Uva Wellassa University of Sri Lanka
Faculty of Applied Sciences
Department of Science and Technology
200 level 1st Semester Examination – Jul. /Aug. 2019
SCT 211-2 Statistical Methods

Instructions to candidates
Duration: One (01) hour and twenty five (25) minutes
Mark allocation: 80 marks
Number of questions: Two (02) Sturctured Essay and two (02) Essay Questions
Answer all questions.

1. A pharmaceutical company has developed a new headache treatment which is being field tested on 1000 volunteers. In a test some volunteers have received the treatment and some a placebo (a harmless neutral substance). The results of the test are as follows:

	Treatment received	Placebo received
Some improvement	600	125
No improvement	150	125

Calculate:

a. the probability that a volunteer has shown some improvement.

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(3 marks)

b. the conditional probability that the volunteer has shown some improvement given that he or she has received the treatment.

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(3 marks)

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c. the conditional probability that the volunteer has received the treatment given that no improvement has been observed.

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(3 marks)

d. the conditional probability that the volunteer has received the placebo given that some improvement has been observed.

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(3 marks)

e. Explain briefly what the evidence in the table suggests to you about the effectiveness of the treatment.

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(3 marks)

2. An experiment to evaluate the effects of certain variables on soil erosion was performed on 20-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 (in pounds/acre), Slop Gradient of the plot, Length (in inches) of the largest opening of bare soil on any boundary and percentage of ground cover. The ANOVA table and the results of Regression analysis are as follows.

Table 01: 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- Slop Gradient of the plot
LOBS- Length (in inches) of the largest opening of bare soil on any boundary
PGC- Percentage of ground cover

a. What is the fitted regression model?

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(2 marks)

b. Complete the ANOVA Table given in below.

Table 02: Analysis of Variance (ANOVA)

Source	DF	Sum of Square Error	Mean Square Error	F value
Regression				
Residual			2.30	
Total		696.59		

(4 marks)

c. Write down the relevant hypothesis to test the model significance.

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(3 marks)

d. Check the model significance using the corresponding p-value at 95% significance level and make the final decision.

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(3 marks)

e. What are the significance estimated parameters in the model? Check them using the corresponding p-values at 95% significance level with suitable hypothesis and comment on your results.

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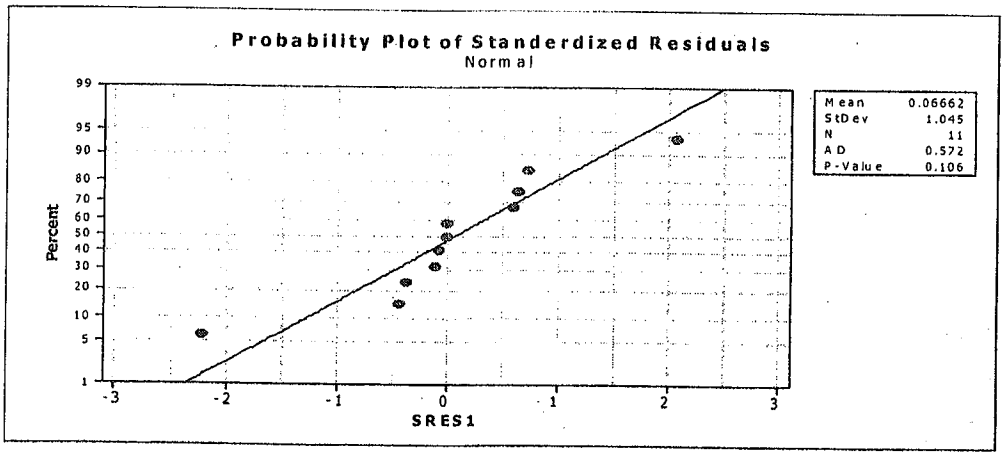
(5 marks)

f. The normal probability plot of standardized residuals of above analysis is given below. What comments can you make using Graph 01?

Graph 01: Probability Plot of Standardized Residuals



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(3 marks)

g. Comment the appropriateness of fitted model using Coefficient of determination value(R^2).

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(3 marks)