THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. Degree Programme

OPEN ELECTIVE - LEVEL 05

ADU5319 - DESIGN AND ANALYSIS OF EXPERIMENTS

NO BOOK TEST 2019/2020

Duration: One Hour

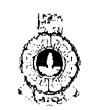| Date: 15.08.2020	Time: 02.30 p.m- 03.30 p.m

Answer all questions

Instructions:

- **This question paper consists of 02 questions and 02 pages.**

- **Non-programmable calculators are permitted.**

- **Consider the level of significance as 0.05 for all the tests.**

(1) A researcher wanted to study whether there is an effect of shelf space on food sales. He selected 5 different shelf spaces, say A, B, C, D, E. The experiment was carried out over a 5-week period using five different stores, say P, Q, R, S, T, resulting in the following data on sales of powdered coffee:

Store	Week					Total
	1	**2**	**3**	**4**	**5**	
P	18(D)	17(C)	14(A)	21(B)	17(E)	87
Q	13(C)	37(B)	21(E)	16(A)	15(D)	102
R	7(A)	29(D)	32(B)	27(E)	13(C)	108
S	17(E)	13(A)	24(C)	31(D)	25(B)	110
T	21(B)	26(E)	26(D)	31(C)	7(A)	111
Total	76	122	117	126	77	518

Total uncorrected sum of squares = $\sum y^2$ = 12234

Shelf spaces	A	B	C	D	E
Total	57	136	98	119	108

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

(b) Construct the ANOVA table and test appropriate hypotheses. Interpret your results. Consider the F_{tab} value as 3.26.

(c) The estimated error variance in an RCBD with the stores as blocks was 13.06. Which design do you prefer? Justify your answer.

(2) A scientist suspects that the yield of a chemical process is influenced by the pressure and the temperature. He selected two levels of each factor and performed the experiment having two replicates with each combination of pressure and temperature. The yield data (in grams) are presented in the following table.

Temperature	Pressure	
	200	230
150	90.4 90.2 90.1	89.5 88.7 88.1
170	91.2 90.9 91.9	90.4 91.5 90.8

(a) Identify the treatment structure of the experiment. Justify your answer.

(b) Construct the complete analysis of variance table.

(c) Test whether the effects of pressure and temperature on the yield are significant or not. Clearly explain your answer. Consider the F_{tab} value as 5.32.

2