24P256 (Pages: 2) Name : ....

Reg. No : ....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2025

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P MST2 C09 / CC22P MST2 C08 - TESTING OF STATISTICAL HYPOTHESES

(Statistics)

(2019 Admission onwards)

Time: 3 Hours Maximum: 30 Weightage

Part-A

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

1. A sample of size 1 is taken from a population following Poisson distribution $P(\lambda)$. To test $H_0 : \lambda = 1$ against $H_1 : \lambda = 3$, consider the nonrandomised test $\phi(x) = \begin{cases} 1, & x > 3 \\ 0, & x \leq 3 \end{cases}$. Obtain the probabilities of type I and type II errors and power of the test.
2. Distinguish most powerful and Uniformly most powerful test
3. Explain i) Unbiased test and ii) Uniformly most powerful unbiased test
4. a) Explain Neyman structure b) Illustrate with an example for complete statistic
5. Write a short note on one sample Wilcoxon signed rank test.
6. Define sequential probability ratio test. What are its advantages and disadvantages over classical tests.
7. Let X have the distribution $f(x, \theta) = \theta^x(1-\theta)^{1-x}, x = 0, 1; 0 < \theta < 1$. Construct the SPRT for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1(\theta_1 < \theta_0)$.

(4 × 2 = 8 Weightage)

Part-B

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

8. A population has the density function $f(x, \theta) = (1+\theta)x^{\theta}, 0 < x < 1$. In order to test a null hypothesis $H_0 : \theta = 2$ against $H_0 : \theta = 4$, a sample of size one is taken. The hypotheissi is rejected if value of the sample is at least three. Obtain the non randomized test function and derive power function, size and power of test.
9. When will you say that a family of distributions possess MLR property ? Verify whether uniform distribution with p.d.f $f(x) = \frac{1}{\theta},\ 0 < x < \theta$ possess MLR property.
10. What do you mean by a) tests with Neyman structure. b) Show that tests with Neyman structure are α similar.
11. Explain chi-square test for homogeneity.

12. Explain Wilcoxon two sample signed rank test.

13. State and prove SPRT terminates with probability 1.

14. Let $X \sim P(\lambda)$, consider $H_0 : \lambda = \lambda_0$ against $H_1 : \lambda = \lambda_1 (\lambda > 0)$. Derive SPRT and find OC function.

(4 × 3 = 12 Weightage)

Part-C

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

15. State and prove Neyman Pearson lemma.

16. Let $X_1, X_2, \ldots, X_n$ be a sample $N(\mu, \sigma^2)$. Develop the likelihood ratio test for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$. when σ is unknown

17. Explain :
    (a) Median test.
    (b) Mann-Whitney Wilcoxon test.
    (c) Sign test for two sample

18. For the density function $f(x, \theta) = \theta e^{-\theta x}; x > 0, \theta > 0$. Develop SPRT for testing $H_0 : \theta = 3.6$ against $H_1 : \theta = 4.8$ of stregth $\alpha = 0.05$ and $\beta = 0.10$.

(2 × 5 = 10 Weightage)

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