



EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
SECOND EXAMINATION IN SCIENCE -2009/2010
SECOND SEMESTER- (April / May, 2012)
ST 204 – STATISTICAL INFERENCE II
(REPEAT)

Answer all questions.

Time: Two hours.

Statistical tables will be provided.

01. (a) (i) What does mean by a non-parametric test? In what ways, are they different from the parametric tests?
- (ii) Point out advantages and disadvantages of non-parametric tests.
- (b) The table below shows the hours of relief provided by two analgesic drugs in 12 patients suffering from arthritis. Use the sign test to test the claim that one drug provides longer relief than the other at 5% level of significance.

Case	Drug A	Drug B	Case	Drug A	Drug B
1	2.0	3.5	7	14.9	16.7
2	3.6	5.7	8	6.6	6.0
3	2.6	2.9	9	2.3	3.8
4	2.6	2.4	10	2.0	4.0
5	7.3	9.9	11	6.8	9.1
6	3.4	3.3	12	8.5	20.9

- (c) Consider the following sequence of one (1) and two (2):

1 2 2 1 1 2 2 1 1 1 1 2 2 1 2 1 2 2 2 1 2 2 2 1 1 1 2

Perform the runs test to test the randomness of above sequence at 5% significance level.

(P. T. O.)

02. (a) An insurance company is reviewing its current policy rates. When originally setting the rates, company believed that the average claim amount was \$1,800. Company is considering that the true mean is actually higher than this, because they could potentially lose a lot of money. Company randomly selected a sample of 40 claims and calculated the sample mean of \$1,950. Assuming that claims are normally distributed with the standard deviation \$500, test whether company's concern is correct at 5% level of significance.

(b) A firm obtains steel wires of a particular gauge from two manufactures A and B. The firm suspects that the mean breaking strength, in Newtons (N), of wires from manufacturer A differs from that supplied by manufacturer B. The data given below show the breaking strengths of random samples of wires from each of the two manufacturers.

A: 80.5 83.1 73.6 70.4 68.9 71.6 82.3 78.6 73.4

B: 71.4 86.2 81.4 72.3 78.9 80.3 81.4 78.0

Assuming all such breaking strengths to be normally distributed with standard deviation 5 N, investigate the firm's suspicion at 5% level of significance.

03. (a) Following table shows the association between gender and handedness among 100 persons. Calculate the coefficient of contingency between gender and handedness.

Gender	Right-handed	Left-handed	Total
Males	43	9	52
Females	44	4	48
Totals	87	13	100

(b) A public opinion poll surveyed a simple random sample of 1000 voters. Respondents were classified by gender (male or female) and voting preference (Republican, Democrat, or Independent). Results are shown in the contingency table below.

Gender	Voting preference			Row total
	Republican	Democrat	Independent	
Male	200	150	50	400
Female	250	300	50	600
Column Total	450	450	100	1000

[Question 03. (b) continued...]

Do the men's voting preferences differ significantly from the women's preferences? Give your conclusion at 5% level of significance.

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

Case 1:	$(a b) = 200$	$(a \beta) = 300$	$(\alpha b) = 250$
	$(\alpha \beta) = 150$	$(N) = 900$	
Case 2:	$(a b) = 250$	$(a \beta) = 150$	$(\alpha b) = 250$
	$(\alpha \beta) = 250$	$(N) = 900$	

The letters a and b are to represent the presence of the attributes A and B respectively. Letters α and β represent the absence of the attributes A and B and N is the total number of observation.

04. (a) Explain optimistic and pessimistic approaches.

(b) A small company is investigating an investment in a surface-mount machine, but they were uncertain about the extent of the investment needed. Initial research led them to identify three potential courses of action (alternatives):

A1: A large investment **A2:** A medium investment **A3:** A small investment

The company also identified three potential directions that they believed the market demand for surface-mounted components could take (**states of nature**).

S1: Large demand **S2:** Moderate demand **S3:** Small demand

Investment	S1(0.5)	S2(0.3)	S3(0.2)
A1	6	4	-2.6
A2	2.5	5	-1
A3	2	1.5	1.2

Payoff (profit) table is as above. Probabilities of states of natures are given in brackets.

- (i) Find the decision of maximax and maximin criteria separately.
- (ii) Calculate the loss table.
- (iii) Find the decision of minimax criterion based on loss table.
- (iv) Calculate the expected payoff for each action and select the most suitable action.