



UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN
APPLIED STATISTICS

MATH 444: DESIGNS AND ANALYSIS OF EXPERIMENTS II

STREAMS:

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 17/4/2024

2.30 PM. –4.30P.M.

QUESTION 1 [30 marks]

- a) Outline the general ANOVA of a Balanced Incomplete Block Design [4 marks]
- b) Explain two uses of response surface designs. [4 marks]
- c) Define the following terms as used in designs of experiments
- Youden square design
 - Partially Balanced incomplete design [8 marks]
- d) The table below shows independent (x) and dependent (y) variables obtained from an experiment

X	0	10	20	30	40
Y	800	1150	1250	1210	1200

- Use the coded values to form normal equations [5 marks]
- Evaluate the regression coefficients and state the model [7 marks]
- Find the coded and actual optimum units [2 marks]

QUESTION 2 [20 marks]

Analyze the following Partially balanced incomplete block design at 5% level of significance.

Blocks

Treatment	1	2	3	4	5	6
1	14	-	-	24	-	16
2	17	-	12	12	-	-
3	20	10	-	-	19	-
4	-	18	-	11	8	-
5	-	13	10	-	-	15
6	-	-	15	-	10	16

QUESTION 3 [20 marks]

- a) Outline the general ANOVA of Lattice designs [3 marks]
- b) Analyze the following Balanced incomplete block design at 5% level of significance. [17 marks]

(Days) Blocks

Conc%	1	2	3	4	5	6	7
M	114	-	-	-	120	-	117
N	126	120	-	-	-	119	-
P	-	137	117	-	-	-	134
Q	141	-	129	149	-	-	-
R	-	145	-	150	143	-	-
S	-	-	120	-	118	123	-
T	-	-	-	136	-	130	127

QUESTION 4 [20 marks]

Analyze the following Lattice design at 5% level of significance.

BLOCK	REP I			BLOCK	REP III		
1	A=7	B=8	C=5	7	A=11	F=14	J=8
2	E=6	F=9	G=7	8	H=9	B=5	G=10
3	H=3	D=9	J=8	9	E=7	D=11	C=12
BLOCK	REP II			BLOCK	REP IV		
4	A=10	E=6	H=9	10	A=8	D=5	G=11
5	B=11	F=7	D=8	11	E=9	B=12	J=9
6	C=10	G=9	J=7	12	H=12	F=6	C=8

QUESTION 5 [20 marks]

Analyze the following Youden Square design at 5% level of significance.

Position

Blocks	1	2	3	4
1	M=7	N=14	P=5	Q=19
2	N=11	M=10	R=10	P=8
3	P=6	Q=14	M=5	R=12
4	Q=13	R=13	N=15	M=9
5	R=12	P=11	Q=16	N=15