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 FOOD SECURITY 2017/2018ACADEMIC YEAR

REGULAR

COURSE CODE: AFB 3324

COURSE TITLE: BASIC QUANTITATIVE METHODS

EXAM VENUE: **STREAM: BSc. (Food Security)**

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 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 [6 MARKS]

Distinguish between the following terms as used in hypothesis testing

i. Type I error and Type II error [2 marks]

ii. P-value of a test and Significance level of a test [2marks]

iii. Null and Alternative hypotheses [2 marks]

QUESTION TWO [6 MARKS]

An investigation to test the hypothesis H_0: $\mu = 40$ against at least 42 at $\alpha = 0.05$ significance level. A random sample of 60 measurements from a population yielded $\bar{y} = 41$ and $\sigma = 6$.
What conclusions can you make about the hypotheses based on the sample information

QUESTION THREE [9 MARKS]

Given that: A = $\begin{pmatrix} -1 & -3 \\ 1 & 1 \end{pmatrix}$, B= $\begin{pmatrix} 4 & 7 \\ -2 & 3 \end{pmatrix}$ and C= $\begin{pmatrix} 3 & 1 \\ -4 & 5 \end{pmatrix}$

Determine:

a. $(A + C)^{-1}$ [4 marks]

b. x and y satisfy two equations such that: 3x – y = 4 and 0.5x + 1.5y = -2 use matrix method to find values of x and y [5 marks]

QUESTION FOUR [9 MARKS]

Given five pairs of points (x, y) as in the table below;

y	0	0	1	1	3
x	-2	-1	0	1	2

a. Plot the points and draw a graph using the plots [2 marks]

b. Find the least-squares line for the data [4 marks]

c. Use the line in b. above to find:

i. x when y = 1.65 [2 marks] ii. y when x = 1.25[1 mark]

QUESTION FIVE [20 MARKS]

a. A certain poultry disease is thought to be noncommunicable. To test this feeling, 30000 kales were randomly partitioned into three groups of 10000. One group had no contact with the diseased chickens, one had moderate contact and the third had heavy contact. After a 6-month period, the following data were collected on the number of diseased chickens in each group.

State	No contact	Moderate contact	Heavy contact
Number of diseased chickens	87	89	124
Number of nondiseased chickens	9913	9911	9876
Total	10000	10000	10000

Find i. the expected number of chicken in each group that were diseased and those that were non diseased [4 marks]

ii. do the data provide evidence to indicate a dependence between the extent of contact between chickens and incidence of the disease at 5% significance level [6 marks]

b. 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]

QUESTION SIX [20 MARKS]

The water intake by plants, y is found to depend on among other factors; time of day, x_1 and humidity, x_2. The table shows some of the values of y, x_1 and x_2

y	1	5	3	8	5	3	10	7
x_1	1	2	2	4	4	4	6	6
x_2	2	4	5	6	8	10	11	13

a. work out: i. XX^T [4 marks]

ii. $X^T Y$ [4 marks]

b. given that $b = (XX^T)^{-1}X^TY$

i. find $(XX^T)^{-1}$ [4 marks]

ii. hence work out an estimate for b [4 marks]

iii. write the regression of y on x_1 and x_2 [2 marks]

iv. interpret the model in iii [2 marks]

QUESTION SEVEN [20 MARKS]

a. The amount of additives x fed to cows and milk production, y are displayed in the table below

x	1	2	3	4	5
y	2	4	5	6	8

i. Find regression of y on x [5 marks]

ii. Find the correlation coefficient amount of additive and milk production [4 marks]

iii. Explain your answer in ii above [1 mark]

b. Test the hypothesis H_0: $b_1 = 0$ at $\alpha = 0.05$ [4 marks]

c.i. Calculate R^2 [4 marks]

ii. Interpret what R^2 in c.i. means [2 marks]

QUESTION EIGHT [20 MARKS]

a. The manager of a food outlet,believes that the recent remodeling project has greatly improved the club's appeal for members and that they now stay longer at the club per visit than before the remodeling. Studies show that the previous mean time per visit was 36 minutes, with a standard deviation equal to 11 minutes. A simple random sample of 200 visits is selected, and the current sample mean is 36.8 minutes. i. state the hypothesis [2 marks]

ii. find the test statistic [3 marks]

iii. determine the p-value and test the manager's claim using $\alpha = 0.05$ level [3 marks]

b. Regression output from regression of Y on X_1 and X_2

Variable	Coefficient	s.e	t-test	p-value
Constant	9.8709	7.061	1.4	0.1735
X_1	0.6435	0.1185	5.43	0.0001
X_2	0.2112	0.1344	1.57	0.1278

$n=30$ $R^2 = 0.708$ $\sigma = 6.817$ D.F = 27

i. Use the table draw the conclusion on regression of Y on X_1 and X_2[6 marks]

ii. given $Y = a + b_1 x_1 + b_2 x_2$

test for the significance of $b_1 = 0$ at $\alpha = 0.05$ [6 marks]