



QP CODE: 25022440

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Reg No :

Name :

M.Sc DEGREE (CSS) SPECIAL REAPPEARANCE EXAMINATION, APRIL 2025

Third Semester

CORE - ST500301 - TESTING OF HYPOTHESES

M.Sc STATISTICS, M.Sc STATISTICS (Applied)

2019 ADMISSION ONWARDS

538874A5

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Explain the concepts of Type I and Type II errors with examples.
2. Define Pitman family.
3. State the important properties of most powerful tests.
4. Define a similar test.
5. Explain likelihood ratio test.
6. State Wald's fundamental identity.
7. Explain sign test.
8. Explain Mann-Whitney U test.
9. Describe run test for randomness.
10. What is meant by asymptotic relative efficiency?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Let a random sample $(x_1, x_2, \dots, x_n)$ taken from $N(\mu, \sigma^2)$. Find the most powerful test for $H_0 : \sigma = \sigma_0$ against $H_1 : \sigma = \sigma_1$ ($\sigma_0 < \sigma_1$).





12. What do you mean by the family of distribution having a monotone likelihood ratio? Explain its relevance in constructing a UMP test with an example.
13. Explain Bartlett's test for homogeneity of variances.
14. *Let X follows one parameter exponential family. For testing $H_0 : \theta = \theta_0$ against $H_1 : \theta < \theta_0$, find out a UMP size α acceptance region and corresponding confidence sets at level $(1 - \alpha)$.*
15. *Develop Wald's SPRT for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 = \sigma_1^2$ based on observations drawn sequentially from the normal population $N(\mu, \sigma^2)$.*
16. *Obtain the approximate expression for the O.C. function for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 = \sigma_1^2$ based on observations from $N(\mu, \sigma^2)$ using Wald's SPRT at strength (α, β) .*
17. Discuss the merits and demerits of non parametric tests.
18. Describe Kruskal-Wallis analysis of variance.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight **5** each.

19. *Let $X_1, X_2, \dots, X_n$ be a random sample drawn from $N(\theta, \sigma^2)$, θ known. Find out a UMP unbiased size α test for $H_0 : \sigma = \sigma_0$ against $H_1 : \sigma \neq \sigma_0$.*
20. Stating the regularity conditions, show that the likelihood ratio test is asymptotically unbiased and consistent.
21. *Let X have the Bernoulli distribution $f(x, \theta) = \theta^x(1 - \theta)^{1-x}$, $x = 0, 1; 0 < \theta < 1$. For testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ construct Wald's SPRT. Also obtain its ASN and O.C function.*
22. (a) Describe Kolmogorov-Smirnov one sample and two sample test. (b) Explain the merits and demerits of and Kolmogorov-Smirnov tests for goodness of fit over Chi-square test.

(2×5=10 weightage)

