25P257 (Pages: 2) Name: ....

Reg.No: ....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2026

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC22PMST2C08 - TESTING OF STATISTICAL HYPOTHESES

(Statistics)

(2022 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Part-A

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

1. Write a short note on Level of significance and power of the test
2. Given the frequency function $f(x) = \frac{1}{\theta}, 0 < x < \theta$ and zero elsewhere. In order to test the hypothesis $H_0 : \theta = 3$ against $H_1 : \theta = 5$. by means of a single sample value X, the critical region proposed is $X \geq 4$. Obtain probabilities of type I and type II errors
3. Define i) Unbiased test and ii) Uniformly most powerful Unbiased test.
4. (a) Define α similar test

   (b) Show that any unbiased size α test is α similar
5. (a) Distinguish between parametric and non-parametric tests.

   (b) Explain the limitations and advantages of non parametric tests
6. Explain Kolmogorov-Smirnov two sample test.
7. What are the merits and demerits of SPRT. Explain the sequential testing procedure

(4 × 2 = 8 Weightage)

Part-B

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

8. (a) Define multi parameter exponential family of distributions.

   (b) Show that beta distribution second type belongs to two parameter exponential family.
9. Let $X_1, X_2, \ldots, X_n$ be a sample taken from a population Poisson distribution with parmeter $f(x, \theta) = \dfrac{e^{-\theta}\theta^x}{x!}, x : 0, 1, 2, 3...$ Using Karlin Rubin theorem obtain the UMP test for $H_0 : \theta \leq \theta_0$ against $H_0 : \theta > \theta_0$
10. Develop a size α likelihood ratio test for testing $H_0 : \theta \leq \theta_0$ against $H_1 : \theta > \theta_0$ where θ is the parameter of a population following Poisson distribution

11. Describe
    (i) Chi-square test for goodness of fit.
    (ii) Kolmogorov Smirnov test for one sample.

12. Explain the testing procedure of SPRT and determine the equations of the constants A and B in terms of the strength α and β.

13. Show that SPRT terminates with probability one.

14. 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. State and prove Neyman Pearson lemma.

16. Consider a sample $X_1, X_2, \ldots, X_n$ drawn from a population following $N(\mu, \sigma^2)$
    $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 \neq \sigma_0^2$ Develop the size α likleihood ratio test under the assumption
    μ unknown

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

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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