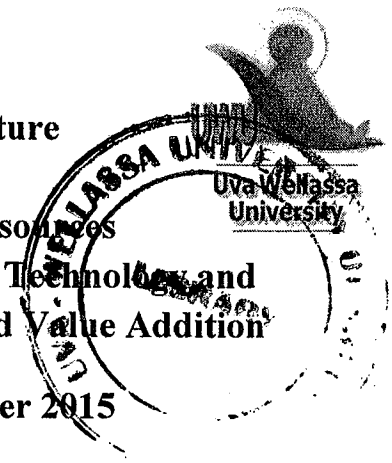
Uva Wellassa University
Faculty of Animal Science & Export Agriculture



Bachelor of Animal Science/ B.Sc. in Aquatic Resources Technology/ B.Sc. in Export Agriculture / B.Sc. in Tea Technology and Value Addition / B.Sc. in Palm & Latex Technology and Value Addition

End Semester Examination September/October 2015
Year III Semester I

Applied Statistics for Agriculture (EAG 301-3)

Instructions

Answer **All** questions
No. of questions : Six (06)
No. of pages : Six (06)
Total marks allocated : 100%
Time : Three (03) Hours
Students are allowed to use calculators.

Question 1

1.1 Suppose a certain drug test is 99% sensitive and 99% specific. The test will correctly identify a drug user as testing positive 99% of the time, and will correctly identify a non-user as testing negative 99% of the time. This would seem to be a relatively accurate test, but Bayes' theorem can be used to demonstrate the relatively high probability of misclassifying non-users as users. Assuming a corporation decides to test its employees for drug use, and that only 0.5% of the employees actually uses the drug. What is the probability that, given a positive drug test, an employee is actually a drug user?

(8 marks)

1.2 An experiment on the effect of immunization of goats against disease was conducted at a farm. Two batches, each of 10 animals, were taken. One batch was inoculated and other batch was not inoculated. Then, both the batches were exposed to the infection of the disease. The frequencies of dead and survived animals were observed in both of the

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batches. The results are given in the table below. From the results, test whether the inoculation is effective against disease.

Table 01: The frequencies of dead and survived animals

	Dead	Survived	Total
Inoculation	2	8	10
Not inoculation	7	3	10
Total	9	11	20

(8 marks)

Question 2

From a field of improved paddy variety, a sample of 36 plants was selected at random and the panicle length of each plant was measured. The mean of these measurements were 18.7 cm and population standard is 1.25 cm. The average panicle length of original variety is known as 19 cm.

2.1 Construct the 95% confidence interval for the mean panicle length of original variety.

(6 marks)

2.2 Test whether the improved variety is significantly different from the original with respect to panicle length.

(8 marks)

Question 3

The chickens of the Ortnithes farm are processed when they are 20 weeks old. The distribution of their weights is normal with mean 3.8 lb, and standard deviation 0.6 lb. The farm has created three categories for these chickens according to their weight: petite (weight less than 3.5 lb), standard (weight between 3.5 lb and 4.9 lb), and big (weight above 4.9 lb).

3.1 What proportion of these chickens will be in each category? Show these proportions on the normal distribution graph.

(5 marks)

3.2 Find the 60th percentile of the distribution of the weight. In other words find c such that P(X < c) = 0:60. (5 marks)

3.3 Suppose five (5) chickens are selected random. What is the probability that 3 of them will be petite? (5 marks)

Question 4

An experiment to evaluate the effects of certain variables on soil erosion was performed on 10-foot-square plots of sloped tea land subjected to 2 inches of artificial rain applied over a 20-minute period. It has recorded the Soil Lost (pounds/acre), Slope Gradient of the plot, Length (in inches) of the largest opening of bare soil on any boundary and percentage of ground cover. The results of Regression analysis are as follows.

Table 02: Parameters Estimated

Predictor	**Coefficient**	**SE coefficient**	**T**	**P**
Constant	-1.88	18.13	-0.10	0.020
SG	77.33	44.51	1.74	0.006
LOBS	1.55	0.73	2.12	0.121
PGC	-23.90	13.43	-1.78	0.000

SG- Slope Gradient of the plot

LOBS- Length (in inches) of the largest opening of bare soil on any boundary

PGC- Percentage of ground cover

In the fitted Model: SST= 696.59 and MSE= 2.30.

4.1 Write down the fitted model using the original terms. (4 marks)

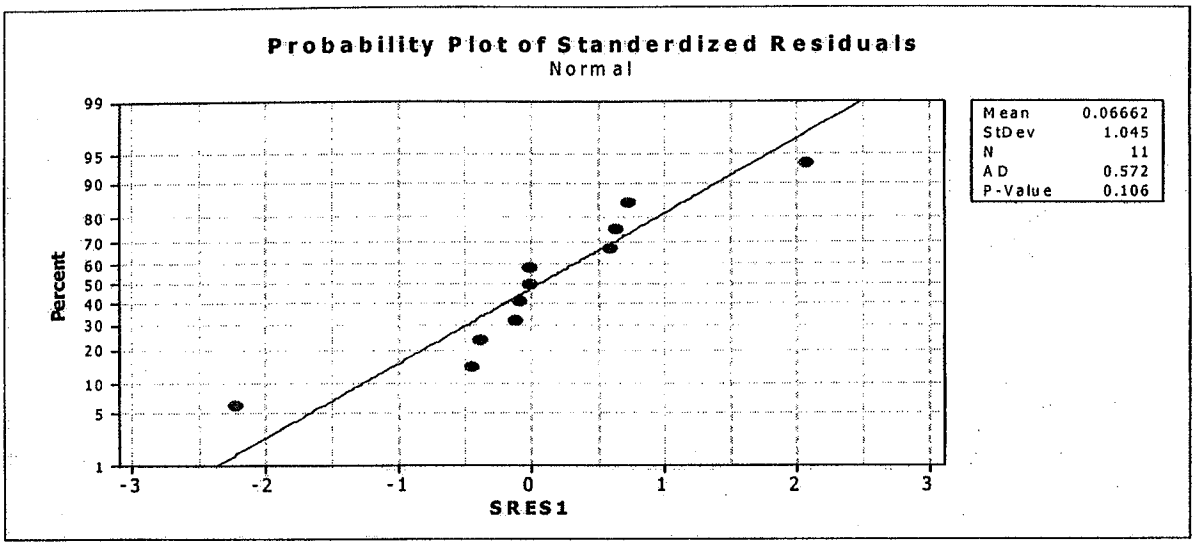
4.2 Does the model predict well and is it significant at 0.05 level of significance. Indicate how you reached your decision. (Construct the full ANOVA table and Hypothesis to answer this part) (6 marks)

4.3 How much variation do these independent variables collectively explain? (2 marks)

4.4 What is (are) the main assumption(s) under the regression analysis? (4 marks)

4.5 The normal probability plot of standardized residuals of above analysis is given below. What comments can you make using Graph 01? (4 marks)

Graph 01: Probability Plot of Standardized Residuals



Question 5

A pharmaceutical company needs to determine whether a new drug successfully lowers blood cholesterol levels for patients with heart disease. To investigate this, 26 patients suffering from heart disease were randomised to receive the new drug or a placebo for a period of 6 weeks. At the end of this period, the patients had their blood cholesterol levels measured in suitable units with the following results.

Table 03: Blood cholesterol levels in two treatments

Placebo	265	268	281	276	270	292	285	267	266	294	299				
Drug	282	230	271	282	233	227	257	240	225	250	271	263	275	262	280

Table 04: Summary Measures of Blood cholesterol levels in two treatments

	Placebo	Drug
Mean	278.5	12.5
SD	256.5	20.9

5.1 Draw a dot-plot of these data and comment on the distribution of the observations in each group. (3 marks)

5.2 Using a suitable non-parametric test, investigate whether the drug is more successful than the placebo in reducing blood cholesterol level in patients with heart disease. (5 marks)

5.3 It is suggested that a parametric test would be more appropriate to analyse these data. Repeat your analysis using a suitable parametric test, stating any assumptions necessary for this analysis to be valid. (5 marks)

5.4 Comment on the comparison of the results obtained in (5.2) and (5.3). (2 marks)

Question 6

An experiment was carried out to study the effect of two factors on the blood sugar level in rabbits. One factor was two types (I and II) of insulin and the other factor was the dose level ("low" or "high") at which each type of insulin was given. Four rabbits were used in the experiment, and each was given all four treatment combinations, in random order, separated by suitable intervals of time in the hope of avoiding carryover effects from one treatment to the next. Measurements of blood sugar level (mg/100cc) are given in the following table.

Table 05: Measurements of blood sugar level

Rabbit	**Type of insulin**			
	I		II	
	Dose level		**Dose level**	
	Low	High	Low	High
A	88	47	76	63
B	89	51	74	65
C	86	54	79	62
D	81	59	72	68

6.1 Calculate the mean responses for the four treatment combinations, and illustrate these in a graph. Is there any suggestion of interaction between the two factors? (4 marks)

6.2 Copy and complete the following analysis of variance (ANOVA) table. What is your decision based on this ANOVA table. (5 marks)

Table 06: Analysis of Variance (ANOVA) table

Source of Variations	**df**	**SS**	**MS**	**F**
Rabbit		7.25		
Insulin type		1.00		
Dose level		1936.00		
Insulin type* Dose Level		506.25		
Residuals		155.25		
Total				

6.3 How much Proportion of variation can be explained by the model? (2 marks)

6.4 Write a brief report on the results of the experiment by considering following Minitab output.

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Grouping Information Using Tukey Method and 95.0% Confidence

Inci   Dose   N    Mean   Grouping
1      1      4   86.00   A
2      1      4   75.25      B
2      2      4   64.50         C
1      2      4   52.75            D

Means that do not share a letter are significantly different.
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(5 marks)

6.5 Another experimenter suggests that it would save time if, instead, four different groups, each of four rabbits, were used in this type of experiment. Each treatment combination would be given to one of the groups, chosen at random. Discuss briefly the advantages and disadvantages of conducting an experiment in this way. (4 marks)