



THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. Degree Programme

ADU5319 – DESIGN AND ANALYSIS OF EXPERIMENTS

OPEN ELECTIVES - LEVEL 05

OPEN BOOK TEST 2021/2022

Duration: One Hour

Date: 31.12.2022

Time: 09.00 a.m- 10.00 a.m

Answer all questions

Question 01

A company is considering three different covers for boxes of a brand of cereal. Box type *A* has a picture of a sports hero eating the cereal, type *B* has a picture of a child eating the cereal and type *C* has a picture of a bowl of the cereal. The company wants to determine which cereal box type provides the highest sales. Eighteen homogeneous test markets were selected by the company and each box type was randomly assigned to six markets. The number of boxes of this cereal sold per 10,000 population in a specified period is recorded for each test market. The data are as follows:

Type A	52.4	47.8	52.4	51.3	50.0	52.1
Type B	50.1	45.2	46.0	46.5	47.4	46.2
Type C	49.2	48.3	49.0	47.2	48.6	48.2

- (a) Identify the design used in this study. Justify your answer.
 (b) Specify the hypotheses that are to be tested.
 (c) Part of the analysis is given below. Complete the ANOVA table.

ANOVA: Tumor size versus Drug				
Source of Variation	Degrees of freedom	Sum of Squares	Mean Squares	F value
Box type
Error
Total	85.4		

- (d) Test your hypotheses in part (b) at 5% level of significance and write down your conclusions.

Question 02

A certain agricultural research institute conducted an experiment to compare the effects of five different insecticides (*E1*, *E2*, *E3*, *E4* and *E5*) on the yield of tomato. Twenty homogeneous plots were selected by the institute and each insecticide was randomly assigned to four plots. Tomatoes of same variety were planted in each plot and 5 different insecticides were randomly assigned to the tomato plants. After a certain time period, tomato yields were recorded in each plot under each insecticide. The data are given in the following table.

Insecticide				
E1	E2	E3	E4	E5
11	13	10	18	15
20	38	25	30	28
8	10	8	16	12
30	35	27	41	28

- (a) In relation to this experiment, identify
 - i. Response variable
 - ii. Experimental unit
 - iii. Treatments
- (b) Construct a 95% confidence interval for the difference between the mean tomato yield of *Insecticide E1* and *Insecticide E2* ($MSE = S^2 = 123$)
- (c) Interpret the confidence interval that you obtained in part(c).
