MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2021/ 2022 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER

SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES.

DEGREE IN APPLIED STATISTICS WITH COMPUTING.
COURSE CODE: STA 4139

COURSE TITLE: DESIGN AND ANANLSIS OF EXPERIMENTS II

DATE: 6TH APRIL, 2022   TIME: 0830-1030

Question One (30 marks)

(a) Define the following terms
    (i)   Main Effects
    (ii)   Interaction effects
    (iii)   Confounding
    (iv)   Treatment aliases
    (v)   Resolution IV design

(**5 marks**)

(b)   Consider the following data
       (I)   = 134.75
       A   = 155.75
       B   = 57.5
       AB = 49.5
    Give the estimates of A, B and AB   (**6 marks**)

(c) Consider the following arrangements:
    Block I - 1, ab, ac, bc
    Block 2 - a, b, c, abc
   (i)   Which treatment is confounded with block effects
   (ii)   Give the arrangement in which treatment A is confounded with block effects.

(4 marks)

(d)   Construct a 2^3 design with ABC confounded in the first two replicates and BC confounded in the third replicate. Outline the analysis of variance.

(**5 marks**)

(e) Define
   (i)   Nested design
   (ii)   Split-plot design

(**4 marks**)

(f) Define BIB design and give two necessary condition for its existence

(**6 marks**)

Question Two (20 marks)

(a) You are given the following information of ANOVA.

Source of variation	df	SS	MSS
A	2	350	-
B	-	300	150
AB	-	200	50
Error	18	150	-
Total	-	1000	-

(i)   How many levels of factor B was used?
(ii)   How many d.f. are associated with interaction effects
(iii)   What is the error mean square
(iv)   What is the mean square for factor A
(v)   What conclusions can you make from this information   (**10 marks**)

(b) A 2^2 –factorial in three blocks is given below:

Block !	Block 2	Block 3
I = 38	I = 25	I = 27
A = 36	A = 32	A = 32
B = 18	B = 19	B = 23
AB= 36	AB = 30	AB = 29

Conduct the analysis of variance.

(**10 marks**)

Question Three (20 marks).

(a) Consider the following information

Treatments Combination	Replicates		
	I	II	III
I	28	25	22
A	36	32	32
B	18	19	23
AB	31	30	29

(i) Give the estimates of all treatments
(ii) Conduct an analysis of variance   (**10 marks**)

(b) Consider the 2^6 factorial design in eight blocks , with ABCD, ACE and ABEF confounded with blocks . Generate the design. Find the other effects confounded with blocks.   (**10 marks**)

Question Four (20 marks)

(a) The results of experiments were as follows:

e – 23.2   ab – 15.5
ad – 16.9   bc -16.2
cd - 23.8   ace- 23.4
bde – 16.8   abcde – 18.1

(i)   Show that the design defining contrast are I = ACE and I = BDE
(ii)   Write down the complete aliases of this design

(iii)   Estimate the main effects

(iv)   Prepare an ANOVA, use AB and AD interactions as errors

(10 marks)

(b) You are given the information design with factor A and factor B in A .

A		1				2				3		
B	1	2	3	4	1	2	3	4	1	2	3	4
	1	-2	-2	1	1	0	-1	0	2	-2	1	3
	-1	-3	0	4	-2	4	0	3	4	0	-1	2
	0	-4	1	0	-3	2	-2	-2	0	2	2	1

Analyse the data.

(10 marks)

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