THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF PHARMACY
ACADEMIC YEAR 2018/2019 – SEMSETER I

BACHELOR OF PHARMACY HONOURS
MLU1141/PCU1142 – HEALTH STATISTICS/BIOSTATISTICS – LEVEL 3
FINAL EXAMINATION
DURATION: TWO HOURS

DATE: 15ᵗʰ MARCH 2019   TIME: 2.00 P.M – 4.00 P.M

INDEX NO: ....

INFORMATION TO CANDIDATES

- There are Six (06) questions. Answer **FOUR (04)** questions only.
- Each question is allocated twenty five marks.
- Write your answers in the answer booklet and the sheets provided.
- If the random number table is used to describe a design for data collection, you are advised to clearly describe how you use it.
- Statistical tables are provided.

IMPORTANT INSTRUCTIONS

- Write your Index Number in the space provided.
- Do **NOT** take off any page/ part of this question paper from the examination hall.
- Do **NOT** keep unauthorized material, including mobile phones and other electronic equipment, with you during the examination.
- Calculators are permitted.

1. In a study to identify the factors that are likely to be associated with the increase in dental problems in children in a school and to estimate the number of students in the school with dental problems, a researcher plans to sample 200 students from 4500 students in the school. Of the students in the school, 30% are below Grade 6, 50% are in Grade 6 or higher but below Grade 10 and 20% are in Grade 10 or higher.

   V_1: gender of the student recorded as, 1: male; 2: female

   V_2: Grade in which the student is studying recorded as,

   1: below Grade 6; 2: Grade 6 or higher but below Grade 10; 3: Grade 10 or higher

   V_3: whether or not the student frequently take artificial fruit drinks recorded as,

   1: not at all; 2: occasionally; 3: frequently; 4: almost daily

   V_4: condition of teeth at the time of data collection recorded as,

   1: very poor; 2: poor; 3: fairly good; 4: quite good; 5: excellent

   V_5: number of times the student brushes the teeth

   i) Classify each of the five variables as qualitative or quantitative.

   ii) Classify the quantitative variables as discrete or continuous.

   iii) Classify each of the five variables as nominal, ordinal, interval or ratio.

   iv) State whether the population referred in this study is a finite population or not. Give reasons for your answer.

   v) Suppose the researcher seeks your advice on how to do the sampling for this study. Clearly describe how you advise the researcher.

2. In a study to find out whether there is any impact of frequent use of computers on the vision, a researcher sampled 5500 persons and recorded the status of vision of the person, coded as, 1: excellent; 2: fairly good; 3: somewhat good; 4: poor. One of the variables recorded was the computer usage recorded as, 1: frequent user; 2: occasional user and 3: rare user; 4: non-user.

i) State whether each of the following statements is true or false in relation to this study. In each case, give reasons for your answer.

    a) The study described here is an experimental study.

    b) The study described here is a cohort study.

    c) The study described here is a prospective study.

    d) Since the researcher has used a fairly large sample, the study cannot have non-sampling error.

    e) The population described in this study is a finite population.

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

    a) Sampling unit

    b) Sample

    c) Confounding

3. A researcher is interested in comparing the effectiveness of two drugs as a pain killer for back pain. For each drug, the researcher wants to compare the effects of two methods of administering the drug, which are, taking 5mg twice a day or taking 10mg only in the night. Suppose the researcher has resources to collect data on 400 patients suffering from back pain who are willing to take the drug as instructed. Of the 400 persons, 100 are males and the rest are females. All males are in the 50 to 55 age group. Among females, 100 are below 40 and the rest are of age 50 to 55. The researcher suspects of gender differences and age differences in response to the drugs.

i) If the researcher seeks your advice to design this study, clearly describe how you advise.

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

    a) Replicate

    b) Random variation

    c) Interaction

4. i) Clearly describe one advantage of each of the following:

    a) Inclusion of replicates in a study

    b) Probability sampling as opposed to non-probability sampling

    c) Randomization

ii) State whether each of the following statements is true or false. In each case, give reasons for your answer.

    a) Simple random sampling is not suitable for collecting a sample from a fairly large population in order to estimate the number of persons in the population infected with a rare disease.

    b) Stratified sampling is suitable for sampling from a homogeneous population.

    c) Randomized block designs are suitable for data collection in observational studies, where the population is made up of homogeneous subgroups.

    d) Estimates derived from data collected in census will not have non-sampling errors.

    e) Sampling error can be reduced by increasing the sample size.

5. A researcher is interested in assessing the effect of a newly improved drug on the reduction of blood cholesterol level in rats by measuring the initial cholesterol level of the rats and six months after the rats are injected with the drug. He has access to 250 rats for this study of which 80 are two-months old female rats, 60 are two-month old male rats and the rest are six-month old female rats. There were no male rats in the six-month old group. He suspects that the effects of the drug could be different in the two gender groups and could be dependent on the age of the rat. The researcher plans to put the rats on the same diet during the study period.

i) Suppose the researcher seeks your advice to design this study. Clearly explain how you advise.

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

    f) Replicate

    g) Random variation

    h) Interaction

6. i) In each of the following studies, clearly explain whether you will expect large random variation, large bias or neither.

    a) In a study to estimate the dried weights of a medicinal plant at the age of one month, the plants measured were eight weeks old.

    b) In a study to estimate the time for relief from headache after taking a drug, participants largely differed in age.

    c) In a study to estimate the reaction time to a certain drug, the researcher had an error of 2 minutes (delay) in each of the measurements.

    d) In a study to estimate the expected time for relief from headache in patients who had taken a pain killer, the researcher had only included patients who are in the 20 to 25 age group.

    e) In a comparative study of the effectiveness of a new drug and the standard drug that was widely used for reducing blood pressure, the participants selected for the standard drug were patients who were taking the drug for a longer period compared to the other group.

ii) State whether each of the following statements is true or false. In each case, give reasons for your answer.

    a) Randomized block designs are suitable for experimental studies involving homogeneous experimental units.

    b) Large sampling errors can be expected in estimates derived from samples collected from populations with large random variation.

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