22MAU413N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 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	An estimator T_n is named as _____ estimator. a) Unbiased b) consistent c) biased d) inconsistent	K1	CO1
	2	Recall that an unbiased estimator, $E(T_n)$ = ____ a) $\lambda(\theta), \forall\, \theta \in \Theta$ b) $\mu(\theta), \forall\, \theta \in \Theta$ c) $\gamma(\theta), \forall\, \theta \in \Theta$ d) $\beta(\theta), \forall\, \theta \in \Theta$	K2	CO1
2	3	Recall the maximum likelihood estimates, which are obtained by maximizing the function of joint density of random variables, are generally _____ a) unbiased& inconsistent b) consistent c) biased d) invariant	K1	CO2
	4	Identify which of the following statement about MLES is not true? _____ a) MLES are consistent b) MLES are sufficient c) if MLE exists, it is most efficient in the class of estimates d) MLE's are unbiased	K2	CO2
3	5	The probability of type I error is given by α is also Named as____. a) critical region b) power of the test c) acceptance region d) level of significance	K1	CO3
	6	Identify which of the following symbol is used for null hypothesis? a) H_0 b) H_1 c) H_2 d) H_4	K2	CO3
4	7	*Identify,* The ψ^2 test is one of the simplest and most widely used ----- test. a) Parametric b) Non parametric c) critical value d) significance	K1	CO4
	8	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	CO4
15	9	Plots of the same size are taken and divided into two groups in one group is named as _____. a) experimental b) local design c) replication d) latin	K1	CO5
	10	Identify which of the following design is used in agricultural traits? a) experimental b) local design c) replication d) latin	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.	If T is an unbiased estimator for θ then show that T^2 is an biased estimated for θ^2.	K3	CO1
		(OR)		
	11.b.	If $X_1, X_2 \ldots X_n$ is a random sample from a normal population $N(\mu, 1)$ then show that $p = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimate of μ^2+1.		
2	12.a.	Explain the method of estimation and list of the method of estimation.	K3	CO2
		(OR)		
	12.b.	Let $X_1, X_2 \ldots X_n$ be a random sample from the uniform distribution with pdf $f(x,\theta) = \begin{cases} \frac{1}{\theta}, & 0 < X < \infty,\ \theta > 0 \\ 0, & \text{elsewhere} \end{cases}$ demonstrate in the MLE of θ.		
3	13.a.	Explain the two types of error and give practical example.	K2	CO3
		(OR)		
	13.b.	Let X~N(μ, σ) is unknown , To test $H_0 : \mu$=-1 against $H_1 : \mu$=1, based on a simple of size 10 from this population we use the critical region $X_1 + 2X_2 + \cdots + 10X_{10} \geq 0$ what is the size ? what is the power of the test?		

Cont...

4	14.a.	In a sample of 1000 people in Maharashtra 540 are rice eaters and the rest are 460 wheat eaters. Can we assume that both rice and wheat are equally popular in this state finally Apply 1% level of significance(The critical value of 1%LOS is 2.58)?	K3	CO4
		(OR)		
	14.b.	Random sample of drawn from the two countries have the following relating to height of adult males mean height is given below A B Mean height 67.42 67.25 S.D 2.58 2.50 Numbers in Sample 1000 1200 (i) Is the difference between mean is significance? (ii) Is the difference between SD is significance?		
5	15.a.	Explain a randomized block design.	K2	CO5
		(OR)		
	15.b.	Explain the significance of Latin square.		

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	Demonstrate Rao-Blackwell theorem.	K2	CO1
2	17	If a random sampling from a normal population $N(\mu,\sigma^2)$ then, find the maximum likelihood estimator for compute (i) μ when σ^2 is known (ii) σ^2 when μ is known (iii) the simultaneous estimator of μ and σ^2.	K3	CO2
3	18	Explain the general procedure of testing of Hypothesis.	K2	CO3
4	19	Samples of two types electric bulbs were tested for length of life and the following data were obtained Sample no : 8 7 Sample mean : 1234 1036 Sample SD's : 36 40 Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life. Using t test.	K3	CO4
5	20	Apply Latin square experiment for the following data. 1 2 3 4 1 A(12) D(20) C(16) B(10) 2 D(18) A(14) B(11) C(14) 3 B(12) C(15) D(19) A(13) 4 C(16) B(11) A(15) D(20) The letters A,B.C.D denotes the treatments and the figures in brackets denotes the observations.	K3	CO5

Z-Z-Z END