

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



M.Sc. DEGREE EXAMINATION – STATISTICS

THIRD SEMESTER – NOVEMBER 2019

18PST3ES02 – NON-PARAMETRIC METHODS

Date: 06-11-2019

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

PART - A

Answer ALL questions

(10 x 2 = 20)

1. State the assumptions of non parametric methods.
2. Explain ordinal data with an example.
3. Distinguish the terms estimator and estimate.
4. State the assumptions on which Binomial sign test is based.
5. Write the large sample test statistic for Run test.
6. State the condition for using Kruskal – Wallis test.
7. State the condition for applying Wilcoxon Signed Ranks Test.
8. Explain Kendal test for independence.
9. State any two advantages of non-parametric testing procedure.
10. Write a short note on Cochran's Q test.

PART - B

Answer ANY FIVE questions

(5 x 8 = 40)

11. Describe the advantages of Non parametric Methods.
12. Write down the general procedure for Kolmogorov – Smirnov goodness test for a Single sample.
13. A cooperative store is interested in knowing whether there is any significant difference between the buying habits of male and female shoppers. Samples of 10 males and 11 females shoppers gave the following information:
Male : 63 40 44 80 87 25 13 53 35 43
Female: 97 120 82 90 120 50 70 75 48 85 89
Use Wald-Wolfowitz Run test to verify whether there is any reason to suppose that the two populations are different.
14. Assume that the median blood cholesterol level for a healthy 30-year-old male is 200 mg/100 ml. Blood cholesterol readings are obtained for a group consisting of eleven 30-year-old men who have had a heart attack within the last month. The blood cholesterol scores of the twelve men are: 180, 157, 280, 325, 412, 170, 208, 228, 219, 252, 306, 254. Can one conclude that the median cholesterol level of the population represented by the sample (i.e., recent male heart attack victims) is some value other than 200?
15. Explain Moses test for equality of variances with illustration.
16. Total runs scored in 2 matches on 3 different pitches for 7 batsmen are given below:

Batsmen	: A	B	C	D	E	F	G
Hard Rolled	: 180	160	155	185	181	122	79
Slow Pitch	: 70	64	70	45	82	100	80
Grass Pitch	: 76	80	81	85	825	78	73

Check whether the data suppose, the fact that, it is easy to score on Hard pitch than slow pitch and it is easy to score on slow pitch than grass pitch.

17. Write down the various steps involve in Spearman’s rank correlation test.
18. A country in which four ethnic groups make up the population establishes affirmative action guidelines for medical school admissions. The country has one medical school, and it is mandated that each new class of medical students proportionally represents the four ethnic groups that comprise the country’s population. The four ethnic groups that make up the population and the proportion of people in each ethnic group are: Balzacs (.4), Crosacs (.25), Murads (.3), and Isads (.05).The number of students from each ethnic group admitted into the medical school class for the new year are: Balzacs (300), Crosacs (220), Murads (400), and Isads (80). Is there a significant discrepancy between the proportions mandated in the affirmative action guidelines and the actual proportion of the four ethnic groups in the new medical school class?

PART - C

Answer ANY TWO questions

(4 x 10 = 40)

19. a) A total of 10 children with autism enroll in the study and the amount of time that each child is engaged in repetitive behavior during three hour observation periods are measured both before treatment and then again after taking the new medication for a period of 1 week. The data are shown below.

Child	1	2	3	4	5	6	7	8	9	10
Before:	75	80	65	70	55	67	50	90	57	75
After :	60	70	55	67	68	43	61	79	52	59

Test is there any improvement in the treatment.

- b) Dr. Radical, a math instructor at Logarithm University, has four classes in advanced calculus. There are six students in Class 1, seven students in Class 2, eight students in Class 3, and six students in Class 4. The instructor uses a programmed textbook in Class 1, a conventional textbook in Class 2, his own printed notes in Class 3, and no written instructional material in Class 4. At the end of the semester, in order to determine if the type of instruction employed influences student performance, Dr. Radical has another math instructor, Dr. Root, rank the 27 students in the four classes with respect to math ability. The rankings of the students in the four classes follow:

- Class 1:** 1, 2, 4, 6, 8, 9;
Class 2: 10, 14, 18, 20, 21, 25, 26;
Class 3: 3, 5, 7, 11, 12 16, 17, 22;
Class 4: 13, 15, 19, 23, 24, 27

(assume the lower the rank, the better the student).

Test whether the type of instruction influences student performance.

20. a) Two psychiatrists, Dr. X and Dr. Y, rank-order ten patients with respect to their level of psychological disturbance (assigning a rank of 1 to the least disturbed patient and a rank of 10 to the most disturbed patient). The rankings of the two psychiatrists are presented in Table. Is there a significant correlation between the rank-orders assigned to the patients by the two doctors?

Patient	1	2	3	4	5	6	7	8	9	10
Dr. X	7	1	8	10	9	6	5	3	2	4
Dr. Y	10	2	6	8	7	4	9	3	1	5

b) To compare the average weekly power cost of two factories, independent samples of sizes 12 and 10 are taken from the records of last year. The observations are given below:
 Factory I : 220 214 190 201 200 220 230 233 217 224 199 215
 Factory II : 192 177 260 201 191 205 189 175 197 194
 Test the assertion that average weekly power costs are higher in factory I.

21. a) A medical researcher is interested to compare the accuracy of a low cost new procedure in determining brain tumor versus a standard high cost procedure. The medical researcher selects 100 patients with complaints at random and made them to undergo both the procedures. The results are as follows:

		New procedure	
		positive	Negative
Standard procedure	Positive	20	25
	Negative	29	16

Determine the effectiveness of the new procedure with respect to the standard procedure?

b) Six horses are rank-ordered by a trainer with respect to their racing form on three different surfaces. Specifically, Track A has a cement surface, Track B a clay surface, and Track C a grass surface. Except for the surface, the three tracks are comparable to one another in all other respects. Table summarizes the rankings of the horses on the three tracks. (In the case of Horse 6, the rank of 1.5 for both the clay and grass tracks reflects the fact that the horse was perceived to have equal form on both surfaces.) Do the data indicate that the form of a horse is related to the surface on which it is racing?

	Track A	Track B	Track C
	Cement	Clay	Grass
Horse 1	3	2	1
Horse 2	3	2	1
Horse 3	3	2	1
Horse 4	3	2	1
Horse 5	3	2	1
Horse 6	3	1.5	1.5

22. a) Twelve soldiers visit a rifle range for two consecutive weeks. For the first week their scores are – 57,34,49,53,65,57,52,71,31,40,43,48 and during the second week the score in the same order 71,48,68,46,77,65,71,39,42,49,54,59. Examine if there is any significant difference in their performance

b) A researcher wants to determine whether or not a group of subjects who are given a low dose of a stimulant drug exhibit more variability with respect to the number of errors they make on a test of eye-hand coordination than a group of subjects who are given a placebo. There are $n_1 = 9$ subjects in the group administered the drug and $n_2 = 7$ subjects in the placebo group. The scores of the $N = 16$ subjects are listed below.

Group A: 4, 3, 2, 5, 1, 13, 17, 7, 8

Group B: 6, 7, 9, 10, 11, 6, 8

Is there a significant difference between the degree of variability within each of the groups?

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