 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

SECOND SEMESTER – **APRIL 2012**

# ST 2959 - SEQUENTIAL AND NON PARAMETRIC METHODS

Date : 24-04-2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**Part A**

**Answer all questions 10 x 2 = 20 Marks**

1. Define Non parametric test.
2. A super market is closed on all Sundays, it is decided to open it on Sundays if atleast 25 % of customer welcome this decision. For that a study is conducted and out of 20 interviewed, 8 responded favourably. Should the market opened on Sundays ?
3. What is Kolmogrov – Smirnov one sample test ?
4. What do you meant by sign test ?
5. Define Wilcoxon signed rank test.
6. Explain Mann – Whitney U test.
7. What is run test ? Give an example.
8. Discuss Wald’s probability ratio test.
9. Write the mean and variance for Wald Wolfowitz run test.
10. Define O.C.function.

**Part B**

**Answer any five questions 5 x 8 = 40 Marks**

1. A survey of 320 families with 5 children each revealed the following

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No . of boys | 5 | 4 | 3 | 2 | 1 | 0 |
| No. of girls | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of families | 14 | 56 | 110 | 88 | 40 | 12 |

Test whether the male and female births are equally probable.

1. The following data gives the number of minutes if schedule (X) buses in a city early arrivals be indicated by - ve values and late arrivals be indicated by +ve values. Examine whether the data ~ N (µ,. Given µ = 1.6 min. and σ = 3,

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | -5 | -3 | -1 | 0 | 1 | 2 | 4 | 7 | 8 |
| f | 1 | 1 | 2 | 1 | 5 | 5 | 3 | 1 | 1 |

1. Write the comparison between Chi square test and Kolmogrov – Smirnov test.
2. The life time batteries for two brands A and B are given. Examine whether the average life times are equal using median test.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Brand A | 40 | 30 | 40 | 45 | 55 | 30 |
| Brand B | 50 | 50 | 45 | 55 | 60 | 40 |

1. Explain Mann – Whitney U test.
2. Two types of finishing gives to 15 pairs of similar modern doors and scores were

given by experts as below.

|  |  |
| --- | --- |
| Finishing A | Finishing B |
| 42 | 44 |
| 56 | 53 |
| 57 | 58 |
| 79 | 67 |
| 62 | 61 |
| 64 | 65 |
| 52 | 51 |
| 73 | 70 |
| 75 | 78 |
| 62 | 63 |
| 63 | 65 |
| 71 | 70 |
| 69 | 67 |
| 81 | 79 |
| 84 | 81 |

Use Wilcoxon signed rank test to examine if finishing A and finishing B are equal in effect.

1. Explain sequential probability ratio test.
2. Obtain the Wald’s SPRT for testing vs () based on observations from N (µ, at given strength (α,β) where µ is known

**Part C**

**Answer any two questions 2 X 20 = 40 Marks**

19. Give the following sequence of observation from mal distribution with σ = 15. Test =135 Vs =150 by means of SPRT of strength α = .01, β = .03

121 137 144 136 104 151 155 130 160 145 120 140 125 106 145 123 138 108 111 118 129 123 135 149 139 127

Draw the acceptance and rejection lines and draw the o.c. curve and ASN curve.

20.a) State and prove Wald’s fundamental identity. (12 Marks)

b) Obtain the O.C. function with respect to SPRT for testing Vs

based on a Poisson distribution with parameter λ at strength (α ,β). (8 Marks)

21. a) Explain test of randomness (14 marks)

b) Apply a suitable non – parametric test to decide the randomness of infection if a sequence of healthy and infected plants as follows

H T H H H T T H H H H T T T H T T H H H H H T H T (6 Marks)

22. a) For the following data arising from two distinct populations . Test for the equality of the probability laws governing the populations using Kolmogrov – Smirnov test.

(10 marks)

|  |  |
| --- | --- |
| Sample 1 | Sample 2 |
| 25 | 27 |
| 24 | 31 |
| 26 | 32 |
| 21 | 29 |
| 13 | 41 |
| 29 | 32 |
| 30 | 23 |
| 16 | 28 |
| 11 | 29 |
| 18 | 27 |
| 17 | 26 |
| 21 | 28 |
| - | 22 |
| - | 27 |
| - | 19 |
| - | 32 |
| - | 40 |
| - | 35 |

b) Two teachers A and B teach the same topic to two sets of students and the scores in the examinations are as follows :

|  |  |
| --- | --- |
| Teacher A | Teacher B |
| 81 | 77 |
| 75 | 63 |
| 92 | 75 |
| 78 | 84 |
| 87 | 85 |
| 83 | 68 |
| 94 | 70 |
| 73 | 73 |
| 79 | 90 |
| 82 | 82 |
| 88 | 62 |
| 72 | 65 |
| 81 | - |
| 97 | - |
| 84 | - |
| 67 | - |
| 63 | - |
| 77 | - |
| 84 | - |
| 66 | - |

Test the hypothesis that there is no difference in the effectiveness of teaching of the two teachers by using Wicoxon rank sum test. Comment on the result.

(10 Marks)