EGERTON UNIVERSITY

UNIVERSITY EXAMINATIONS
NJORO CAMPUS

FIRST SEMESTER, 2017/2018 ACADEMIC YEAR

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE, AGRICULTURE AND HUMAN ECOLOGY, ANIMAL PRODUCTION, DRYLAND RESOURCE MANAGEMENT, HORTICULTURE AND SOIL ENVIRONMENT AND LAND USE MANAGEMENT

AGRO 291: STATISTICS FOR AGRICULTURE

STREAM: B.Sc. AGRIC, AGHE, ANSCI, DRLM, HORT & SELUM **TIME:** 3 HRS

EXAMINATION SESSION: FEBRUARY-MARCH **YEAR:** 2018

INSTRUCTIONS:

(i) **Answer ALL questions.**
(ii) **Show all your calculations and formulae where applicable.**
(iii) **Scientific calculators may be used.**
(iv) **Mobile phones are STRICTLY PROHIBITED in the examination room.**
(v) **Figures in brackets indicate marks for each question.**
(vi) **Statistical tables and graph paper are provided.**

QUESTION ONE

(a) Differentiate between the following terms as used in Agricultural Statistics:

(i) Sample and Population **(2 marks)**
(ii) One-Tailed and Two-Tailed test **(2 marks)**
(iii) Mutually exclusive and Independent events **(2 marks)**
(iv) Discrete and continuous variable **(2 marks)**
(v) Type I and Type II error **(2 marks)**

(b) A plant breeder claims that selection of *Phaseolus vulgaris* for seed should be based on number of seeds per pod. Thus, the more the number of seeds per pod, the higher the recurrence of the trait. A sample of 40 pods had seed distribution in the proportions shown. Study the table below and answer the questions that follow

Table 1: Proportions of number of seeds per pod for *Phaseolus vulgaris*

No. of seeds/pod(x)	3	4	5	6
Proportions (%)	20	52.5	25	2.5

(i) Complete this simple frequency distribution table **(3 marks)**

(ii) Calculate mean, mode, median, standard deviation ,coefficient of variation, and range **(6 marks)**

QUESTION TWO

(a) To detect the presence of harmful insects in farm fields, we can put up boards covered with a sticky material and examine the insects trapped on the boards. Is there any evidence that the effectiveness of the boards to attract insects varies? Test at α=.05 **(10 marks)**

Table 2: Insect behavior against coloured boards

Board colour	Insects trapped					
Blue	16	11	20	21	14	7
Green	37	32	20	29	37	32
White	21	12	14	17	13	20
Yellow	45	59	48	46	38	47

(b) A white bull is mated with a black cow; the probability of getting a single grey calf is ¼. Taking a sample of 9 calves from this type of mating, what is the probability that there will be:

i) Two grey calves **(2 marks)**

ii) No grey calf **(2marks)**

QUESTION THREE

a) An Entomologist sprayed 120 adult Melon flies with a specific low concentration of Malathion and observed their survival times. The mean and the standard deviation were found to be 18.3 and 5.2 days, respectively. Use these data to construct a 99% confidence interval for the true mean survival time. **(5 marks)**

(b) State the challenges a researcher is likely to encounter in running a multiple t-test (3 marks)

(c) What circumstances would permit a researcher to use a Completely Randomized Design in experimentation? (3 marks)

(d) State any two distinguishing characteristics of mean and standard deviation (2 marks)

QUESTION FOUR

An Agricultural marketing company was engaged to evaluate the sales of an agricultural product before and after a promotional campaign. The table below shows the volumes (in kg per day) sold in six sampled outlets before or after marketing promotion.

Table 3: Daily sales of cauliflower (kg) in six marketing outlets

Outlets	A	B	C	D	E	F
Before promotional campaign (X)	53	28	31	48	50	42
After promotional campaign (Y)	58	29	30	55	56	45

(i) Test at α=0.05 whether the campaign could be judged as a success (8 marks)

(ii) Outline and explain the four categories of experiments (4 marks)

QUESTION FIVE

(a) By giving appropriate examples, differentiate between Independent and Dependent variables as used in regression analysis (3 marks)

(b) An Agronomist assumes that there is a linear relationship between the amount of fertilizer supplied to tomato plants and the subsequent yield of tomatoes obtained. Eight tomato plants of the same variety, with a solution in which x grams of fertilizer was dissolved in a fixed quantity of water. The yield, y kilograms, of tomatoes was recorded.

Table 4: Effects of fertilizer on yield (kg) of tomatoes

Plant	A	B	C	D	E	F	G	H
x	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
y	3.9	4.4	5.8	6.6	7.0	7.1	7.3	7.7

(i) Plot a scatter diagram of yield, y, against amount of fertilizer, x (4 marks)

(ii) Calculate the equation of the least squares regression line of y on x (4 marks)

(iii) Estimate the yield of a plant treated with 3.2 grams of fertilizer (1 mark)

Table A.3 Values of t

df	Probability of a numerically larger value of t								
	0.5	0.4	0.3	0.2	0.1	0.05	0.02	0.01	0.001
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619
2	816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.598
3	765	978	1.250	1.638	2.353	3.182	4.541	5.841	12.941
4	741	941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	727	920	1.156	1.476	2.015	2.571	3.365	4.032	6.859
6	718	906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	711	896	1.119	1.415	1.895	2.365	2.998	3.499	5.405
8	706	889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	703	883	1.100	1.383	1.833	2.262	2.821	3.250	4.781
10	700	879	1.093	1.372	1.812	2.228	2.764	3.169	4.587
11	697	876	1.088	1.363	1.796	2.201	2.718	3.106	4.437
12	695	873	1.083	1.356	1.782	2.179	2.681	3.055	4.318
13	694	870	1.079	1.350	1.771	2.160	2.650	3.012	4.221
14	692	868	1.076	1.345	1.761	2.145	2.624	2.977	4.140
15	691	866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
16	690	865	1.071	1.337	1.746	2.120	2.583	2.921	4.015
17	689	863	1.069	1.333	1.740	2.110	2.567	2.898	3.965
18	688	862	1.067	1.330	1.734	2.101	2.552	2.878	3.922
19	688	861	1.066	1.328	1.729	2.093	2.539	2.861	3.883
20	687	860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
21	686	859	1.063	1.323	1.721	2.080	2.518	2.831	3.819
22	686	858	1.061	1.321	1.717	2.074	2.508	2.819	3.792
23	685	858	1.060	1.319	1.714	2.069	2.500	2.807	3.767
24	685	857	1.059	1.318	1.711	2.064	2.492	2.797	3.745
25	684	856	1.058	1.316	1.708	2.060	2.485	2.787	3.725
26	684	856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	684	855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	683	855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	683	854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	683	854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	681	851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
60	679	848	1.046	1.296	1.671	2.000	2.390	2.660	3.460
120	677	845	1.041	1.289	1.658	1.980	2.358	2.617	3.373
∞	674	842	1.036	1.282	1.645	1.960	2.326	2.576	3.291

	0.25	0.2	0.15	0.1	0.05	0.025	0.01	0.005	0.0005
df	Probability of a larger positive value of t								

SOURCE: This table is abridged from Table III of Fisher and Yates, *Statistical Tables for Biological, Agricultural, and Medical Research*, published by Oliver and Boyd Ltd., Edinburgh, 1949, by permission of the authors and publishers.