



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

**THIRD YEAR FIRST SEMESTER UNIVERSITY EXAMINATION FOR
THE DEGREE OF BACHELOR OF SCIENCE IN ANIMAL SCIENCE**

2017/2018 ACADEMIC YEAR

REGULAR

COURSE CODE: AAS 3313

COURSE TITLE: DESIGN AND ANALYSIS OF ANIMAL EXPERIMENTS

EXAM VENUE:LR 7

STREAM: BSc. (Animal Science)

DATE: 12/12/17

EXAM SESSION: 9.00 – 11.00 AM

TIME: 2 HOURS

Instructions:

- 1. Answer ALL questions in section A and ANY other 2 Questions in section B.**
- 2. Candidates are advised not to write on question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A: [30 MARKS]

Answer ALL questions from this Section.

QUESTION ONE [SIX MARKS]

Distinguish between the following terms:

- a. Experiment and Experimental unit [2 Marks]
- b. Completely Randomized Block Designs and Latin Square Designs [2 Marks]
- c. 2^2 and 2^3 Factorial Designs [2 Marks]

QUESTION TWO [SIX MARKS]

Data for a statistical test concerning μ yielded $n = 50$, $\sigma = 12.57$ $\bar{y} = 48.2$

- i. Determine the P-value for testing the $H_0: \mu = 45$ $H_1: \mu > 45$ [3 marks]
- ii. Is there evidence to support the claim that μ greater than 45 at $\alpha = 0.05$ [3 marks]

QUESTION THREE [NINE MARKS]

a. All combinations of 2 levels of a solvents K and P on milk yield were studied. The following were the resultant yields.

	(1)	(K)	(P)	(KP)
1	23	25	22	38
	(P)	(1)	(K)	(KP)
2	40	28	36	38
	(1)	(K)	(PK)	(P)
3	29	20	30	20
	(PK)	(K)	(P)	(1)
4	34	31	24	28

Determine the main and interaction effects [7 marks]

b. Give the sum of treatments for the following experimental design [2 marks]

Rows	Columns		
	1	2	3
1	B(12)	A(7)	C(17)
2	C(10)	B(7)	A(4)
3	A(20)	C(8)	B(12)

QUESTION FOUR [NINE MARKS]

a. In an experiment data on Tomatoes was analyzed and the results are as in the anova table shown below ($\alpha = 0.025$)

Source of variation	DF	SS	MSS	P-value
Treatment	3	1.219	0.4063	0.012
Residual	20	1.724	0.0862	

- i. State the levels of the factor under investigation [1 mark]
 - ii. State the hypothesis being tested [2 marks]
 - iii. Draw conclusions for the test [2 marks]
- b. i. Distinguish between main effects and interaction effects in factorial experiments [2 marks]
- ii. Distinguish between balanced and unbalanced design in CRD [2 marks]

SECTION B: [40 MARKS]

Answer ANY TWO questions from this Section.

QUESTION FIVE [20 MARKS]

a. A farmer visits a demonstration farm and told that each cow produces an average 30 litres per day. He samples milk production from eight of the animals and realises the following production.

30.05	29.95
29.25	30.05
29.35	29.35
29.65	29.05

He decided to test if the average yield differs from 30 litres

- i. State the test that is suitable to do [1 mark]
- ii. State the hypotheses for the test [2 marks]

- iii. Determine the p-value for the test [2 marks]
 - iv. Do the test and draw your conclusions at 5% significance level given that the population standard deviation is 3.94 [3 marks]
- b. An experiment was conducted compare price of animal feeds by sampling four stores along streets A, B, C, D as in the table.

Store	Prices			
A	59	63	65	61
B	58	61	64	63
C	54	59	55	58
D	69	70		

- i. Identify the experimental design being used [1 mark]
- ii. State what the stores and Prices represent in the experiment [2 marks]
- iii. Do the data provide evidence to indicate a difference in mean price of animal feeds in stores [9 marks]

QUESTION SIX [20 MARKS]

A study was conducted to compare weight gain for three breeds of chicks, A, B, C. Four feed types, all the same composition and mass were employed in the experiment and each breed was tested on each feed type. The weight gain in grams are as follows:

Breed	Feed type			
	P	Q	R	S
A	15.7	17	17.3	16.1
B	17.2	18.1	17.9	17.7
C	16.1	17.5	16.8	17.8

- a. i. State the experimental design in use giving a reason for your answer [2 marks]
 - ii. Identify what each of the variables serves in the experiment [2 marks]
 - iii. Name the response variable [1 mark]
- b. Is there evidence to indicate a difference in the mean weight gain for the breeds of chicks [8 marks]
- c. An animal experimenter was interested in potential production differences resulting from the two types of animal feeds. As a measure of the amount of production, he measured the milk output of the animals fed on the two feeds. The results follow:

Feed type	Animal			
	Jane	Martha		
A	39	45	20	13
	58	35	16	11
B	44	35	13	10
	42	21	16	15

- i. Draw the AB interaction plots [5 marks]
- ii. Interpret the plot [2 marks]

QUESTION SEVEN [20 MARKS]

- a.i. State two advantages of a Latin Squares design over a Completely Randomized Block Design [2 marks]
- ii. Draw a Latin Square Design for an experiment with treatments P, R, S, T, W, Y [2 marks]

b. The table below is a result of an experimental design

Rows	Columns		
	1	2	3
1	B(12)	A(7)	C(17)
2	C(10)	B(7)	A(4)
3	A(2)	C(8)	B(12)

- i. Identify the design it is giving reason [2 marks]
 - ii. Identify the treatments [1 mark]
 - iii. Do the data present sufficient evidence to indicate a difference in the treatment means [10 marks]
- c. Define the following terms: Significance level, P-value of a test, Critical region [3 marks]

QUESTION EIGHT [20 MARKS]

A bacteriologist is interested in the effects of two different culture media and two different times on the growth of a particular virus. He or she performs six replicates of a 2^2 design, making the runs in random order.

	<u>Culture medium</u>			
Time(h)	1	2		
	21	22	25	26
12	23	28	24	25
	20	26	29	27
	37	39	31	34
18	38	38	29	33
	35	36	30	35

- a.i. Identify the response variable [1 mark]
- ii. State the factors and their levels [2 marks]
 - b.i. Make a table for the Treatment combinations, factor levels and total effects [6 marks]
- ii. Determine main and interaction effects [6 marks]
 - a. Do Interaction plots and give their interpretation [5 marks]