

THE OPEN UNIVERSITY OF SRI LANKA

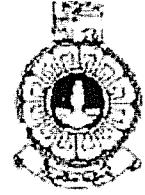
B.Sc. /B.I./D.I. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS - LEVEL 05

PCU3142/PSU2182/ PCU2142 - DESIGN AND ANALYSIS OF EXPERIMENTS

OPEN BOOK TEST 2016/2017

Duration: One Hour



Date: 07.10.2017

Time: 01.00 p.m- 02.00 p.m

Answer all questions

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

01. A physician wants to determine whether diabetes can be controlled through diet. He is interested in studying the effect of three different types of diets, say *Type I*, *Type II*, *Type III*. He selected 15 volunteers for the study and they were divided into three groups of five randomly. Each person in first, second and third groups were given *Type I*, *Type II*, *Type III* diets respectively. Same quantity was given from each diet. After a specified period of diet use, the fasting blood sugar levels were measured for all 15 patients. The data obtained are given below.

Diet Types	Observations					Total
<i>Type I</i>	200	195	195	200	190	980
<i>Type II</i>	175	180	185	175	170	885
<i>Type III</i>	160	155	165	165	160	805

Total sum of squares = 3340

- (a) Are there any weaknesses in planning the experiment? Suggest possible remedial measures for each of those weaknesses. (if any)
- (b) In relation to this experiment, identify
 - (i) Response variable
 - (ii) Experimental unit
 - (iii) Treatments
- (c) Construct a 95% confidence interval for the difference between the mean blood sugar level of *Type I* and *Type II* diets ($MSE = S^2 = 22.5$)
- (d) Interpret the confidence interval that you obtained in part(c).

02. A researcher wishes to determine whether four pharmaceutical drugs have the same effect to decrease the rate of the growth of a certain type of tumor. He selected 16 homogeneous mice and randomly divided into four groups, with each group receiving one of the drugs in its diet. At the end of the experiment, the following data on tumor size were recorded.

Drugs	Observations				Total
Drug 1	4.5	6.0	4.6	5.3	20.4
Drug 2	6.2	5.8	5.0	5.3	22.3
Drug 3	9.1	8.1	9.2	8.4	34.8
Drug 4	9.7	8.4	8.8	9.9	36.8

- (a) Identify the design used in this study. Justify your answer.
 (b) Write down the hypotheses to be used.
 (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
Drug
Error
Total	57.86		

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