JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

THIRD YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE AND SOIL SCIENCE

2017/2018 ACADEMIC YEAR

REGULAR

COURSE CODE: ALS 3328

COURSE TITLE: BIOMETRY

EXAM VENUE: STREAM: BSc. (Horticulture/Soil Science)

DATE: EXAM SESSION:

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 the question paper.
3. Candidates must hand in their answer booklets to the invigilator while in the examination room.

SECTION A: COMPULSORY [30 marks]

QUESTION ONE [SIX MARKS]

a. Define a treatment in design of experiments. [2 marks]

b. Distinguish between a critical value and a critical region. [2 marks]

c. Distinguish between CRBD and LSD. [2 marks]

QUESTION TWO [SEVEN MARKS].
We wish to check that normal body temperature maybe different from 98.6 degrees. In a random sample of 18 individuals, the sample mean was found to be 98.617 and the standard deviation was .684. Assume the population is normally distributed.

a. Determine the test statistic [2 marks]

b. Determine p-value for the test [3 marks]

c. Test these hypotheses based on p-values at $\alpha = 0.05$. [2 marks]

QUESTION THREE [EIGHT MARKS]
a. In an experiment data on spinach was analysed and the results are as in the anova table shown below ($\alpha = 0.05$)

Source of variation	DF	SS	MSS	P-value
Seed variety	4	1.219	0.30475	0.012
Residual	25	1.724	0.0862	

i. State the level of the treatments under investigation. [1 mark]

ii. Draw conclusions for the test [2 marks]

b. Feeding time (A) and drinking water (B) were administered on some dairy goats. Two feeding times (early and late) and two temperatures of water (cold and warm) are selected. Four observations are made on each set of conditions as shown below.

The response is the average milk produced each week over one month.

A	B	Treatment combination	Replicate I	II	III	IV
-	-		18.2	19	12.9	14.4

		27.2	24	22.4	22.5
+	-	27.2	24	22.4	22.5
-	+	15.9	15	15.1	14.2
+	+	41	44	36.3	39.9

Estimate the main effects. [5 marks]

QUESTION FOUR [NINE MARKS]

An agronomist wishes to determine the percentage of Phosphorous in four varieties of a compound fertilizer. The results are the following:

Variety	Percentage of Phosphorous		
A	31	15	21
B	20	21	24
C	23	15	21
D	20	17	19

a. Identify the:

i. Treatment factor in this study. [1 mark]

ii. The experimental unit. [1 mark]

iii. The response   variable. [1 mark]

b. Determine the treatment sum of squares. [6 marks]

SECTION B: 40 MARKS

ANSWER TWO QUESTIONS ONLY

QUESTION FIVE [20 MARKS]

a. i. Define a one- way test [1 mark]

ii. State a special feature of CRD [1 mark]

b. A vegetable grower performs an experiment to investigate the effect of method of planting on yield of kales. He employs three methods A, B, C on same size of plots using same inputs. The yields in kg per plot from each of the methods are recorded in the table below.

Method	Yield			
A	73	83	76	68
B	54	74	71	80
C	79	95	87	75

i. Identify the experimental design used giving your reason [1 mark]

ii. how many replications do we have [1 mark]

c. i. state the hypothesis to test effect of method on yield   [2 marks]

ii. Perform an analysis of variance for this experiment   [10 marks]

iii. What conclusion do you make on effect of method of planting on yield of kales at 5% significance level   [3 marks]

QUESTION SIX [20 MARKS]

An experiment was conducted to compare the amount of herbicide in some drugs. Four agroverts 1, 2, 3, 4 were randomly selected and amounts of herbicide in three drugs A, B, C determined and recorded as shown below.

Agroverts	Drug		
	A	B	C
1	59	63	65
2	58	61	64
3	54	59	55
4	69	70	58

a. i. Identify the experimental design applied giving reasons   [2 marks]

ii. Identify the factors appropriately and state their levels.   [4 marks]

b. i. State the appropriate hypotheses for the experiment   [2 marks]

   ii. Determine the treatment sum of squares   [6 marks]

c.i. Construct anova table for the experiment   [4 marks]

   ii. Do the treatments differ significantly? Use $\alpha = 0.05$ [2 marks]

QUESTION SEVEN [20 MARKS]

The effect of five different catalysts (A, B, C, D, and E) on reaction time of a chemical process is being studied. Each batch of new material is only large enough to permit five runs to be made. Furthermore, each runs requires approximately 2 hours, so only five runs can be made in one day. The experimenter decides to run the experiment as a Latin square so that day and batch effects can be systematically controlled. She obtains the data that follow.

| | Day | | | | |
Batch	1	2	3	4	5
1	A=8	B=7	D=1	C=7	E=3
2	C=11	E=2	A=7	D=3	B=8
3	B=4	A=9	C=10	E=1	D=5
4	D=6	C=8	E=6	B=6	A=10
5	E=4	D=2	B=3	A=8	C=8

a. Identify the:

i. Treatment factor in this study [1 mark]

ii. The experimental unit [1 mark]

iii. The response [1 mark]

b. i. Analyze the data from this experiment (use $\alpha = 0.05$) [7 marks]

   ii. Draw conclusions [3 marks]

c. An experiment was run on animal feeds in an effort to increase their intake. Two feeds A and B each at two values were studied. The factors and levels were A, setting [small, large], B, exposure time [20% below nominal,20% above nominal].

Results of a replicated 2^2 design are: (1) =7, a =9, b= 34, ab = 55.

i. State the response variable [1 mark]

 ii. Determine all possible contrasts [3 marks]

 iii. Estimate main and interaction effects [3 marks]

QUESTION EIGHT [20 MARKS]

a.It has been reported that the average credit card debt for renting farming land is $3262. A farmers' producer group feels that their members have a debt much less than this, so it conducts a study of 50 randomly selected farmers and finds that the average debt is $2995, and the population standard deviation is $1100.

i. State the hypotheses for the producer group. [2 marks]

ii. Determine the test statistic. [3 marks]

iii. Work out p-value for the test [3 marks]

iv. Draw your conclusion based on the p-value at $\alpha = 1\%$ [2 marks]

b. An animal experimenter was also 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. Determine main and interaction effects   [5 marks]

ii. Draw the interaction plots   [4 marks]

ii. Interpret the plots   [1 mark]