CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN AGRONOMY, MASTER OF SCIENCE IN BIOCHEMISTRY, MASTER OF SCIENCE IN BOTANY (PLANT PATHOLOGY, MASTER OF SCIENCE IN AGRICULTURAL EXTENSION, MASTER OF SCIENCE INCROP PROTECTION AND MASTER OF SCIENCE IN HORTICULTURE

AGRI 891 (MATH 800): DESIGN AND ANALYSIS OF EXPERIMENTS
BOTA 803: BIOMETRY EXPERIMENTATION AND METHODOLOGY

STREAMS: "AS ABOVE" **TIME: 3 HOURS**

DAY/DATE: MONDAY 06/04/2020 **2.30 P.M. – 5.30 P.M.**

INSTRUCTIONS:

- **Answer ALL questions in section A and any TWO questions in section B**
- **Use of calculators and statistical tables is allowed**
- **Do not write anything on the question paper**

SECTION A (COMPULSORY)

QUESTION ONE (20 MARKS)

(a) The following computer output shows two sets of the analysis of results from and experiment on the effect of media type and temperature on bacteria growth. Interpret the two outputs. [8 marks]

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 coefficients

Variable	df	Estimate	StdError	
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	8.906
Error	141	2236893.292	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

(b) Discuss the various types of data measurements [4 marks]

(c) 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]

SECTION B (40 MARKS): ANSWER ANY TWO QUESTINOS

QUESTION TWO (20 MARKS)

(a) Design an experiment to determine the impact of introduced Argentine ants on soil insects and arthropods. State your null hypothesis and explain what preliminary data you would collect to help you decide how to design your experiment. [10 marks]

(b) The pyrethrin content of two samples of pyrethrum were found to be as follows:

Sample A	24	27	26	21	25	22	19	24	21	20	28	21	27	22	24	24	17
Sample B	27	30	28	31	22	36	32	27	34	30	27	27	35	27	22		

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

QUESTION THREE (20 MARKS]

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

Table 1: yield of cowpea in tonnes

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 $\alpha = 0.05. TSS = 164.50$ and SSAB = 3.11 [14 marks]

(c) Apply the Least Significance Difference (LSD) to separate the means of the factor B [3 marks]

QUESTION FOUR (20 MARKS)

A split-plot experiment laid out in Randomized complete Block Design and replicated three times was conducted to test the effect of temperature on bacterial growth. Three different temperature levels (20°C, 25°C and 30°C) and three bacteria (A, B and C) were used (Table 2).

Table 2: The rate of bacterial growth (in percentage)

	Block	A	B	C
20°C	1	40	44	39
	2	38	41	41
	3	41	45	42
25°C	1	45	41	36
	2	42	46	40
	3	47	50	44
30°C	1	47	48	43
	2	50	52	42
	3	51	49	49

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

(b) Analyze the data using a split-plot design. Use $\alpha = 0.05$. TSS = 480.07 and MPSS = 301.41 [17 marks]
