

THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. Degree Programme
OPEN ELECTIVE - LEVEL 05
ADU5319 - DESIGN AND ANALYSIS OF EXPERIMENTS
OPEN BOOK TEST 2017/2018



Duration: One Hour

Date: 04.01.2019

Time: 04.15 p.m- 05.15 p.m

Answer all questions

Statistical Tables are provided. Non-programmable calculators are permitted.

- (1) An important factor in road safety on rural roads is the use of reflective paint to mark the lanes on highways. A researcher has conducted a study to compare three new paints (P_2 , P_3 , P_4) to the currently used paint (P_1). He wants to determine whether reflectivity measurements of 4 paints are same or not. He has decided to test the paints before choosing one type of paint, by comparing the percentage decrease in reflectivity of the markings 6 months after application. The paints were applied to more or less similar sections of highway (6 feet in length). There were 16 sections of highway.
- (a) In relation to this study, identify
- (i) Response variable
 - (ii) Experimental unit
 - (iii) Treatments
- (b) Identify the design used in this study. Justify your answer.
- (c) Specify the hypotheses that are to be tested.
- (d) Assume that you are the researcher, then how do you apply the concept of randomization in conducting this experiment?
- (2) An experiment was carried out to investigate the effect of fertilizer on the yield of a certain variety of paddy. Three amounts of fertilizer, say 10lbs, 15lbs and 25lbs were tested along with the control (i.e. no fertilizer) using a Complete Randomized Design with 4 replicates per each treatment. The yields (rounded to the nearest integer) obtained are as follows.

Treatment	Yield (bushels/plot)			
Control	6	5	4	5
5lbs	6	11	9	6
15lbs	4	10	8	10
25lbs	17	14	17	15

- (a) Identify the treatment structure of the experiment. Justify your answer.
 (b) Part of the analysis is given below. Complete the ANOVA table.

ANOVA: Yield versus Fertilizer				
Source of Variation	Degrees of freedom	Sum of Squares	Mean Squares	F value
Fertilizer
Error
Total	304.44		

- (c) Test whether there is a significant effect of fertilizer on the yield of paddy at 5% level of significance and write down your conclusions.
 (d) Test whether following meaningful comparisons are orthogonal,
 i) Average effect of three levels of fertilizer and the effect of Control
 ii) Effects of any two amounts of the fertilizer
