LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - STATISTICS

THIRD SEMESTER – NOVEMBER 2013

ST 3958 - NON PARAMETRIC INFERENCE

Date : 12/11/2013   Dept. No.   Max. : 100 Marks
Time : 9:00 - 12:00

Section A

Answer **ALL** the Questions   (10 X 2 = 20)

1. What is standard error?
2. Distinguish between Parameter and statistic.
3. Define Degrees of freedom.
4. When do you recommend Wilcoxon signed rank test ?
5. Briefly explain one sample sign test.
6. Define discordant pair in Kendall's test.
7. Explain ordinal data with an example.
8. Write down the assumptions for McNemar test .
9. Define Critical region.
10. Write down the uses of non parametric inference.

Section B

Answer **Any FIVE** Questions   (5 X 8 = 40)

11. Compare parametric test procedure with non parametric test procedure?
12. Write a short notes on Wilcoxon signed Rank test.
13. Twelve 3-year-old boy and ten 3-year-old girls were observed during two sessions of recess in a nursery school. Each child's play was scored for incidence and degree of aggression as follows:

    Boys: 96   65   74   78   82   121   68   79   111   48   53   92
    Girls: 12   47   32   59   83   14   32   15   17   82

    Is there evidence to suggest that there are gender differences in the incidence and amount of aggression? At 5% level, Use Wald-Wolfowitz Run test.

14. The following are the numbers of hours which 10 students studied for an examination and the scores they obtained:

    Number of
    hours studied : 8   5   11   13   10   5   18   15   2   8
    Score   : 56   44   79   72   70   54   94   85   33   65

    Find the rank correlation. Is it significance at 0.01 level.(Table value is 0.794)

15. Random sample of two models of scooters were tested for mileage.

    Model A: 60   54   76   48   66   52   62   72   68
    Model B: 62   58   52   48   70   56   47   70

    Use median test, at 5% level of significance, test whether the average mileage of these two models are same.

16. A market researcher asks 7 female subjects whether or not they would purchase an automobile manufactured by three different companies. Specifically, subjects are asked whether they would purchase a car manufactured by the following automobile manufacturers:

Tata, Hundai and Maruti

$$response = \begin{cases} 0, & \text{if she likes the product} \\ 1, & \text{if she doesn't like the product} \end{cases}$$

Subject	1	2	3	4	5	6	7
TATA	1	0	0	0	0	0	1
HUNDAI	1	1	1	1	1	1	1
MARUTI	0	0	0	0	1	0	0

Use Cochran Q test, at 1% level of significance, Can the market researcher conclude that there are differences with respect to car preference based on the responses of subjects?

17. The following data represent life times (hours) of batteries for two brands:
Brand A: 40   30   40   45   55   30
Brand B: 50   50   45   55   60   40
Test the equality of the distribution functions of two brands at 5% level of significance.
(Table value is 0.833)

18. Briefly explain the steps involved in two sample KS test.

Section C

Answer **Any TWO** Questions   (2 X 20 = 40)

19. a. Test whether the given data follows binomial distribution at 5% level of significance.
X   :   0   1   2   3   4
Frequency :   8   46   55   40   11
($D_{tab} = 0.563$)   (10)

b. A psychologist conducts a study to determine whether or not noise can inhibit learning. Each of six subjects is tested under three experimental conditions. In each of the experimental conditions a subject is given 20 minutes to memorize a list of 10 nonsense
syllables, which the subject is told she will be tested on the following day. The number of nonsense syllables correctly recalled by the six subjects, under the three experimental conditions follow:

Subject	1	2	3	4	5	6
No noise condition	9	10	7	10	7	8
Moderate noise condition	7	8	5	8	5	6
Extreme noise condition	4	7	3	7	2	6

By using Friedman two way analysis, check whether do the data indicate that noise influenced subjects 'performance? Test at 5% level of significance.   (10)

20. a. The following data represent the operating times in hours for 3 types of scientific calculators before a recharge is required.
Casio 50 fx   :   4.9   6.1   4.3   4.6   5.3
Casio 100 ws :   5.5   5.4   6.2   5.8   5.5   5.2   4.8
Casio 991 ms :   6.4   6.8   5.6   6.5   6.3   6.6

Use H- test, at the 0.01 level of significance, to test the hypothesis that the operating times for all three calculators are equal. (10)

b. The following are the speeds (in kms) at which every fifth passenger car was timed at a certain check point: 46, 58, 60, 56, 70, 66, 48, 54, 62, 41, 39, 52, 45, 62, 53
Test their randomness. (10)

21. a. The ranks of nine students of a class in two subjects, viz., Statistics and Mathematics are as follows. Perform Kendall's Tau test at 5% level of significance.

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

Test the hypothesis that there is no agreement of ranks in the two subjects. (Table value is 0.50)
(10)

b. Random sample of two models of scooters were tested for mileage.

Model A: 60   54   76   48   66   52   62   72   68
Model B: 62   58   52   48   70   56   47   70

Test whether the average mileage of these two models are same. (10)

22. a. Ten soldiers visit a riffle 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, 42.
Examine if there is any significant difference in their performance. Test at 5% level using Two sample Sign test . (10)

b.A researcher conducts a study to investigate whether or not a weekly television series which is highly critical of the use of animals as subjects in medical research influences public opinion. One hundred subjects are administered a pretest to determine their attitude concerning the use of animals in medical research. Based on their responses, subjects are categorized as pro-animal research or anti-animal research. Following the pretest, all of the subjects are instructed to watch the television series (which lasts **two** months). At the conclusion of the series each subject's attitude toward animal research is reassessed. The results are summarized as follows:

		Post Test	
		Anti	Pro
Pre-Test	Anti	10	13
	Pro	41	36

Do the data indicate that a shift in attitude towards animal research occurred after subjects viewed the television series? Use McNemar test. (10)

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