LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – **APRIL 2023**

UST 5504 – TESTING OF HYPOTHESES

Date: 13-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART - A

Answer ALL the Questions **(10 x 2 = 20 Marks)**

1. What are the two types of error?
2. Define Critical Region.
3. Define a family with monotone likelihood ratio.
4. When does UMP test exist?
5. What are the properties of Likelihood Ratio test?
6. Define a parameter space.
7. What are the uses of Chi - Square test?
8. Define F distributions.
9. When do we use non - parametric tests?
10. When do we use U test?

PART - B

Answer any FIVE Questions **(5 x 8 = 40 Marks)**

11. What are the steps in solving testing of hypothesis problem?
12. Prove that the family N(θ ,1) θ > 0 has MLR property.
13. Examine whether a best critical region exits for testing the null hypothesis $H_0 : \theta = \theta_0$ against the alternative hypothesis $H_1 : \theta > \theta_0$ for the parameter θ of the distribution:

$$f(x, \theta) = \frac{1 + \theta}{(x + \theta)^2}, 1 \leq x < \infty$$

14. Explain the concept of SPRT in detail.
15. Explain the procedure for testing goodness of fit.
16. What are the advantages and disadvantages of non - parametric tests over parametric methods?

17. Let X have a pdf of the form:

$$f(x,\theta) = \begin{cases} \frac{1}{\theta} e^{-x/\theta}; & 0 < x < \infty, \theta > 0 \\ 0 & \text{elsewhere} \end{cases}$$

To test $H_0: \theta = 2$, against $H_1: \theta = 1$, use the random sample x_1, x_2 of size 2 and define a critical region: $W = \{(x_1, x_2): 9.5 \le x_1 + x_2\}$. Find

a. Power of the test.

b. Significance level of the test.

18. The following arrangement of men M and women W lined up to purchase tickets for a rock concert are as follows:

MWMWMMMWMWMMMWWMMMMWWMWM

MMWMMMWWWMWMMMWMWMMMMWWM

Test for randomness at α = 0.05.

PART - C

Answer any TWO Questions **(2 x 20 = 40)**

19. State and Prove Neymann - Pearson Lemma.

20. Show that for the normal distribution with zero mean and variance σ^2, the best critical region for $H_0: \sigma = \sigma_0$ against the alternative $H_1: \sigma = \sigma_1$ is the form:

$$\sum_{i=1}^{n} x_i^2 \le a_\alpha, for\ \sigma_0 > \sigma_1\ and \sum_{i=1}^{n} x_i^2 \ge b_\alpha, for\ \sigma_0 < \sigma_1$$

Show that the power of the best critical region when $\sigma_0 > \sigma_1$ is $F\left(\frac{\sigma_0^2}{\sigma_1^2} . \chi^2_{\alpha,n}\right)\Sigma$, where $\chi^2_{\alpha,n}$ is lower 100 α - percent point and F is the distribution function of the χ^2 - distribution with n degrees of freedom.

21. a) Give the test for the equality of two population variances.

b) Explain the steps involved in a test for equality means of a two normal population.

22. A college statistics professor claims that the median test score for his students last test is 58. the score for 18 randomly selected tests are listed below. At α = 0.01, can you reject the professor's claim?

58	62	55	55	53	52	52	59	55
55	60	56	57	61	58	63	63	55

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