22MAU413N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(Fourth Semester)

Branch - **MATHEMATICS**

MATHEMATICAL STATISTICS -II

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	Identify the T_n be an estimator based on a sample $X_1, X_2 \ldots X_n$ of the parameter θ. Then T is a consistent estimator of θ if _____. a) $p(T_n - \theta > \varepsilon) \to 0 \forall \in > 0$ b) $p(T_n - \theta < \varepsilon) \to 1$ 1 c) $\lim_{n\to\infty} p(T_n - \theta > \varepsilon) = 0 \forall \in > 0$ *d)* $\lim_{n\to\infty} p(T_n - \theta < \varepsilon) = 0 \forall \in > 0$	K1	CO3
	2	Find the Cramer Rao inequality, var(t) = _____ *a)* $\gamma_1(\theta)$ *b)* $\frac{\lvert\gamma(\theta)\rvert^2}{I(\theta)}$ *c)* $\frac{\lvert\gamma^1(\theta)\rvert^2}{I(\theta)}$ *d)* $-\gamma_1(\theta)$	K2	CO3
2	3	Recall :If T is the MLE of θ and ψ(θ) is 1-1 function of θ, then Ψ(T) is the MLE of ψ(θ) _____ a) asymptotic normality b) Hazoor Bazars theorem c) invariance property of MLE d) T	K1	CO2
	4	What is the name of the theorem, any consistent solution of the likelihood equation provides a maximum of the likelihood with probability tending to unity as the sample size(n) tends to infinity name the theorem. a) Hazoor bazar b) Cramer Rao c) Rao-blackwell d) Asymptotic normality	K2	CO2
3	5	Identify, In any testing problem, the _____ is considered more series than _____. a) type I error, type II error b) type I error, α c) type II error, β d) type II error, type I error	K1	CO2
	6	The value of the test statistic which separates the critical region and the acceptance region is named as _____. a) two tailed b) critical value c) one tailed d) Sampling error	K2	CO2
4	7	Who is discovered Students t distribution? a) a.Gosset b) R.A.Fisher c) Karl pearson d) De Moivre	K1	CO3
	8	Identify, the mean of a chi square distribution with n d.f is -- a) n-1 b)n c) 2n d)n-2	K2	CO3
5	9	Identify the Replication design is used in _____. a) 1 plot b) 3 plot *c) 5 plot* *d) more than one*	K1	CO2
	10	Identify how many principles are adopted while designing experiment? a) 3 b) 4 c) 1 d) 2	K2	CO2

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.	Explain the and prove sufficient conditions for consistency	K2	CO3
		(OR)		
	11.b.	If $X_1, X_2 \ldots X_n$ are observation on a Bernoulli variance X taking the value 1→ P and q → 0 when the probability Illustrate that $\sum\frac{x_i}{n}(1-\sum\frac{x_i}{n})$ is consistent estimator of p(1-p).		
2	12.a.	Explain method of maximum likelihood estimate.	K3	CO2
		(OR)		
	12.b.	A random sample $X_1, X_2 \ldots X_5$ of size of 5 is of drawn from a normal population with unknown mean μ consider the following estimated to estimate μ (i) $t_1 = \frac{X_1, X_2 \ldots X_5}{5}$ (ii) $t_2 = \frac{X_1+X_2}{2} + X_3$ (iii) $t_3 = \frac{2X_1+X_2+\lambda X_3}{3}$ where λ is such t_3 is an un biased estimator of μ, compute λ		
3	13.a.	Given the frequency function $f(x,\theta) = \begin{cases} \frac{1}{\theta}, 0 < X < \infty, \theta > 0 \\ 0, \text{ elsewhere} \end{cases}$ and that you are testing the null hypothesis H_0: $\theta = 2$ by means of a single observed value of x, Discuss about a would be the size of the type I and type II errors, if you choose $0.5 \leq x$	K2	CO2
		(OR)		
	13.b.	Explain about a power of the set.		
4	14.a.	Explain an applications of t distribution.	K2	CO3
		(OR)		
	14.b.	Test the hypothesis that σ = 10 given that s = 15 for a random sample of size 50 from a normal population. Using ψ^2 test.		
5	15.a.	Explain principles of a good experimental design.	K2	CO2
		(OR)		
	15.b.	Discuss briefly the advandanges and disadvantage of Latin square design.		

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	Let $X_1, X_2 \ldots X_n$ be a random sample from a population with pdf $f(x, \theta) = \theta x^{\theta-1}$, $0 < x < 1$, $\theta > 0$. Illustrate $t = \prod_{i=1}^{n} x_i$ is a sufficient estimator for θ.	K2	CO2
2	17	If T_1 and T_2 are two unbiased estimator of $\gamma(\theta)$ with variance σ^2 and σ^2 correlation ρ then, (i) Illustrate the best unbiased linear combination of T_1 and T_2 (ii) Illustrate the variance of such a combination	K2	CO2
3	18	Let $X_1, X_2 \ldots X_n$ be a random sample from auniform population on (r,θ) Calculate sufficient estimator of θ.	K3	CO2
4	19	A sample of 8 observations, the sum of square of deviation of items from the mean was 94.5 in another sample of 10 observations the value was found to the 101.7 test whether the difference in the variance is at 5% level of significance. Using F test.) The critical value at 5% LOS is 3.292	K3	CO3
5	20	There varieties A,B,C of a crop are tested in a RBD with four replications the plots yields in bounds are as follows A6 C5 A8 B9 C8 A4 B6 C9 B7 B6 C10 A6 Analyse the experimental yields and state your conclusions.(Use RBD)	K4	CO2

Z-Z-Z END