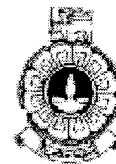**The Open University of Sri Lanka**
B.Sc/B.Ed./B,Sc(Nursing)/B.I/D.I/Continuing Education Programme
Final Examination – 2013/2014
Applied Mathematics – Level 03
PCU1142/PCE3142/PSU1182/PSE3182/PSZ3182/PSZ4182-Bio Statistics

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Date: 21.11.2014   Time: 2.00pm – 4.00pm

Instructions:

- **The duration of this examination is two hours.**

- **There are six questions. Answer only four questions.**

- **Non programmable calculators are permitted.**

- **Statistical Tables are provided.**

01. In a study to find out the views about a fertilizer that was given in packets of 10grams each, farmers were asked to record the following information when using for bean cultivation.

V_1 : Number of packets of fertilizer applied to a plant in a three-month period

V_2 : Frequency of application, to be recorded as
1: once in three weeks; 2: once in two weeks; 3: weekly

V_3 : Amount of water applied per plant (in litres), to be recorded as
1: less than half; 2: half to one; 3: more than one

V_4 : Whether compost was used in addition, to be recorded as
0:no; 1: yes

V_5 : Attitude on the fertilizer used, to be recorded as
1: not satisfied; 2: satisfied; 3: very satisfied

i)
   a) Classify the data collected in this study as qualitative or quantitative.
   b) Classify the data collected in this study as nominal, ordinal, interval or ratio.
   c) State whether the study described here is observational or experimental. Give reasons for your answer.

ii) In relation to this study, state whether each of the following statements is true or false. In each case, give reasons for your answer.
   a) Sampling unit is a plant.
   b) This is a confirmatory study.

iii) Suggest a suitable graphical summary that can be used to find out whether the attitude of the farmers (V_5) had varied depending on the amount of fertilizer applied (V_1).

02. The following are soil pH measured on 22 samples collected from a site.

| 5.0 | 5.0 | 5.0 | 5.5 | 5.5 | 5.5 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| 6.0 | 6.0 | 6.5 | 6.5 | 6.5 | 6.5 | 7.0 | 7.0 | 7.5 | 7.5 | 7.5 |

i) Clearly state the assumptions you make to test whether the soil pH in the site is less than 7.0.

ii) Describing the notation you use, state the null and the alternative hypotheses you would use,

iii) Using a 5% significance level, test the hypothesis and clearly state the findings.

03. Clearly describe how you advise the researcher to do the sampling in each of the following. If you use the random number table, describe how you read the values.

a) In a farm of 1000 cattle, feeding is done in groups of 10. It is required to estimate the number of cattle infected with a disease that is known to get spread through food sharing. This means, if a cattle in a group is found to be infected, it is reasonable to assume that the rest of the nine cattle in the group are infected. The researcher has resources to sample only 200 cattle for inspection.

b) It is required to estimate the total number of seeds that will germinate from the seeds in two lots produced in March 2014 (Lot1) and October 2014 (Lot2). Lot1 and Lot2 have 300 and 500 seeds respectively. In each lot, seeds are in packets of 5 each. Resources are only available to test for germination of 50 seeds. Germination rates can differ according to the date of production.

c) It is required to find out the attitudes of students about the course material for a course. Resources are available to collect information from 50 students using a questionnaire. Students are to be selected from a list of 800 registration numbers of students, arranged in ascending order of the registration number.

04. A researcher is interested in studying the effect of nitrogen on the growth of bean plants as measured by the increase in the stem length in two weeks after application of dried nitrogen rich leaves. He has decided to examine three amounts of dried leaves, which are, 0mg, 2mg and 5mg per plant. He also wants to know how the effect varies depending on whether compost is added or not. Fifty more or less similar plants are available for the study. Thirty of these plants are in moisture rich plots whereas the rest are in plots with less moisture content.

i) Clearly describe how you advise the researcher to design this study. If the random number table is to be used, you need to describe how to use it.

ii) Explain the following terms in relation to this study.
   a) Replicate
   b) Random variation
   c) interaction

2

05. The numbers of leaves infected with a disease in 30 randomly selected banana trees in a farm are given below.

0	0	0	1	1	2	2	2	2	3
3	3	3	4	4	4	4	4	5	5
5	5	6	6	6	6	7	7	7	12

i) Find the median.
ii) Find the 5% trimmed mean.
iii) Find the first quartile of the data and describe what it measures in relation to this study.
iv) Find the inter quartile range of the data.
v) Find the standard deviation of the data and describe what it measures in relation to this study.

06. The following cumulative frequency table was constructed from the information collected on the number of children in each family selected from a farming community of 100 families.

Number of children	Cumulative frequency
0	5
1	13
2	36
3	47
4	53
5	60

i) What is the sample size used in this study?
ii) What is the sampling unit?
iii) Find the percentage of families with two children.
iv) Estimate the number of families in the farming community with no children.
v) If the Government decides to pay a monthly subsidiary of Rs.1000/= per family with more than three children in the community how much money is needed in a month?