THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.I/D.I. Degree Programme

APPLIED MATHEMATICS - LEVEL 05

PCU3142/PSU2182/ PCU2142 - DESIGN AND ANALYSIS OF EXPERIMENTS

NO BOOK TEST 2016/2017

Duration: One Hour

Date: 05.11.2017	**Time: 01.00 p.m- 02.00 p.m**

Answer all questions

Instructions:

- **Statistical Tables are provided.**
- **Non-programmable calculators are permitted.**
- **Consider the level of significance as 0.05 for all the tests.**

01. An industrial engineer wanted to conduct an experiment on eye focus time. He is interested in the effect of the distance of the object from the eye on the focus time. Four different distances are of interest. He has five subjects, say S_1, S_2, S_3, S_4, S_5, available for the experiment because there may be differences among individuals. The focus time data is given below.

Distance (ft)	Subject					Total
	S_1	S_2	S_3	S_4	S_5	
4	10	6	6	6	6	**34**
6	7	6	6	1	6	**26**
8	5	3	3	2	5	**18**
10	6	4	4	2	3	**19**
Total	**28**	**19**	**19**	**11**	**20**	**97**

(a) Name the suitable design for the above experiment. Justify why the design you name is suitable.

A part of the analysis is given below. Some values were missing in the ANOVA table and marked with "*".

Source	Degrees of freedom	Sum of Squares	Mean Square	F ratio
Distance	*	*	*	*
Subject	*	*	*	*
Error	*	*	*	
Total	*	84.55		

(b) Complete the ANOVA table by computing missing values.

(c) Write down the conclusions that can be drawn from the analysis of variance table.

02. A researcher wants to study the effect of four diets (*A, B, C, D*) on weight gain (in kilograms) of cattle in a certain farm. It was believed that weight gain is affected by age of the animal and genetic factors. Animals were grouped by age and genetic factors. They were weighted at the beginning of the study period. The different diets were given to the animals for a period of three months, and then they were re-weighted. The study plan and the weight gain over the three months' period are given below:

Genetic Group	**Age Group**				**Total**
	1	**2**	**3**	**4**	
1	5 (*A*)	7 (*B*)	4 (*C*)	3 (*D*)	**19**
2	10 (*B*)	8 (*A*)	5 (*D*)	5 (*C*)	**28**
3	7 (*C*)	5 (*D*)	6 (*A*)	12 (*B*)	**30**
4	10 (*D*)	11 (*C*)	15 (*B*)	12 (*A*)	**48**
Total	**32**	**31**	**30**	**32**	**125**

Total sum of squares = 180.44

Diet	***A***	***B***	***C***	***D***
total	31	44	27	23

(a) Identify the design used in this experiment. Justify your answer.

A part of the analysis is given below. Some values were missing in the ANOVA table and marked with "*".

Source	**Degrees of freedom**	**Sum of Squares**	**Mean Square**	**F ratio**
Diet	*	*	*	*
Age	*	*	*	*
Genetic	*	110.69	*	*
Error	*	*	*	
Total	*	180.44		

(b) Complete the ANOVA table by computing missing values.

(c) Write down the conclusions that can be drawn from the analysis of variance table.

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