# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – DATA SCIENCE

Max.: 100 Marks

10 \* 2 = 20

5\*8 = 40

FOURTH SEMESTER – APRIL 2022

### **PDS 4603 – STATISTICAL INFERENCE**

Date: 15-06-2022 Dept. No. Time: 01:00 PM - 04:00 PM

### PART A

1) Differentiate between Null hypothesis and Alternative hypothesis.

2) What are the two types of errors in testing of hypothesis?

- 3) What do you mean by Level of Significance concept?
- 4) What are Most Powerful Tests?

Answer ALL questions.

- 5) Write the test procedure for testing two proportions in the case of large samples.
- 6) Write the test procedure for testing the significance of a regression coefficient.
- 7) How will you carry out Independence of Attributes test?
- 8) How will you use F-distribution to test the equality of two variances?
- 9) Which assumptions are associated with Non-Parametric tests?
- 10) Write the test procedure for Wald-Wolfowitz Run Test.

#### PART B

## Answer ALL questions.

11) a) Briefly explain: (i) Most Powerful Test (ii) Importance of NP Lemma

or

**b)** Suppose that we want to test  $H_0$ :  $\Theta = 0.5$  against  $H_1$ :  $\Theta = 1$  in the case of the distribution  $f(x, \Theta) = 6.x.(1 - x), \quad 0 \le x \le \Theta$ . Find the size and power of the test, assuming that the Critical Region is given as  $x \le 0.5$ .

- **12) 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 distribution N(0,  $\sigma^2$ ).
  - **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  $\sigma^2$  is unknown.
- 13. (a) In a sample of 1000 people from Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this State?
  - (b) A sample of 100 insurance policy holders, average age is 28.8 years and standard deviation is 6.35 years. Can we say that the population mean age is 30.5 years?
- 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 is 66 inches?[Table value is 2.62]

(b) In an immunization experiment, following results were obtained. Test whether the vaccine

succeeds in controlling the disease [Table Value is 7.82].

Affected Unaffected

Inoculated	12	28	3	
Not-inoculated	13	7		
15.(a) State the advantages of Non-Parametric tests. Briefly explain the assumptions made in the				
case of Non-Parametric tests.				
		01	r	
(b) Apply Run Test for the following data to test whether these two samples have come				
from the same population . Sample 1: 28 69 80 68 60 12 24				
Sample 2: 48 57 2	6 95 7:	5 34 3	1 PART C	
Answer ANY TWO questi	ons.			2 * 20 = 40
<ul> <li>16. (a) State and prove Neyman-Pearson Lemma.</li> <li>(b) Suppose that we want to test H<sub>0</sub>: Θ = 1.5 against H<sub>1</sub>: Θ = 0.25 in the case of the distribution f(x, Θ) = 1/Θ, 0 ≤ x ≤ ∞. Find the size and power of the test, assuming that the Critical Region is given as 0.8 ≤ x.</li> <li>17. (a) Use NP Lemma to obtain BCR for testing H<sub>0</sub>: Θ = Θ<sub>0</sub> against H<sub>1</sub>: Θ = Θ<sub>1</sub> in the case of the distribution f(x, Θ) = Θ. exp(-Θx), 0 ≤ x ≤ ∞</li> </ul>				
<ul><li>(b) A sample of 900 members has a mean of 3.40 cm and standard deviation of 2.61 cm. Test the hypothesis that the population mean is 3.25.</li><li>18. (a) Two horses A and B were tested according to time (in seconds) to run a particular track. The</li></ul>				
following results were obtained:				
Horse A: 28 30 3	32 33 3	33 29	34	
Horse B: 29 30 3	30 24 2	27 29		
Test whether the two horses have the same running capacity.[Table Value is 2.20].				
(b) Apply Sign Test for the following data to test whether these two samples have come from				
the same population.				
Sample 1: 27 15 6 Sample 2: 34 37 7	3 71 8. 8 98 29	3 72 3 9 60 5	1	
			&&&&&	