CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF MASTERS OF SCIENCE IN BOTANY (PLANT PATHOLOGY)

BOTA 803: BIOMETRY, EXPERIMENTATION AND METHODOLOGY

STREAMS: MSC **TIME: 3 HOURS**

DAY/DATE: TUESDAY 03/12/2019 **2.30 PM – 5.30 PM**

INSTRUCTIONS:

- **Answer any Three Questions**
- **Use of calculators and statistical tables is allowed**
- **Do not write anything on the question paper**

QUESTION 1 (20 MARKS)

A researcher designed an experiment to study the growth of a particular strain of bacteria. It is suspected that the bacteria growth is influenced by temperature and environment and thus the researcher carried out the experiment at four different temperatures and three levels of nutrient medium. Due to the length of time required to observe the bacteria growth, the experiment was replicated over five days with the days forming blocks. The results which represent totals over the five days are given below:

Temperature nutrient	T_1	T_2	T_3	T_4
N_1	74.8	89.0	96.6	102.2
N_2	78.4	99.8	109.2	112.5
N_3	78.1	94.6	98.6	105.9

(a) Write down the statistical model. [2 marks]

(b) Carry out the analysis of variance and draw appropriate conclusions. TSS = 959.35 and SSR=421.6 [14 marks]

(c) Perform mean separation procedures on the analysed data at , and make your comment. [4 marks]

QUESTION 2 (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 3 (20 MARKS)

(a) 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 1 – 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	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	Estimate	Std Error	t
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	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

(b) Describe the research process. [8 marks]

QUESTION 4 (20 MARKS)

A split-plot experiment laid down in Randomised 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 sorghum 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) Analyse the data using a split-plot design.
Use [17 marks]
