



MACHAKOS UNIVERSITY

University Examinations for 2017/2018 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

SECOND YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE

IN AGRICULTURAL EDUCATION AND EXTENSION

AGR 291: STATISTICS FOR AGRICULTURE

DATE: 14/12/2017

TIME: 11.00-1.00 PM

Instructions:

Answer ALL questions in section A and ANY TWO questions in section B

SECTION A: COMPULSORY: (30 MARKS)

QUESTION ONE

- a) Distinguish between a parameter and statistics (2 marks)
- b) Indicate whether each of the following statements is true (T) or false (F). If a statement is false, explain why. (3 marks)
 - i) For a fixed α level, as the degrees of freedom increases in a t test, the absolute value of the critical value decreases.
 - ii) If two samples consist of pairs of data, the experimenter may choose between the paired test and the t test for two independent samples.
 - iii) A paired comparison t test should always be used when $\sigma_1^2 = \sigma_2^2$
- c) Explain the implications of acceptance limits when testing differences between two sample means (3 marks)
- d) Explain when do you use the following types of analysis (2 marks)
 - i) Correlation

- ii) Regression
- e) i) You collected a set of data and intend to determine the central tendency. What characteristic would you consider before choosing the type of measure to use (3 marks)
- ii) Using the given data below for grain weight per plant data, determine the mean (2 marks)

Class limits	Frequency (fi)
5-10	1
10-15	4
15-20	3
20-25	9
25-30	13
30-35	12
35-40	4
40-45	2
45-50	2

- f) You collected data on animal weights and obtained the results given below.
- i) 95% limits: lower 681.8 g upper 851.6 g
- ii) 99% limits: lower 646.9 g upper 886.5 g
- Give the interpretation of your data (2 marks)
- g) i) Explain why you would choose randomized complete block design when carrying out field experimentation (3 marks)
- ii) Explain three advantages of using randomized complete block design (3 marks)

SECTION B: ANSWER ANY FOUR QUESTIONS (40 MARKS)

QUESTION TWO

- a) Discuss any three principles of experimental designs (6 marks)
- b) After an extended dry period, measurements were taken on atmospheric pollution in urban and rural locations. The data were summarized as follows:

	Urban	Rural
n	11	10
$\bar{X}$	24 ppm	18 ppm
S^2	91	100

- i) What are the null and alternative hypotheses if the experimenter is looking for evidence of effect of higher pollution to agricultural production in the urban locations? (4 marks)
- ii) Determine if there was a significant difference in pollution levels between urban and rural locations using t distribution level at 5%. (10 marks)

QUESTION THREE

- a) i) The table below gives a summary of effects of different acids on shoot growth. Mean separation was done based on least square difference. Draw your conclusions at the 5% confidence level (4 marks)

Treatment	Mean	LSD
Control	4.19	a
HCl	3.87	b
Propionic	3.73	c
Butyric	3.64	c

- ii) Explain why you would advice your fellow scientist not to use complete random design (4 marks)
- b) An experiment was conducted using five varieties of sweet potatoes (A, B, C, D, E). The objective was to evaluate these varieties in terms of their yield. A randomized complete block design was used. The following were yields (kg/plot) from the various plots.

	Block			
Variety	I	II	III	IV
A	6.8	6.4	6.1	6.7
B	5.6	5.5	4.7	4.6
C	5.5	5.3	4.8	4.5
D	5.3	5.2	4.7	4.6
E	4.4	4.1	4.6	4.2

Part of the calculation is shown in the table below

Source of variation	s.s
Block	1.18800
Treatment	10.227
Residual	1.07700
Total	12.49200

- State the null and alternate hypothesis (4 marks)
- Complete the ANOVA table (6 marks)
- Draw conclusions from the results using F test at 5% (2 marks)

QUESTION FOUR

- a) The following data was obtained from an experiment conducted to determine the effect of insecticides on number of dead insects after a spray on a marked area.

Insecticide	Sample size (n_i)	Observations	Mean	Total
A	4	10, 8, 12, 10	10	40
B	6	24, 27, 30, 26, 29, 32	28	168
C	5	18, 21, 17, 20, 19	19	95
Total				303

ANOVA table

Sources of Variation	Degrees of Freedom (df)	Sum of Squares (SS)	Mean square (MS)	F Calculated (F_{cal})	F Table (F_{table}) 1%
Insecticides	2				6.93
Error	12				
Total	14				

- Complete the ANOVA table above (10 marks)
 - Identify design used by the scientist and interpret his results (4 marks)
- b) You intent to carry out a survey on adoption of technology by farmers and marketers in Makueni county, explain three methods of sampling your respondents (6 marks)

QUESTION FIVE

- a) Use the data given for the average weight (g) of fruits per plant of tomato grown in 12 plots to answer the questions below.

840 750
680 890
890 1000
720 570
540 830
720 770

- i) Calculate the mean (2 marks)
ii) Calculate the standard deviation (6 marks)
iii) Determine the standard error (2 marks)
- b) An agronomist would like to determine the effect of NPK fertilizer (X) on the yield (Y) of carrots. Use the information given in the table below to answer the question.

Plot	x	$x - \bar{x}$	y	$y - \bar{y}$
1	0	-20	6	-13.7
2	0	-20	8	-11.7
3	10	-10	11	-8.7
4	10	-10	14	-5.7
5	20	0	18	-1.7
6	20	0	23	3.3
7	30	10	25	5.3
8	30	10	28	8.3
9	40	20	30	10.3
10	40	20	34	14.3

Determine whether there is any correlation between x and y using α at 1% (10 marks)