

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE IN AGRONOMY, MASTER OF SCIENCE IN MICROBIOLOGY AND BIOTECHNOLOGY AND MASTER OF SCIENCE IN ENVIRONMENTAL SCIENCE

**AGRI 891(MATH 800): DESIGN AND ANALYSIS OF EXPERIMENTS
BOTA 803: BIOMETRY EXPERIMENTATION AND METHODOLOGY
ENSC 810: RESEARCH METHOD II**

STREAMS: MSC AGRI, BOTA AND ENSC

TIME: 3 HOURS

DAY/DATE: TUESDAY 04/12/2018

2.30 P.M. – 5.30 P.M.

INSTRUCTIONS:

- Answer all questions in section I and any TWO questions in section II.
- Use of calculators and statistical tables is allowed.
- Do not write anything on the question paper.

SECTION I (20 MARKS)

QUESTION I (20 MARKS)

- (a) Assuming that you conducted an experiment with eight fields planted with maize, four fields (A, B, C and D) having no nitrogen fertilizer and four fields (E, F, G and H) having 80 kg nitrogen fertilizer. The resulting maize yields were 120, 360, 60, 180, 1280, 1120, 1120 and 760 kg per plot for fields A, B, C, D, E, F, G and H, respectively.
- (i) Fit a simple linear regression line to the above data. (5 marks)
- (ii) Interpret the fitted equation and predict maize yield for a field treated with 60 kg of fertilizer. (2 marks)
- (iii) Determine if the model is appropriate for relating yields and nitrogen fertilizer levels. (5 marks)

- (b) The following computer output shows two sets of the analysis of results from an experiment on the effect of media type and temperature on bacteria growth. Interpret the two outputs.

Model I-Response variable: Growth rate

Analysis of variance

Source	df	SS	MS	F-Value
Regression	1	249798.01	249798.01	15.628
Error	145	2269682.63	15983.68	
Total	143	2519480.64		

Estimates of regression coefficient

Variable	df	Estimate	StdError	t
Intercept	1	601.934	40.118	
Temperature	1	-3.401	0.860	-3.953

Model II-Response variable: Growth rate

Analysis of variance

Source	df	SS	MS	F-Value
Regression	2	282587.347	141293.67361	8.906
Error	141	2236893.293	15864.49143	
Total	143	2519480.639		

Estimates of regression coefficients

Variable	df	Estimate	StdError	t
Intercept	1	868.68	189.80	4.577
Temperature	1	-16.205	8.95	-1.811
Growth media	1	0.14	0.0996	1.438

SECTION II (40 MARKS) Answer two questions

QUESTION 2 (20 MARKS)

- (a) Discuss three assumptions that are usually made in the analysis of variance and discuss one possible solution if some of the assumptions are not met. (8 marks)
- (b) Describe the research process. (6 marks)
- (c) Discuss three commonly used non-parametric methods, indicating their parametric methods counterpart. (6 marks)

QUESTION 3 (20 MARKS)

The following results (Table 1) are coded values of solid waste weights on two different categories (factor A) sampled at three locations (factor B)

Table 1: Solid waste in tonnes

Location	Block	Category 1	Category 2
Embu	1	26	17
	2	27	18
	3	28	19
Runyenje	1	18	12
	2	20	13
	3	22	14
Chuka	1	21	14
	2	24	16
	3	23	15

- (a) Give the design model for the experiment. (3 marks)
- (b) Perform the analysis of variance. Use $\alpha=0.05$. TSS=413.61 and SSAB=3.11. (14 marks)
- (c) Apply the Least Significance Difference (LSD) to separate the means of Factor B. (3 marks)

QUESTION 4 (20 MARKS)

A split-plot experiment laid down in Randomized Complete Block Design and replicated three times was conducted to test the effect of nitrogen application on yield of rice varieties. Three different nitrogen levels (0 N kg/ha, 60 N kg/ha and 120 N kg/ha) and three rice varieties (Mugeto, Seredo and Serena) were used (Table 2)

Table 2: Yield of rice varieties under different nitrogen levels

	Rep	Mugeto	Seredo	Serena
0 N kg/ha	1	30	34	29
	2	28	31	31
	3	31	35	32
60 N kg/ha	1	35	41	26
	2	32	36	30
	3	37	40	34
120 N kg/ha	1	37	38	33
	2	40	42	32
	3	41	39	39

- (a) Give the design model for the experiment. (3 marks)
- (b) Analyse the data using a split-plot design. Use $\alpha = 0.05$. $TSS = 512.67$ and $MPSS = 260.67$. (17 marks)
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