



LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – APRIL 2025

UST 5504 – TESTING OF HYPOTHESES



Date: 06-05-2025

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A - K1 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

1. Answer the following
 - a) Define Power of a test
 - b) State the use of Neyman-Pearson Lemma.
 - c) What do you mean by SPRT
 - d) Define F test for equality of variance
 - e) What is the need for non-parametric tests?
2. Fill in the blanks
 - a) A region in the sample space S which amounts of rejection of H_0 is termed as _____ of rejection.
 - b) Monotone likelihood ratio property is a property of the ratio of two _____ functions.
 - c) The _____ of SPRT is defined as Probability of accepting $H_0: \theta = \theta_0$ when θ is the true value of the parameter.
 - d) In Student t-test, the parent population from which samples is drawn is _____.
 - e) _____ does not make any assumptions regarding the form of the population.

SECTION A - K2 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

3. Match the following
 - a) Type I Error - SPRT
 - b) One parameter Exponential family - Matched sample
 - c) OC function - Sign Test
 - d) Paired t test - Reject H_0 when it is true
 - e) Two related samples - Monotone likelihood ratio property
4. True or False
 - a) Type II error is accept H_0 when it is wrong.
 - b) Monotone likelihood ratio property is non decreasing in the argument of random variable X.
 - c) If we are testing a simple hypothesis H_0 against a simple alternative hypothesis H_1 then the Likelihood Ratio principle leads to same test as given by Neyman-Pearson Lemma.
 - d) A very powerful test for testing the significance of the discrepancy between theory and experiment was given by Karl Pearson and is known as Chi square test of goodness of fit.
 - e) Non Parametric tests are not available to deal with the data which are given in ranks.

SECTION B - K3 (CO2)

Answer any TWO of the following in 100 words each.

(2 x 10 = 20)

5. (i) State the steps in solving testing of hypothesis (6 marks)
(ii) Distinguish between Null hypothesis and Alternative hypothesis (4 marks)
6. Show that the family B(n,p) has MLR property.
7. The marks obtained by a group of 9 regular course students and another group of 11 part-time course students in a test are given below:

Regular:	56	62	63	54	60	51	67	69	58		
Part time:	62	70	71	62	60	56	75	64	72	68	66

Examine whether the marks obtained by regular students and part time students differ significantly at 5% level of significance using two independent sample t-test.

8. On a commuter train, the conductor wants to see whether the passengers entering a train enter in a random manner. He observes the first 25 people, with the following sequence of males (M) and females (F).

F F F M M F F F F M F M M M F F F F M M F F F M M

Test for randomness at $\alpha = 0.05$.

SECTION C – K4 (CO3)

Answer any TWO of the following in 100 words each. (2 x 10 = 20)

9. Let p be the probability that a coin will fall head in a single toss in order to test $H_0: p = \frac{1}{2}$ against $H_1: p = \frac{3}{4}$. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probability of Type I error and power of the test.

10. Define MLR property and show that non exponential family possess MLR property with an example.

11. A Company arranged an intensive training course for its team of salesman. A random sample of 10 salesmen was selected and the value (in '000) of their sales made in the weeks immediately before and after the course are shown in the following table:

Salesman	1	2	3	4	5	6	7	8	9	10
Sales before	12	23	5	18	10	21	19	15	8	14
Sales after	18	22	15	21	13	22	17	19	12	16

Test whether there is evidence of an increase in mean sales using Paired t-test.

12. Analyze the following data whether two samples have been drawn from the same population using Median test

Sample-I	86	69	72	65	113	65	118	45	141	104	41	50
Sample-II	55	40	22	58	16	7	9	16	26	36	20	15

SECTION D – K5 (CO4)

Answer any ONE of the following in 250 words (1 x 20 = 20)

13. State and prove Neyman-Pearson lemma.
14. Let X be a random variable follows normal distribution with unknown mean μ and unknown variance σ^2 . Construct a likelihood ratio test for testing the hypothesis $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 \neq \sigma_0^2$ using likelihood ratio test.

SECTION E – K6 (CO5)

Answer any ONE of the following in 250 words (1 x 20 = 20)

15. Let X be assumed to be normally distributed with mean μ and unknown variance σ^2 . Test the hypothesis $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ using likelihood ratio test.

16. (i) Analyze the following data whether two samples have been drawn from the same population using Mann Whitney test.

Sample-I	57	120	101	137	119	117	104	73	53	68	118
Sample-II	89	30	82	50	39	22	57	32	96	31	88

(ii) Elaborate about the steps involved in performing Kolmogorov- Smirnov test for one sample in detail.

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