M.Sc DEGREE EXAMINATION,APRIL 2019
I Year II Semester
Mathematical Statistics

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Define unbiased estimator.
2. Define most efficient estimator.
3. State cramer-rao inequality.
4. State any two properties of maximum likelihood estimator.
5. Define Standard error.
6. Define Type I error.
7. Explain the concept of the power of a test.
8. What is the standard error of mean.
9. What is the degree of freedom while testing the significance of the difference of two sample means if both the sample size is less than 10.
10. Write the ANOVA table for simple linear regression model.
11. Define ANOVA.
12. State the assumptions of anova.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Let X1, X2, ...Xn is random sample of from a normal population with mean μ and variance
    1. Find the unbiased estimator of $1 + \mu^2$.
14. Find the maximum likelihood estimator of for the parameter λ of a poisson distribution on the basis of sample size n.
15. If x $\geq$ 1 is the critical region for testing $\theta = 2$ against the alternative $\theta = 1$ on the basis of single observation from the population f(x,θ) $= \theta$ e $^{-x\theta}$ x $\geq$ 0, obtain the values of type I and type II errors.
16. In a sample of 100 people in Tamil Nadu 74 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in the state at 1 % level of significance .

17. Explain the oneway anova model.
18. State and prove Lehmann-Scheffe theorem
19. X_1, $X_{2,}X_3$,. . . .. X_n be a random sample from Normal with mean μ and standard deviation σ. Use likelihood ratio test to obtain BCR of size α under H_0: μ=μ_0 against H_1: $\mu \neq \mu_0$.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. State and Prove Rao-Blackwell theorem.
21. X1, X2 and X3 is a random sample of size 3 from a population with mean 'μ' and variance 'σ^2'. T_1, T_2, T_3 are the estimators used to estimate mean value μ where

    T_1= X1 + X2 – X3 , T_2 = 2X1 +3X2-4X3 T_3= (λX1 + X2 + X3) /3

    (i) Are T_1, and T_2 unbiased estimators
    (ii) Find the value of λ such that T_3 is unbiased estimator for μ
    (iii) With the value of λ Check whether T_3 is consistent estimator
    (iv) Which is the best estimator.
22. State and prove Neymann Pearson lemma.
23. State and prove the nessesary and sufficient condition for consistent estimators.
24. The following data gives the yield of three varieties of wheat in four blocks. Carryout the anova and state your conclusion.

    Per hectare yield (in '00 kgs)

	Varieties		
Plots	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

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