EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

SECOND EXAMINATION IN SCIENCE - 2008/2009

SECOND SEMESTER (Sep./Nov., 2010)

ST 204 - STATISTICAL INFERENCE II

(REPEAT)

Answer all questions

Time : Two hours

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1. (a) i. What are non-parametric test? In what ways are they different from parametric tests?

    ii. Point out advantages and disadvantages of non-parametric test?

   (b) The following data relate to the daily production of cement (in m.tonnes) in a large plant for 30 days:

11.5	10.0	11.2	10.0	12.3	11.1	10.2	9.6
9.3	10.7	11.3	10.4	11.4	12.3	11.4	10.2
10.8	11.9	12.4	9.6	10.5	11.6	8.3	9.3
8.7	11.6	10.4	9.3	9.5	11.5		

   Use sign test to test the null hypothesis that the plant's average daily production cement is 11.2 m.tonnes against the alternative hypothesis that the average daily production of cement is less than 11.2 m.tonnes at the 0.05 level of significance.

(c) The following is an arrangement of 25 men, M, and 15 women, W, lined up to purchas
tickets for a premier picture show:

M   WW   MMM   W   MM   W   M   W   M   WWW

MMM   W   MM   WWW   MMMMMM   WWW   MMMMMM

Test for randomness at the 5% level of significance.

2. A company sells detergent packed in two machines. From past experience, the compar
knows that the amount of detergent boxes packed in the two machines are normally dis
tributed. The company takes a random sample of 25 boxes from the output of each machin
and finds that the mean weight and standard deviation of the detergent in the boxes fror
machine 1 is 1064gms and 100gms respectively. For the sample in machine 2, the mean i
1024gms and standard deviation is 70gms.

(a) Can the company claim with 5% level of significance that the boxes of detergent fron
machine 1 contain more than 1000gms.

(b) Test at the 5% level of significance that the amount of detergent the boxes of botl
machines is same.

3. (a) The following table shows the association among 1000 criminals between their weigh
and mentality. Calculate the coefficient of contingency between the two.

Weight in pounds

Mentality	110-120	120-130	130-140	140-150	Above 150	Total
Normal	50	102	198	210	240	800
Week	30	38	72	30	30	200
Total	80	140	270	240	270	1000

(b)   i. Do you find any association between the temperaments of brothers and sisters fror
the following data:

Good natured brothers and good natured sisters   1, 230

Good natured brothers and sullen sisters   850

Sullen brothers and good natured sisters   530

Sullen brothers and sullen sisters   980.

(c) Test the consistency of the data given below.

Case I   (AB) = 200   (A) = 300

           (α) = 200   (B) = 250

           ($\alpha\beta$) = 150   (N) = 500

Case II   (AB) = 250   (A) = 150

           (α B) = 1000   ($\alpha\beta$)= 600

           (β)   = 500   (N) = 1750
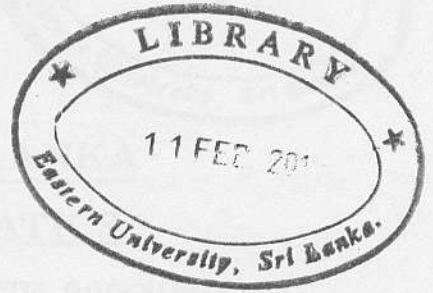
The capital letters A and B to represent the presence of the attributes, α and β to represent absence of the attributes and N is the total number of observations.

4. (a) Explain what is meant by a minimax decision rule.

(b) Each item produced by a machine is subjected to a quick test which has three results: r_1(too small), r_2(correct size) and r_3(too big). If the item really is the correct size, the probabilities of these results are $P(r_1) = 0.1$, $P(r_2) = 0.7$ and $P(r_3) = 0.2$, while if it is wrong size the probabilities are $P(r_1) = 0.4$, $P(r_2) = 0.3$ and $P(r_3) = 0.3$. After each item is tested it is either sold or scrapped. If an item of incorrect size is sold, there is a penalty cost of Rs. 10, while if an item is scrapped a cost Rs. 3 is incurred.

   i. List the possible decision rules for deciding whether each item should be scrapped.

   ii. Calculate the risk table and find the minimax decision rule.

   iii. If the prior information, the probability of the item really correct size is 0.6 which is the best of these strategies.