22STP207N / 22STP207

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2024
(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	Parameters are those constants which occur in: (a) samples (b) probability densityfunction (c) a formula (d) none of the above	K1	CO1
	2	Consistency can specifically be named as: (a) simple consistency (b) mean-squared consistency (c) simple consistency and mean squared consistency both (d) all the above	K2	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	Rao-Blackwell theorem enables us to obtain minimum variance unbiased estimator through: (a) unbiased estimators (b) complete statistics (c) efficient statistics (d) sufficient statistics	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	By the method of moments one can estimate: (a) all constants of a population (b) only mean and variance of a distribution (c) all moments of a population distribution (d) all the above	K2	CO3
4	7	Bayes approach is (a) universally accepted (b) a matter of controversy (c) irrelevant (d) none of the above	K1	CO4
	8	Pitman's estimator for location parameters are generally: (a) unbiased (b) consistent (c) a function of sufficient statistics (d) none of the above	K2	CO4
5	9	Confidence region tentamounts to estimation of: (a) Confidence interval for a parameter of a distribution (b) confidence interval fro two or more parameters of a population distribution (c) both (a) and (b) (d) neither (a) nor (b)	K1	CO5

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5	10	Formula for the confidence interval for the ratio of variances of two normal population involves: (a) χ2- distribution (b) F-distribution (c) t-distribution (d) none of the above	K2	CO5

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.	Let X_1, X_2, X_3 be three independent observations on a random variable $X \sim B(1, \theta)$. Find that $T = X_1 + 2X_2 + 3X_3$ is not sufficient for θ.		
2	12.a.	State and prove Lehmann – Scheffe Theorem for convex loss function.	K4	CO4
		(OR)		
	12.b.	State and Prove the necessary and sufficient condition for unbiased estimator to be UMVUE.		
3	13.a.	Describe the method of moments and illustrate with an example.	K5	CO5
		(OR)		
	13.b.	Obtain the maximum likelihood estimators of the parameters of a normal distribution.		
4	14.a.	Show that the Bayes estimator of normal distribution with known variance, the posterior distribution of μ is $N(c/b, 1/b)$.	K5	CO4
		(OR)		
	14.b.	Write a note on Baye's estimation.		
5	15.a.	Consider the normal distribution $N(\mu, \sigma^2)$ when σ^2 is known. Examine the confidence interval for μ.	K4	CO3
		(OR)		
	15.b.	Test for the problem of constructing a simultaneous confidence region for mean μ and variance σ^2 of a normal distribution using a random sample of n observations.		

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 prove a sufficient condition for the consistency of an estimator.	K4	CO4
2	17	Derive Chapman – Robbin's inequality, using covariance inequality.	K5	CO5
3	18	Explain the method of maximum likelihood.	K5	CO5
4	19	Explain Bayesian estimation procedure with an example.	K4	CO4
5	20	Examine the theorem of the large sample method of constructing CIs which provides the shortest average width intervals asymptotically.	K5	CO4

Z-Z-Z END