



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - STATISTICS

SECOND SEMESTER – APRIL 2013

ST 2959 - SEQUENTIAL AND NON PARAMETRIC METHODS

Date : 07/05/2013
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

Part A

Answer all questions

(10 x 2 = 20 Marks)

1. What are the disadvantages of 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 do you meant by sign test?
4. What is Kolmogrov – Smirnov one sample test?
5. Define Wilcoxon signed rank test.
6. Explain Mann – Whitney U test.
7. Write the probability of getting an odd number of runs ($R = 2k + 1$) in the combined ordered sample of n_1 observations of X and n_2 observations of Y.
8. What is called sequential test ?
9. Define ASN function.
10. Discuss Wald's probability ratio test

PART B

Answer any five questions

(5 x 8 = 40 marks)

11. Write the comparison between Chi square test and Kolmogrov – Smirnov test.
12. Let x and Y equal the percentage of body fat for freshman women and men with distribution function $F(x)$ and $G(y)$. We shall use run test to test $H_0: F(z) = G(z)$ Vs $H_1 : F(z) < G(z)$. Ten observations of both X and Y are given below.

X	16.6	16.7	18.5	19.2	21.5	22.4	22.6	23.2	24.2	26.3
Y	9.4	9.7	11.3	11.8	13.3	15.6	16.1	16.5	18.2	21.7

13. Two samples are given

X	1	2	3	5	7	9	11	18	-
Y	4	6	8	10	12	13	14	15	19

Test whether the two samples from same population using Mann –Whitney U test.

14. A standard process is known to work out to 5% defectives and an improved process claimed to work out to 1% defectives. Draw a suitable sequential graphical procedure to test whether the process is superior to the first process. $\alpha = 0.2, \beta = 0.1, p_0 = 0.05, p_1 = 0.01$
15. Explain sign test.
16. State and prove Wald's fundamental identity.
17. 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

18. Explain Sequential Probability Ratio Test.

PART C

Answer any two questions

(2 x 20 = 40 marks)

19. a) Prove that Wald's SPRT terminates with probability one. (13 Marks)
- b) Obtain the ASN function for testing $H_0: \lambda = \lambda_0$ Vs $H_1: \lambda = \lambda_1$ in Poisson(λ) (7 Marks)
20. a) A large hospital higher most of the doctors from the major universities. Last year hospital has been conducting test for the newly recruited doctors. Determine which is better using U test based on the following scores, calculate the HR department of the hospital to decide whether the universities differ in quality. $\alpha = 0.1$ (12 Marks)

A	99	83	89	64	98	85	61	79	91	87	88	-
B	96	90	97	94	86	95	68	78	93	56	76	84

- b) 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

(8 Marks)

21. Given the following sequence of observation from normal distribution with $\sigma = 15$. Test $H_0: \mu = 135$ Vs $H_1: \mu = 150$ by means of SPRT of strength $\alpha = 0.01, \beta = 0.03$

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.

22. a) 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. (10 marks)

b) 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. (10 marks)
