



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2018/2019 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

SCHOOL OF SCIENCE

**BACHELOR OF SCIENCE IN APPLIED STATISTICS WITH
COMPUTING**

COURSE CODE: STA 423

COURSE TITLE: BIOMETRY METHODS

DATE: APRIL 2019

TIME:

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions
2. Show all your working and be neat
3. Do not write on the question paper

*This paper consists of **FIVE** printed pages. Please turn over.*

QUESTION ONE (30 MARKS)

- a) Briefly explain the following terms
 - i) Experiment (1mark)
 - ii) Replication (1mark)
 - iii) Clinical Trial (1mark)
 - iv) Randomization (1marks)
 - v) Unstructured Treatment test (1mark)
- b) Describe briefly the uses of randomization in clinical trials (3marks)
- c) State and describe the different between statistical model for the fixed effect model and Random effect model. (7 marks)
- d) Discuss factors that are leading to undersized trials (4 marks)
- e) Response to fertilizer (kilogram plot Kg)

Contrast	Treatment:			HO:
	No fertilizer	Supers	Super + N	
Total (r=4)	16	20	26	
1. Fert. Vs. No Fert (w_1)	-2	1	1	$\frac{1}{2}(u_2 + u_3) - u_1 = 0$
2. N vs. No Nitrogen (w_2)	0	- 1	1	$u_3 - u_2 = 0$
i). Perform the average treatments with Fertilizer vs. No fertilizer				(5marks)
ii). Shows whether there is a significant response to fertilizer and improvement in yield with the addition of Nitrogen				(6 marks)

QUESTION TWO (20 MARKS)

- a) State and explain the measures of effectiveness in Biometry methods (4marks)
- b) The following table shows the fatal doses or tolerances of 3 groups of cats for 2 preparations of strophantus and a preparation of ouabain. The doses were recorded as quantities per kg body weight.

	Strophantus 1	Strophantus 2	Ouabain
Doses	15.5	24.2	52.3
	15.8	18.5	99.1

17.1	0.0	47.6
14.4	22.7	65.1
12.4	17.0	66.8
18.9	14.7	57.6
23.4	22.0	49.3
		45.8
		66.9

Suppose that strophantus 2 and 1 are regarded as standard and test preparations respectively.

- i). Estimate the relative potency of the test preparation. (4marks)
- ii). Estimate the variance of each set in (i) above (4marks)
- iii). Obtain the sample variance of the relative potency in (i). (4marks)
- iv). Construct the 95% C.I. for the estimated potency. (4marks)

QUESTION THREE (20 MARKS)

- a) Describe the techniques for determining difference between treatments means (5marks)
- b) An Experiment was performed to improve the yield of a chemical process. Four factors were selected, and two replicates of a completely randomized experiment were run. The results are shown in the following table

Treatment Combination	Replicate		Treatment Combination	Replicate	
	I	II		I	II
(1)	90	93	d	98	95
a	74	78	ad	72	76
b	81	85	bd	87	83
ab	83	80	abd	85	86

c	77	78	cd	99	90
ac	81	80	acd	79	75
bc	88	82	bcd	87	84
abc	73	70	abcd	80	80

- i). Estimate the factor effects (3Marks)
- ii). Prepare an analysis of variance table, and determine which factors are important in explaining yield (4Marks)
- iii). Plot the residual versus the predicted yield and on normal probability paper. Does the residual analysis appear Satisfactorily (3marks)
- iv). Two three-factor interactions, ABC and ABD, apparently have large effects. Draw a cube plot in the factors A, B and C with the average yields shown at each corner. Repeat using the factor A,B and D. Do these two plots aid in data interpretation? Where would you recommend that the process be run with respect to the four variable (5marks)

QUESTION FOUR (20 MARKS)

- a) Briefly describe the purpose of performance monitoring (4 marks)
- b) Explain the factors influencing the data collection schedule for prior and After randomization (8marks)

An experiment in which haemoglobin levels in the blood of brown trout were measured after treatment with four rates of sulfamerazine. Two methods of administering the sulfamerazine were used. Ten fish were measured for each rate and each method. Perform a two-way ANOVA

Data for the haemoglobin

Method	Rate			
	1	2	3	4
A	6.7	9.9	10.4	9.3
	7.8	8.4	8.1	9.3
	5.5	10.4	10.6	7.2

	8.4	9.3	8.7	7.8
	7.0	10.7	10.7	9.3
	7.8	11.9	9.1	10.2
	8.6	7.1	8.8	8.7
	7.4	6.4	8.1	8.6
	5.8	8.6	7.8	9.3
	7.0	10.6	8.0	7.2
B	7.0	9.9	9.9	11.0
	7.8	9.6	9.6	9.3
	6.8	10.2	10.2	11.0
	7.0	10.4	10.4	9.0
	7.5	11.3	11.3	8.4
	6.5	9.1	10.9	8.4
	5.8	9.0	8.0	6.8
	7.1	10.6	10.2	7.2
	6.5	11.7	6.1	8.1
	5.5	9.6	10.7	11.0

(8 Marks)

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