

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



M.Sc. DEGREE EXAMINATION – DATA SCIENCE

SECOND SEMESTER – APRIL 2022

PDS 2507 – STATISTICAL INFERENCE

Date: 15-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART - A

Answer ALL Questions.

10 × 2 = 20

- 1) Differentiate between Simple Hypothesis and Composite Hypothesis.
- 2) What do you mean by Level of Significance?
- 3) Define Best Critical Region.
- 4) What are Most Powerful Tests?
- 5) Write the test procedure for testing two means in the case of large samples.
- 6) Write the test procedure for testing the significance of a correlation coefficient.
- 7) How will you carry out Goodness of fit test?
- 8) When will you use paired t-test?
- 9) Why are Non-Parametric tests important?
- 10) Write the test procedure for Mann-Whitney-Wilcoxin U Test.

PART- B

Answer ALL Questions.

5 × 8 = 40

- 11) a) State and prove Neyman-Pearson Lemma.

or

b) Suppose that we want to test $H_0: \theta = 2$ against $H_1: \theta = 3$ in the case of the distribution $f(x, \theta) = 1/\theta^2, 0 \leq x \leq \theta$. Find the size and power of the test, assuming that the Critical Region is given as $2 \leq x \leq 3$.

- 12) a) Use NP Lemma to obtain BCR for testing $H_0: \theta = \theta_0$ against $H_1: \theta = \theta_1$ in the case of the Normal Population $N(\theta, \sigma^2)$, where σ^2 is known.

or

b) Derive the LR test to test $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ in the Normal distribution $N(\mu, \sigma^2)$, where σ^2 is not known.

13. (a) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Test whether the proportion of bad apples in the consignment can be regarded as 0.13.

or

(b) The Manufacturer of Television Tubes knows from past experience that the average life of a tube is 2000 hours with a standard deviation of 200 hours. A sample of 100 tubes has an average life of 1950 hours. Test whether this sample has come from a Normal Population whose mean is 2000 hours.

14. (a) Ten individuals are chosen at random from a Normal population and their heights are found to be 63, 63, 67, 66, 68, 69, 70, 70, 71, 71 inches. Test whether the population mean

height can be regarded as 66 inches? [Table value is 2.26].

or

(b) A Manufacturer of Gun Powder has developed a new powder which is designed to produce a muzzle velocity equal to 3000 feet/second. Seven shells are loaded into gun and the muzzle velocities are measured as 3005, 2935, 2965, 2995, 3905, 2935, 2975. Do these data present sufficient evidence to indicate that the average velocity differs from 3000 feet/second. [Table value is 2.45].

15.(a) Why do we need Non-Parametric tests? Briefly explain the assumptions made in the case of Non-Parametric tests.

or

(b) Apply Sign Test for the following data to test whether these two samples have come from the same population .

Sample 1: 27 15 63 71 83 72 31

Sample 2: 34 37 78 98 29 60 51

PART - C

Answer ANY TWO Questions.

2 × 20 = 40

16.(a) Briefly explain: (i) Null and Alternative Hypotheses (ii) Power of a Test

(b) Suppose that we want to test $H_0: \Theta = 1.5$ against $H_1: \Theta = 0.25$ in the case of the distribution $f(x, \Theta) = 1/\Theta, 0 \leq x \leq \infty$. Find the size and power of the test, assuming that the Critical Region is given as $0.8 \leq x$.

17.(a) Use NP Lemma to obtain BCR for testing $H_0: \sigma = \sigma_0$ against $H_1: \sigma = \sigma_1$ in the case of the Normal Population $N(0, \sigma^2)$.

(b) In a sample of 400 persons, the average food expenditure was Rs. 250 and the standard deviation was 40. In another sample of size 400, the average food expenditure was Rs. 220 and the standard deviation was 55. Test whether these two samples have come from the same population.

18.(a) Ten soldiers visited a Rifle range for two consecutive weeks. The scores were as follows:

Week 1 Score: 67 24 57 55 63 54 56 68 33 43

Week 2 Score: 70 38 58 58 56 67 68 72 42 38

Test whether there is improvement in scores. [Table Value is 2.10].

(b) Apply Mann-Whitney U Test for the following data to test whether these two samples have come from the same population.

Sample 1: 19 37 25 57 79 65

Sample 2: 21 35 28 54 84 68 61

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