

(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER
MAIN EXAMINATION
FOR THE DEGREE OF MASTER OF SCIENCE IN
STATISTICS

COURSE CODE: STA 801

COURSE TITLE: EXPERIMENTAL DESIGN I

DATE: 15/09/17

TIME: 8 AM -11 AM

INSTRUCTIONS TO CANDIDATES

Answer Any THREE Questions

TIME: 3 Hours

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (20 MARKS)

A food processing company is interested in comparing the taste of six new brands (A, B, C, D, E and F) of cereal. For this purpose;

- Subjects are asked to compare these cereals scoring them on a scale of 0-100.
- For practical reasons it is decided that each subject should be asked to taste and compare at most four of the six cereals

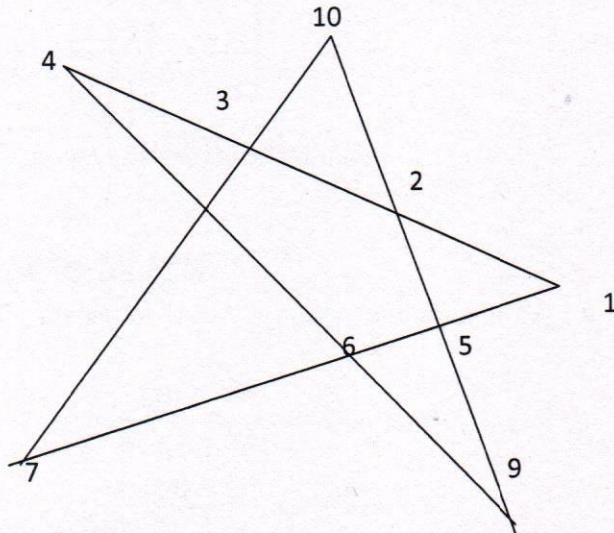
Use $b=15$ subjects and a Balanced Incomplete Block Design to assess the difference in taste of the six brands of cereal.

The data is tabulated below:

Subject	Taste and scores (Brands)			
1	51(A)	55(B)	69(C)	83(D)
2	48(A)	87(D)	56(E)	22(F)
3	65(B)	91(C)	67(E)	35(F)
4	42(A)	48(B)	65(C)	43(E)
5	36(A)	58(B)	69(D)	7(F)
6	79(C)	85(D)	56(E)	25(F)
7	54(A)	60(B)	90(C)	21(F)
8	62(A)	92(C)	94(D)	63(E)
9	39(B)	71(D)	47(E)	11(F)
10	51(A)	59(B)	84(D)	51(E)
11	39(A)	74(C)	61(E)	25(F)
12	69(B)	78(C)	78(D)	22(F)
13	63(A)	74(B)	59(E)	32(F)
14	55(A)	74(C)	78(D)	34(F)
15	73(B)	83(C)	92(D)	68(E)

QUESTION TWO (20 MARKS)

The design for varietal trial of ten (10) varieties of soya beans was obtained from the following configuration



The design is a PBIB design with two associate classes. The parameters are $b=5, k=4, V=10, \lambda_1 = 1, \lambda_2 = 0, n_1 = 6, n_2 = 3$

$$P^{(1)} = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$$

$$P^{(2)} = \begin{bmatrix} 4 & 2 \\ 2 & 0 \end{bmatrix}$$

The actual layout and yields are given below, the yield being kg. per plot;

BLOCK I		BLOCK II		BLOCK III		BLOCK IV		BLOCK V	
Variety	Yield	Variety	Yield	Variety	Yield	Variety	Yield	Variety	Yield
1	20	6	80	6	75	2	50	10	145
2	45	1	15	8	65	5	100	8	60
3	35	7	50	4	45	9	15	3	30
4	40	5	105	9	10	10	155	7	40

Analyse the experiment

QUESTION THREE (20 MARKS)

Suppose we have two blocks, 3 levels of A and 3 levels of B. The data is

BLOCK 1

a_1b_1	a_1b_3	a_1b_2
10	12	14
a_3b_3	a_3b_2	a_3b_1
8	9	7
a_2b_2	a_2b_1	a_2b_3
16	13	15

BLOCK 2

a_3b_1 10	a_3b_3 9	a_3b_2 12
a_1b_1 15	a_1b_3 18	a_1b_2 19
a_2b_3 24	a_2b_2 18	a_2b_1 20

Using Split-plot design analyse the experiment

QUESTION ONE (20 MARKS)

Construct ANOVA table for $H_0 : t_1 = t_2 = t_3$ and also for $H_0 : b_1 = b_2 = b_3$ for the table below

	B_1	B_2	B_3
t_1 (24)	t_1 (36)	t_1 (50)	
t_2 (6)	t_2 (14)		
	t_3 (20)		

QUESTION FIVE (20 MARKS)

Construct ANOVA table for the BIBD below

B_1	B_2	B_3	B_4	B_5	B_6
t_1 (7)	t_3 (28)	t_2 (15)	t_4 (31)	t_3 (46)	t_3 (16)
t_2 (3)	t_2 (12)	t_4 (35)	t_1 (9)	t_1 (14)	t_4 (24)