20P261 (Pages: 2) Name: …………………….

Reg. No: …………………..

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2021

(CUCSS - PG)

CC19P ST2 C09 - TESTING OF STATISTICAL HYPOTHESES

(Statistics)

(2019 Admission - Regular)

Time: Three Hours Maximum: 30 Weightage

PART A

Answer any ***four*** questions. Each question carries 2 weightage.

1. Let $X \sim G(1, \theta)$, for testing $H_0: \theta = 1$ against $H_1: \theta > 1$, based on a single observation the test function $\varphi(X)$ = 1 if $x > 2$, and $0\ if\ x \leq 2$. Find the size of the test and power function.
2. (a) Explain uniformly most powerful test and locally most powerful test.

   (b) Define P value.
3. (a) Define invariant tests.

   (b) Show that every Neyman structure test of level α leads to a similar region test of level α.
4. Explain Median test.
5. Discuss Kolmogorov- Smirnov test for two samples.
6. Explain Wilcoxon signed rank test.
7. State an prove Wald's equation in SPRT.

(4 × 2 = 8 Weightage)

PART B

Answer any ***four*** questions. Each question carries 3 weightage.

8. State and prove Neyman-Pearson lemma.
9. Obtain UMP test for testing $H_0: \theta < \theta_0$ against $H_1: \theta \geq \theta_0$, based on a sample of size n from $U(0, \theta)$.
10. Discuss likelihood ratio test and show that under assumptions to be stated, that $-2log\lambda$ has a Chi-square distribution.
11. (a) Explain Spearman rank correlation test.

    (b) What is robustness?
12. Explain locally Most Powerful Tests
13. Construct SPRT for testing $H_0: \mu = 0$ against $H_1: \mu = 1$, where μ is the mean of normal population with $\sigma = 1$.

14. Define ASN function. Let $X \sim P(\lambda)$, Consider $H_0: \lambda = \lambda_0$ against $H_1: \lambda = \lambda_1 (\lambda > 0)$. Derive SPRT and find ASN of the test.

(4 × 3 = 12 Weightage)

PART C

Answer any ***two*** questions. Each question carries 5 weightage.

15. a) State and Prove Karlin-Rubin theorem.

b) Let $X_1, X_2, \cdots X_n$ be a random sample from $f(x) = \frac{\theta}{x^2}, if\ 0 < \theta \leq x < \infty$. Find an MP test of $\theta = \theta_0$ against $\theta = \theta_1 (\neq \theta_0)$.

16. (a) Prove that one parameter exponential family has MLR property.

(b) Show that necessary and sufficient conditions that a Neyman structure test and a similar region test are identical if there exist a bounded complete sufficient statistic T at least when H_0 is true.

17. (a) Develop chi-square test for homogeneity.

(b) Describe Kendall's tau test.

18. Show that SPRT terminates with probability one.

(2 × 5 = 10 Weightage)

****