THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.Ed. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS-LEVEL 03

ADU3318 – Statistics for Agriculture I

Open Book Test (OBT) 2017/2018

Date: - 21.07.2018 **Time: 10.30am – 11.30am**

Instructions

- This examination is of **One hour** duration.
- There are two parts to the question paper. Part *A* consists of 10 multiple choice questions. Each correct answer is given 5 marks. Part *B* consists of a structured essay question. Fifty (50) marks are allocated for this question distributed as indicated.
- Answer **All** questions. At the end of the examination, handover Part *A* with correct answers underlined along with the answers to Part *B*.

Part *A*

Underline the most suitable answer from the choices given.

1. Underline the incorrect statement.
   a) Simple random sampling is not suitable for sampling from inhomogeneous populations.
   b) Simple random sampling can produce non-representative samples.
   c) Simple random sampling is a probability sampling procedure.
   d) Simple random sampling is suitable for sampling from infinite populations.

2. Identify the non-probability sampling method.
   a) Stratified sampling
   b) Systematic sampling
   c) Cluster sampling
   d) Quota sampling

3. Which of the following is always true for probability sampling?
    a) Each experimental unit has a known chance to be included into the sample.
    b) Each experimental unit has the same chance to be included into the sample.
    c) The probability that a sampling unit gets selected to the sample is proportional to the size of the population.
    d) The statements (a), (b) and (c) are all true.

4. Which of the following is not true about replicates in a study?
    a) Replicates can be used to estimate the random variation.
    b) Replicates are observations collected on experimental units under similar experimental units.
    c) Replicates enhance the ability to identify extreme observations.
    d) None of the statements (a), (b) and (c) is true.

5. Underline the incorrect statement
    a) Non-sampling error can result in biased estimates.
    b) Estimates derived from populations with large random variation generally have large sampling errors.
    c) Instrumental errors can lead to biased estimates.
    d) Bias can always be reduced by increasing the sample size.

6. Which of the following is not true about what happens when the sample size is increased?
    a) Sampling error reduces.
    b) Sample will be more representative of the population.
    c) Non-sampling error may increase.
    d) None of (a), (b) and (c) is true.

7. In a study on estimating the unreported robberies in an area, a researcher randomly selected 300 families and from the head of the household collected information on whether any unreported robberies happened for his family over the last two years. Identify the correct statement.
    a) The researcher has conducted an observational study.
    b) The researcher has conducted a confirmatory study.
    c) In this study, sampling unit is a resident of the area.
    d) The statements (a), (b) and (c) are all true.

8. Identify the correct statement.
    a) Randomized complete block designs are probability sampling methods used for data collection in observational studies.
    b) Randomized complete block designs are non-probability sampling methods used for data collection in observational studies.
    c) Randomized complete block designs are suitable for data collection in studies in which experimental units are homogeneous.
    d) The statements (a), (b) and (c) are all false.

9. In a study to compare the effectiveness of two fertilizers (A and B) on the yield of tomatoes, a researcher collected 40 farmers already applying fertilizer A and 25 farmers already applying fertilizer B and recorded the yields per acre. Identify the correct statement.
    a) The fact that different numbers of farmers are selected will introduce a bias to the study.
    b) The study is likely to have confounding errors.
    c) The study is an experimental study.
    d) All of the statements (a), (b) and (c) is false.

10. A sampling method that is not suitable for a homogeneous population is
    a) simple random sampling.
    b) systematic sampling.
    c) convenience sampling.
    d) stratified sampling.

Part *B*

1. A researcher is interested in identifying the type of fertilizer and the amount that gives the highest expected yield of beans. Two fertilizers are to be examined (say F_1 and F_2) and for each, the researcher is interested in studying two levels, which are, with no fertilizer added and $1mg$ of fertilizer added per plot each month. Eighty similar experimental plots are available for the study.

   Suppose the researcher seeks your advice to design this study.

   i) Clearly explain how you advise. If you use the random number table, clearly explain how you read the values.

   (20 marks)

   ii) Explain the following terms in relation to this study:

   a) Random variation

   (10 marks)

   b) Replicate

   (10 marks)

   iii) State whether the study is observational or experimental. Give reasons for your answer.

   (10 marks)