

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc., DEGREE EXAMINATION - STATISTICS

THIRD SEMESTER – NOVEMBER 2014

ST 3958– NON PARAMETRIC INFERENCE

SET 1

Time & Date :

Max. : 100 Marks

PART - A

Answer ALL questions

(10 x 2 = 20)

1. What is statistical inference?
2. Write down the assumptions of non parametric methods.
3. Explain ordinal data with an example.
4. Distinguish the terms parameter and statistic.
5. Define level of significance.
6. What do you mean by degrees of freedom in a testing situation?
7. State the situation for using Mann- Whitney U - test.
8. What are the assumptions of Cochran Q-Test.
9. Define discordant pair in Kendall's procedure.
10. State any two advantages of non-parametric testing procedure.

PART - B

Answer ANY FIVE questions

(5 x 8 = 40)

11. Compare parametric and non parametric procedures.
12. Write down the general procedure for two sample KS test.
13. Random sample of two models of scooters were tested for mileage.

Bajaj	:	54	76	48	66	62	72	65
Yamaha	:	58	52	48	70	47	70	

At 5% level of significance, test whether the two models have come from the same population by using Wald-Wolfowitz run test .

14. A researcher wants to assess the relative likelihood of three brands of house paint fading within two years of application. In order to make this assessment he applies the following three brands of house paint that are identical in hue to a sample of houses that have cedar shingles: Brightglow, Colorfast, and Prismalong. A house is assigned the number **1** if there is evidence of fading and the number **0** if there is no evidence of fading. The following table summarizes the results of the study.

House	:	1	2	3	4	5	6	7
Brightglow	:	1	0	1	0	0	0	0
Colorfast	:	1	1	1	1	1	1	0
Prismalong	:	0	0	1	0	0	1	0

At 5% level, do the data indicate differences between the three brands of house paint with respect to fading?

15. 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 eleven men are: 230, 167, 250, 345, 442, 190, 200, 248, 289, 262, 301. At 5% level of significance, 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 by using binomial test?

16. Briefly explain Moses test for equality of variances.

17. 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	:	160	150	145	175	161	102	88
Slow Pitch	:	95	66	74	42	79	95	69
Grass Pitch	:	81	77	79	65	75	68	63

By using Page test, check whether the data suppose the fact that it easy to score on Hard pitch than slow pitch and it is easy to score on slow pitch than grass pitch in 1% level of significance? (Table Value = 80)

18. Test whether the given data follows Uniform distribution at 5% level of significance.

X	:	0	1	2	3	4
Frequency	:	8	46	55	40	11

Use chi-square test procedure.

PART - C

Answer ANY TWO questions

(2 x 20 = 40)

19. a) 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).

By using H-Test, test whether the type of instruction influences student performance at 1% level of significance.

b) Measurements of the fat content of two kinds of ice cream, Fat A and Fat B yielded from ten ice cream types are given below.

Fat A : 13.5 14 13.6 12.9 13.0 12.4 13.8 13.5 12.7 12.9

Fat B : 12.9 13.0 12.4 13.5 12.7 12.8 12.9 12.3 13.4 12.6

At 5% level, do the brands differ with respect to fat content? Use Wilcoxon signed rank test. **(10+10)**

20. a) 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 : 201 225 209 192 190 210 229 223 207 215 198 212

Factory II : 182 167 240 190 182 200 185 165 187 184

By using Mann -Whitney U – statistic, at 1% level of significance test the assertion that average weekly power costs are higher in factory I. (Table value = 2.58)

b) The ranks of nine students of a class in two subjects, viz., statistics and Mathematics are as follows.

Student	1	2	3	4	5	6	7	8	9
Statistics	4	7	9	3	8	2	6	5	1
Mathematics	3	6	8	1	7	5	9	2	4

At 5% level, test the hypothesis that there is no agreement of ranks in the two subjects by Kendall tau. ($S_{\text{tab}} = 20$; $T_{\text{tab}} = 0.556$) **(10+10)**

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 in 5% level of significance?

b) Eight horses are measured by a trainer with respect to their racing speed 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. The Speed (in Km/Hr) of the horses on the three tracks are given below.

Horse	:	1	2	3	4	5	6	7	8
Track A(Cement)	:	98	101	89	75	95	99	96	93
Track B(Clay)	:	86	95	85	73	94	92	86	86
Track C(Grass)	:	85	90	81	72	81	80	79	86

At 1% level, do the data indicate that the form of a horse is related to the surface on which it is racing by using Friedman two way analysis test? **(10+10)**

22. a) 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 1: 5, 4, 3, 6, 1, 14, 18, 8, 9

Group 2: 7, 8, 10, 11, 12, 7, 9

At 5% level, is there a significant difference between the degree of variability within each of the groups? Use Seigal-Tukey test. (Table value = 12)

- b) Ten soldiers visit a rifle range for two consecutive weeks. For the first week their scores are – 67,24,57,55,63,54,56,68,33,43 and during the second week the score in the same order 70,38,58,56,67,68,72,42,38,47. By using Binomial test, examine if there is any significant difference in their performance at 5% level of significance. **(10+10)**