	18	Describe the method of minimum chi-square and method of modified minimum chi-square.	K5	CO5
4	19	Explain Bayesian estimation procedure with an example.	K4	CO4
5	20	Examine the confidence interval in large sample with the likelihood function of a random sample of size n drawn from a Poisson distribution with parameter θ.	K5	CO4

Z-Z-Z END