THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.Ed. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS - LEVEL 05

PCU3142/PSU2182/ PCU2142/PCE5142/PCE4142- DESIGN AND ANALYSIS OF EXPERIMENTS

NO BOOK TEST 2015/2016

Duration: One Hour

Date: 12.11.2016	**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.**

(1) A firm is interested in evaluating 3 file management systems. The firm designed a test involving 5 different word processing operators. Since operator variability was believed to be a significant factor, each of the 5 operators was trained on each of the 3 systems in random order. The mean time (in weeks) to learn a system is given below.

System	**Operator**					**Total**
	1	2	3	4	5	
1	16	19	14	13	18	**80**
2	16	17	13	12	17	**75**
3	24	22	19	18	22	**105**
Total	**56**	**58**	**46**	**43**	**57**	**260**

Total Sum of Squares = 175.33

(a) Name the suitable design for the above experiment. Justify your answer.

(b) State the hypotheses that need to be tested to achieve the objectives of the firm.

(c) Construct the analysis of variance (ANOVA) table, suitable to test the stated hypotheses.

(d) Test your hypotheses in part (b), at 5% level of significance and clearly state the findings.

(2) An experiment was conducted to study the lifetime of four brands of tires (T_1, T_2, T_3 and T_4).There are 16 tires such that four tires from each brand are available for the study. The experimenter suspects that the lifetime of the tire can vary according to the type of the car used (*I, II, III* and *IV*) and the position of the tire on the car (*FL, FR, BL* and *BR*). To optimize the available resources, each brand of tire has been studied once for each type of car and once for each position of the tire on the car. The following are the data obtained from the experiment.

Car type	**Tire position**				**Total**
	FL	***FR***	***BL***	***BR***	
I	T_1=31	T_4=76	T_2=40	T_3=54	**201**
II	T_2=36	T_3=53	T_4=81	T_1=42	**212**
III	T_4=76	T_1=43	T_3=62	T_2=38	**219**
IV	T_3=60	T_2=41	T_1=45	T_4=84	**230**
Total	**203**	**213**	**228**	**218**	**862**

(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**
Car type	*	111.25	*	*
Tire position	*	*	*	*
Brand	*	4278.75	*	*
Error	*	*	*	
Total	*	4517.75		

(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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