CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF BACHELOR DEGREE IN MATHEMATICS AND BACHELOR OF EDUCATION SCIENCE

MATH 444: DESIGNS AND ANALYSIS OF EXPERIMENT II

STREAMS: Bsc. MATHS

TIME: 2 HOURS

DAY/DATE : TUESDAY 28 /09/ 2021 **11.30 AM – 1.30 PM**

INSTRUCTIONS

- Answer question one and any other two questions

QUESTION ONE (30 MARKS)

a) Define the following terms as used in Designs of experiments.

(i) Balanced incomplete block designs. [2 Marks]

(ii) Response surface designs [2 Marks]

(iii) Lattice designs [2 Marks]

(iv) Simple lattice [2 Marks]

b) (i) Outline the first six steps of analyzing a lattice design. [12 Marks]

c) Draw a general ANOVA of a partially Balanced incomplete block design. [4 Marks]

d) The table below shows a PBIBD with two associate classes.

Block	Treatment		
1	1	2	4
2	1	2	3
3	3	4	6
4	3	4	5
5	1	5	6
6	2	5	6

(i) Draw an associate scheme [3 Marks]

(ii) Obtain two associate matrices [3 Marks]

QUESTION TWO [20 MARKS]

An Engineer uses a balanced incomplete block design to test performance of scars on 5 gasoline additives, due to time constraint.

	Car				
Additive	1	2	3	4	5
1	-	17	14	13	12
2	14	14	-	13	10
3	12	-	13	12	9
4	13	11	11	12	-
5	11	12	10	-	8

Analyse the data at 5% S.L and draw conclusions. [20 Marks]

QUESTION THREE (20 MARKS]

Perform the intrablock analysis for the following partially balanced incomplete block design at 5% level of significance.

	Block					
Treatment	1	2	3	4	5	6
1	14	-	-	10	-	16
2	10	-	12	15	-	-
3	20	24	-	-	19	-
4	-	16	-	11	10	-
5	-	13	17	-	-	12
6	-	-	9	-	10	8

QUESTION FOUR [20 MARKS]

a) State and explain briefly two uses of response surface designs. [2 Marks]

b) The data below shows the factors used in an agricultural experiment and the yields there of .

X (Nitrogen kg /ha)	0	10	20	30	40
Y (Yield kg/ha)	775	1250	1375	1280	1200

(i) The coded values table [7 Marks]

(ii) Obtain the Normal equations [3 Marks]

(iii) The optimum level of nitrogen (coded) [7 Marks]

(iv) Hence the optimum according to original units. [1 Mark]

QUESTION FIVE [20 MARKS]

(a) Analyse the following youden square design at 5% level of significance. IS position significant?

Blocks	1	2	3	4
1	A=2	B=9	C=0	D=14
2	B=6	A =5	E =5	C =3
3	C=1	D=9	A=0	E=7
4	D =8	E =8	B = 10	A =4
5	E=7	C=6	D=11	B=10

[20 Marks]

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