22STU411N/22STU411

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 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	Considering the sample statistic, if the mean of sampling distribution is equal to population mean then the sample statistic is classified as a) Unbiased estimator b) biased estimator c) Interval estimator d) Hypothesis estimator	K1	CO1
	2	The denominator in the Cramer -Rao inequality is known as: a) Upper bound of the variance b) lower bound of the variance c) Information limit d) Minimum variance	K2	CO1
2	3	Rao-Blackwell theorem enables us to obtain minimum variance unbiased estimator through a) Unbiased estimators b) Complete statistics c) Efficient statistics d) Sufficient statistics	K1	CO2
	4	The necessary and sufficient condition for a distribution to admit .....statistic is provided by the factorization theorem due to Neymann a) Sufficient b) Efficient c) Consistent d) Unbiased	K2	CO2
3	5	The maximum likelihood estimators are necessarily: a) Unbiased b)Sufficient c)Most sufficient d)Unique	K1	CO3
	6	For a random sample $(x_1, x_2 ....., x_n)$ from a population N (μ, σ^2), the maximum likelihood estimator of σ^2 is a) $\frac{1}{n}\sum_i (X_i - \bar{X})^2$ b) $\frac{1}{n-1}\sum_i (X_i - \bar{X})^2$ c) $\frac{1}{n}\sum_i (X_i - \mu)^2$ d) $\frac{1}{n-1}\sum_i (X_i - \mu)^2$	K2	CO3
4	7	An interval calculated from the sample data and it is likely to contain the value of parameter with some probability is called a) Interval estimate b) Point estimate c) Confidence interval d) Level of confidence	K1	CO4
	8	The end points of a confidence interval are called.. a) Confidence coefficient b) Error of estimation c) Confidence limits d) Parameters	K2	CO4
5	9	Which test is useful to determine the randomness of the sample? a) Sign test b) Median test c) One sample run test d) U test	K1	CO5
	10	The indications of the positive or negative signs are substituted for quantitative values is in _____ test. a) Median b) One sample run c) U d) Sign	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.	What do you understand about Point Estimation? When would you say that estimate of a parameter is good? –Discuss.	K3	CO1
		(OR)		
	11.b.	If T_1 and T_2 be two unbiased estimators of $\gamma(\theta)$ with variances σ_1^2 , σ_2^2 and correlation , what is the best unbiased linear combination of T_1 and T_2 and what is the variance of such a combination?		
2	12.a.	If T_1 is an MVUE of $\gamma(\theta)$ and T_2 is another unbiased estimator of $\gamma(\theta)$ with efficiency $e<1$, then prove that no unbiased linear combination of T_1 and T_2 can be an MVUE of $\gamma(\theta)$	K2,K3	CO2
		(OR)		
	12.b.	Let $\chi_1\ \chi_2 \ldots\ldots \chi_n$ be a randam sample from a distribution with p.d.f $f(x,\theta)=e^{-(x-\theta)}, \theta<x<\infty,\ -x<\theta<\infty$ obtain sufficient statistics for 'θ'.		
3	13.a.	Find the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample size n. Also find its variance.	K2,K3	CO2
		(OR)		
	13.b.	State the different methods of estimation. Describe the ML method of estimation with its properties.		
4	14.a.	Given one observation from a population with p.d.f $f(x,\theta)=\frac{2}{\theta^2}(\theta-x),\ 0\le x\le\theta$, Estimate $100(1-\alpha)\%$ confidence interval for θ.	K3	CO4
		(OR)		
	14.b.	Explain Prior and Posterior distributions in Bayesian estimation.		
5	15.a.	Define order statistics. Explain the smallest and largest statistics.	K3	CO4
		(OR)		
	15.b.	Distinguish between parametric and non-parameter 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	*If* T_1 and T_2 are two unbiased estimators of $\gamma(\theta)$, having the same variance and ρ is the correlation between them, then show that $\rho\ge 2e-1$, where e is the efficiency of each estimator.	K3	CO1
2	17	State and prove Rao Blackwell Theorem.	K2,K3	CO2
3	18	For the double Poisson distribution : $P(x)=P(X=x)=\frac{1}{2}\frac{e^{-m_1}.m_1^x}{x!}+\frac{1}{2}\frac{e^{-m_2}.m_2^x}{x!}; x=0,1,2,\ldots..$ Show that the estimates for m_1 and m_2 by the method of moments are : $\mu_1^1 \pm\sqrt{\mu_2^1-\mu_1^1-\mu_1^{1^2}}$	K4	CO2
4	19	Obtain $100(1-\alpha)\%$ confidence intervals for the parameters (a) θ and (b) σ^2 of the normal distribution $f(x;\theta;\sigma)=\frac{1}{\sigma\sqrt{2\pi}}\left[-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right], -\infty<x<\infty$	K4	CO4
5	20	Describe the procedure of Wilcoxon's Signed Rank Test for one sample and its sample groups. Illustrate.	K3	CO4

Z-Z-Z END