Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
1st Year 1st Semester Examination –August/September 2014

Uva Wellassa University

ESS 104-3 Quantitative Reasoning

Number of Parts : Three (03), Part A, B and C
Time allocation : Two (02) hours
Mark allocation : 100 marks
Answer All Questions in all three parts

Part C: Essay Questions

Two (02) questions, One (01) hour, Fifty (50) marks

1.

a) An audit has been commissioned in a hospital. The aim is to estimate the frequency of occurrence of a particular adverse event for the whole hospital over a 12-month period. The people carrying out the audit have been advised that they do not need to visit every ward, but that they can select wards and also months in which to carry out the audit.

i. Identify the type of sampling used. Give reasons for your answer.
ii. Discuss whether you think this is an appropriate method of sampling for this audit.

(10 marks)

b) A survey is to be carried out on makers of organic cheese in England. The aim is to assess their training needs in relation to their knowledge of food health and safety laws. Cheese makers are a very busy group of people who start work early in the morning and often work right through the day. They work in controlled environments, widely scattered throughout England, to which the general public are not normally allowed access and which they cannot leave for long. You have been given the names, addresses and telephone numbers of the people in the sample, together with the questions to be asked. Some questions are closed and some are open. You have a fixed budget and a short timescale.

Outline the advantages and disadvantages of each of the following methods for obtaining the required information in this survey.

i. Direct Interview Method
ii. Postal questionnaire (Questionnaire filled by responder)

(10 marks)

c) A random sample of 50 households is taken in each of two districts, A and B, and for each household the presence or absence of digital television is recorded. The data are presented in the table below.

02

	District A	District B
Digital TV: Yes	38	27
Digital TV: No	12	23

Investigate whether there is significant evidence of a difference between the two districts in the uptake of digital TV. Briefly state your conclusions.(Calculated table value = 3.841)

(10 marks)

2. An experiment is being conducted into the physical fitness of older people. A physical fitness test is given to each of 10 subjects (a higher score represents greater fitness). Each subject's fitness score for the test is recorded as value y and age as value x (ages are between 40 and 80 years). The following totals are given.

$n = 10 \quad \sum_{i=1}^{10} x_i = 581 \quad \sum_{i=1}^{10} y_i = 607 \quad \sum_{i=1}^{10} x_i y_i = 33426$

$\sum_{i=1}^{10} {x_i}^2 = 37193 \quad \sum_{i=1}^{10} {y_i}^2 = 38795$

Calculate:

a) mean of x and mean of y

b) the product-moment correlation coefficient.

c) Comment on both the sign and magnitude of the coefficient.

d) By fitting the appropriate straight line, estimate the average fitness score of a person who is aged 45.

e) Explain briefly why your value is an estimate and why it is the average fitness score that is being estimated.

(20 marks)

Useful Formula

1. $r = 1 - 6 \sum \frac{d_i^2}{n(n^2-1)}$

2. $r = \frac{(\sum_{i=1}^{n} X_i Y_i - n\bar{X}\bar{Y})}{\sqrt{(\sum_{i=1}^{n} X_i^2 - n\bar{X}^2)(\sum_{i=1}^{n} Y_i^2 - n\bar{Y}^2)}}$

3. $\beta_1 = \frac{(\sum_{i=1}^{n} X_i Y_i - n\bar{X}\bar{Y})}{(\sum_{i=1}^{n} X_i^2 - n\bar{X}^2)}$

4. $\beta_0 = \bar{Y} - \beta_1 \bar{X}$