CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN AGRONOMY, MASTER OF SCIENCE IN MICROBIOLOGY AND BIOTECHNOLOGY, & MASTER OF SCIENCE IN ENVIRONEMNTAL SCIENCE

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

STREAMS: BSC (AGRI, BOTA, ENSC 810)   PART-TIME   TIME: 3 HOURS

DAY/DATE: WEDNESDAY 07/8/2019   2.30 P.M. – 5.30 P.M.

INSTRUCTIONS:
- **Answer question ONE and any other TWO questions**
- **Use of calculators and statistical tables in allowed**
- **Do not write anything on the question paper**

QUESTION 1 (20 MARKS) – COMPULSORY

(a)   Discuss the various types of data measurements   [8 marks]

(b)   The following computer output show two sets of the analysis of results from an

        experiment on the effect of media type and temperature of bacteria growth. Interpret the

        two outputs.   [12 marks]

Model I – Response variable: Growth rate

Analysis variance

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

Estimates of regression coefficients

Variable	df	Estimate	Std Error	t
Intercept	1	601.934	40.118	15.004
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	18.906
Error	141	2236893.292	15864.49143	
Total	143	2519480.639		

Estimates of regression coefficients

Variable	df	Estimate	Std Error	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

QUESTION 2 (20 MARKS)

(a) Discuss four assumptions that are usually made in the analysis of variance and discuss one possible solution if some of the assumptions are not met. [10 marks]

(b) Two type of fertilizers were applied on plots of maize yielding the following data:

A	135	142	160	122	139	175	152	178	156	136	117	169	125	132	148	153
B	140	151	171	129	149	189	162	177	163	146	127	170	135	132	158	

Construct a 95% and 99% confidence interval for the difference between the two population mean. [10 marks]

QUESTION 3 (20 MARKS)

The following results (Table 1) are coded values of yield of cowpea under different treatments (Factor A) and grown at three locations (Factor B)

Location	Block	Treatment 1	Treatment 2
Embu	1	12	9
	2	10	7
	3	11	8
Chuka	1	10	5
	2	9	6
	3	11	4
Meru	1	15	10
	2	14	11
	3	15	10

(a) Give the design model for the experiment   [3 marks]

(b) Perform the analysis of variance. Use amd SSAB = 3.11

[14 marks]

(c) Apply the Least Significance Difference (LSD) to separate the means of the 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 sorghum 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 level

	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)   Analyze the data using a split-plot design. Use . TSS=512.67 and MPSS = 260.67

[17 marks]