

GWANDA STATE UNIVERSITY



FACULTY OF LIFE SCIENCES

DEPARTMENT OF CROP SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

LCS 1202 RESEARCH METHODS IN AGRICULTURE

Second Semester Final main Examination Paper

June-July 2019

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Graph paper, Mathematical tables, scientific calculators

Examiner's Name: A. Banda

INSTRUCTIONS

1. Answer **all** questions in Section A
2. Answer **only two** questions in Section B

MARK ALLOCATION

QUESTION	MARKS
SECTION A	60
SECTION B	40
TOTAL ATTAINABLE MARKS	100

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Section A Compulsory

- An experiment to investigate the effect of winter feeding on milk production uses a Latin Square Design (LSD). Four diets called A, B, C and D, in order of increasing starch equivalent, were each fed for three weeks to each cow, and the total yield of milk in the third week of each period was recorded. The reason for using only the third week was that there might be some carry-over effects of the previous treatment during the first two weeks of a period. The yields (in millilitres of milk) were;

		Cow			
		1	2	3	4
Period	1	A192	B195	C292	D249
	2	B190	D203	A218	C210
	3	C214	A139	D245	B163
	4	D221	C152	B204	A134

Carry out an analysis of variance to determine if there was a significant effect of diet on mean milk yield [20]

- Come up with a research problem, suggest an appropriate experimental design to investigate the problem, describe the data collection methods and instruments, and show how you analyse the data. Provide a skeleton ANOVA for the data analysis. [20]
- Discuss the possible strength and weaknesses of the following experimental designs (i) Complete Randomised Design [7]
(ii) Randomised Complete Block Design [6]
(iii) Latin Square [7]

Section B Answer any 2 questions

- An Agriculturist investigated the effect of applying different amounts of fertilizer on the yield of grass on reclaimed derelict land. Grass seed is sown uniformly over the area. Ten one (1) m² plots are located randomly and a different mass of commercial fertilizer is applied evenly to each. Two months later the grass is carefully harvested from each plot, dried and weighed. The results of the experiment are tabulated below.

Mass of fertilizer (g/m ²) X variable	25	50	75	100	125	150	175	200	225	250
Yield of grass (g/m ²) Y variable	84	80	90	154	148	169	206	244	212	248

- Fit the model $Y=B_0+B_1X$ and give equation [5]
 - Carry out analysis of variance on the data and comment on the result of the F test [15]
- Discuss the importance of Analysis of Variance (ANOVA) as an analysis tool [10]
 - State the assumptions of the ANOVA [8]
 - What are the uses of ANOVA [5]

6. In an experiment to compare the effects of four drugs, A, B, C and a placebo (inactive substance) labelled D on the lymphocyte counts in mice. The experiment was set up as a randomized complete block design with four mice from each of five litters was used, the litters being regarded as blocks. The lymphocyte counts (thousands per mm³ of blood) were:

Litters	1	2	3	4	5	Drugs totals
Drugs						
A	7.1	6.1	6.9	5.6	6.4	
B	6.7	5.1	5.9	5.1	5.8	
C	7.1	5.8	6.2	5.0	6.2	
D	6.7	5.4	5.7	5.2	5.3	
Block totals						

Complete the following analysis of variance table and summarize the results of the analysis. The uncorrected total S.S = $\sum(x^2)$ is 720.51

Variation due to	d.f	s.s	m.s	F ratio
Block				
Treatment				
Error				
Total				

[11]

Correction factor (cf) =

[1]

Standard deviation (sd)

[1]

Strain means:

A=

B=

C=

D=

[4]

Show all your working

[3]

7a. What are the principles of experimental design

[3]

b. Describe how you would set up an experiment to compare the effect of four different nutrients on the growth of a new bean variety grown in a green house (same soil type)

[12]

c. Give a skeleton of the analysis of variance (ANOVA) for the above experimental design

[5]