

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2023
(Third Semester)

Branch – **STATISTICS**

HYPOTHESES TESTING

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (5 x 1 = 5)

- 1 The upper bound for the probability of type I error, selected by the statistician, is called ----- of the test.

(i) level of confidence	(ii) level of the significance
(iii) power	(iv) critical value
- 2 A test function $\phi(x)$ is said to be invariant under a group G of transformations, if $g \in G$ and.

(i) $\phi\{g(x)\} = \phi(x)$	(ii) $\phi\{g(x)\} < \phi(x)$
(iii) $\phi\{g(x)\} > \phi(x)$	(iv) $\phi\{g(x)\} \neq \phi(x)$
- 3 The LR test criterion is a function of

(i) the consistency	(ii) the unbiasedness
(iii) the sufficient statistics	(iv) efficient
- 4 In SPRT if $\lambda_m \leq B$, we terminate the process by

(i) accepting H_0	(ii) rejecting H_0
(iii) either (i) or (ii)	(iv) none of these
- 5 If U is the sign test, then the expected value of statistic U is

(i) $[(2n_1n_2) / (n_1+n_2)] + 1$	(ii) $[(2n_1n_2) / (n_1+n_2)] - 1$
(iii) $[(2n_1n_2) / (n_1-n_2)] + 1$	(iv) $[(2n_1n_2) / (n_1-n_2)] - 1$

SECTION - B (15 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

- 6 a Explain type I and type II errors.
OR
b Discuss the randomized test.
- 7 a Write a note on UMP test.
OR
b How do you test one parameter exponential family of distributions.
- 8 a State the properties of LR test.
OR
b Explain asymptotic distribution of LR test.
- 9 a What is SPRT? State its boundary conditions.
OR
b Discuss about the ASN of SPRT.
- 10 a Distinguish between parametric and non- parametric test.
OR
b Write the procedure for run test.

Cont...

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

11 a State N.P Lemma and prove the existence part.

OR

b If $x \geq 1$ is the critical region for testing $H_0: \theta = 2$ against the alternative $H_1: \theta = 1$, on the basis of the single observation from the population,

$$f(x, \theta) = \theta e^{-\theta x}, \quad 0 \leq x < \infty$$

obtain the values of type I and type II errors.

12 a Under $H_0: X \sim f(x)$, where $f(x) = \begin{cases} \frac{1}{4}, & \text{if } 0 \leq x < \frac{1}{2} \\ \frac{7}{4}, & \text{if } \frac{1}{2} \leq x < 1 \end{cases}$ and $H_1: X \sim g(x)$, where $g(x) = \begin{cases} \theta e^{-\theta x}, & 0 < x < 1 \text{ and } \theta > 0 \\ 0, & \text{otherwise} \end{cases}$ considering a sample observation x on X reject H_0 if $x < \frac{1}{10}$ or $x > \frac{9}{10}$, otherwise accept H_0 . Examine whether the test is unbiased.

OR

b Show that one parameter exponential family has MLR property.

13 a If sufficient statistics exists then prove that LR test always function of the sufficient statistics.

OR

b Explain the Chi-square test for goodness of fit.

14 a Prove that SPRT terminates with probability one.

OR

b Obtain the OC function of SPRT.

15 a Describe Kolmogorov – Smirnov test for one Sample problem.

OR

b Enumerate the application of median test with an example.

Z-Z-Z

END