QP CODE: 25047467

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Reg No : .....

Name : .....

M.Sc DEGREE (CSS) EXAMINATION, NOVEMBER 2025

Third Semester

Core Course - ST500301 - TESTING OF HYPOTHESES

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

2019 ADMISSION ONWARDS

8BCD25B2

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What is meant by a statistical hypothesis? What are the two types of errors in hypothesis testing?
2. Define MLR property.
3. Define unbiased tests. Give an example of a test which is unbiased.
4. When do you say that a test has Neyman structure?
5. What is likelihood ratio test?
6. Define ASN functionof an SPRT.
7. What is meant by nonparametric test?
8. Define median 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. State and prove Neymann-Pearson fundamental lemma.
12. Prove that a MP test is necessarily unbiased.
13. Derive the likelihood ratio test for testing the equality of means of several normal populations with common unknown variance.
14. Let X1, X2, ... ,Xn and Y1, Y2, ... ,Ym be a random sample drawn from $N(\mu_1, \sigma^2)$ and $N(\mu_2, \sigma^2)$,where μ_1 , μ_2 and σ^2 are unknown for testing $H_0: \mu_1 - \mu_2 = 0$ against $H_1: \mu_1 - \mu_2 \neq 0$ .Find a UMAU family of confidence sets for $\mu_1 - \mu_2$ at level (1-α).
15. Show that SPRT terminates with probabilities one.

16. Obtain the approximate expression for the O.C. function for testing $H_0 : \theta = \theta_0$ against $H_0 : \theta = \theta_1$ based on observations from $b(n, \theta)$ using Wald's SPRT.

17. Describe the chi-square test for homogeneity.

18. Explain Wilcoxon signed rank test. Obtain its null distribution.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Given a random sample of size n from the distribution with p.d.f $f(x, \theta) = \theta e^{-\theta x}, x > 0.$ Show that there exists no UMP test for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta \neq \theta_0$.

20. Let X1, X2, ... ,Xn be a random sample drawn from $N(\mu, \sigma^2)$,when both μ and σ^2 are unknown. Find out a UMPU size α test for testing $H_0 : \mu \leq 0$ against $H_1 : \mu > 0$.

21. (a) Briefly explain Wald's SPRT. What are the advantages of SPRT over fixed sample size tests?

(b) Obtain Wald's SPRT for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu = \mu_1 \ (\mu_1 > \mu_0)$ based on observations drawn sequentially from the normal population $N(\mu, \sigma^2)$.

22. Describe Kruskal-Wallis one way analysis of variance and Friedman's two way analysis of variance.

(2×5=10 weightage)