



K24N 0002

Reg. No. :

Name :

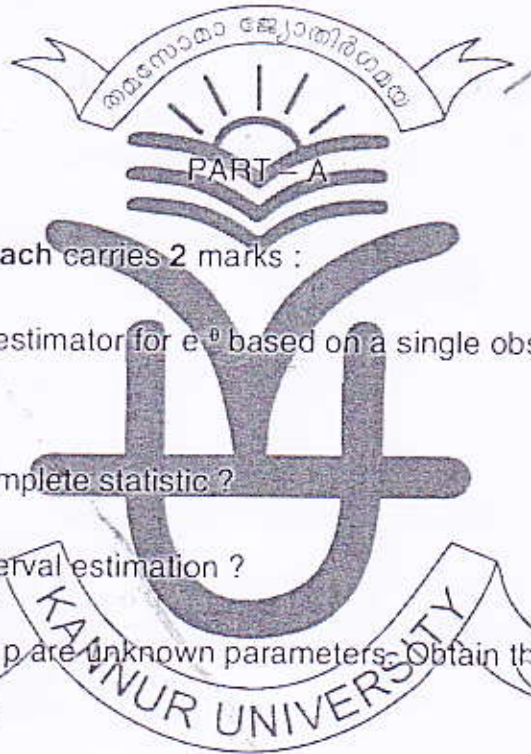
II Semester M.Sc. Degree (C.B.S.S. – Regular) Examination, April 2023
(2022 Admission)

STATISTICS WITH DATA ANALYTICS

MST2C06 : Statistical Inference

Time : 3 Hours

Max. Marks : 80



Answer **all** questions. Each carries 2 marks :

1. Obtain an unbiased estimator for $e^{-\theta}$ based on a single observation from Poisson (θ).
2. What is meant by complete statistic ?
3. What is meant by interval estimation ?
4. Let $X \sim b(n, p)$, n and p are unknown parameters. Obtain the estimate of n by method of moments.
5. Define MLR property with an example.
6. State the principle of invariance in testing of hypotheses.
7. State the Kendall's tau statistic.
8. Explain Chi-square test of goodness of fit.

(8×2=16)

P.T.O.



PART – B

Answer **any four** questions. **Each** carries 4 marks :

9. Obtain the CR lower bound for any unbiased estimator for μ of a normal population.
10. Write short notes on :
 - i) Joint sufficient statistic.
 - ii) MVUE.
11. A random sample is drawn from $U(-\theta, 0)$, $\theta > 0$. Estimate θ by
 - i) Method of MLE.
 - ii) Method of moments.
12. Explain the following :
 - i) Error probabilities
 - ii) UMP unbiased tests.
13. Substantiate the statement "UMP test does not exist for a simple hypothesis against two sided alternatives" with an example.
14. Elucidate OC function and ASN function. Give mathematical expressions.

(4×4=16)

PART – C

Answer **any four** questions. **Each** carries 12 marks :

15. State and prove Rao-Blackwell theorem. Obtain the UMVUE of $P(X = 0)$ where X has negative binomial distribution.
16. Describe the procedure of MLE. Give an example to illustrate that MLE is not unique. Also show that method of moment estimators are consistent.



17. Explain the following with examples :

i) MP test

ii) UMP test. Obtain the most powerful size α test using a single observation on $X \sim f(x)$ given that

$$H_0: f(x) = \begin{cases} 4x, & 0 < x < \frac{1}{2} \\ 4 - 4x, & \frac{1}{2} \leq x < 1 \end{cases} \text{ against } H_1: f(x) = 1, 0 < x < 1.$$

18. Derive the test statistic for testing the equality of two population means using GLRT. State and prove any one property of likelihood ratio test.

19. Discuss Wald-Wolfowitz run test with an example. Derive the mean and variance of total number of runs.

20. Explain briefly about the determination of constants in SPRT. With usual notations prove that $\alpha' + \beta' \leq \alpha + \beta$.

(4×12=48)

