The Open University of Sri Lanka

B.Sc/B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME

No Book Test (NBT) 2015/2016

Level 04 - Applied Mathematics

APU2141/APE4141– Regression Analysis I

Date: - 13.11.2016 **10.30 am-11.30 am**

Instructions

- This examination is of **One hour** duration.
- Answer **All** questions.
- Each of the two questions is allocated fifty marks.
- Non programmable calculators are permitted.

1. The following summary statistics were computed from the dried weights(y) of 5-weeks old 20 medicinal plants, measured in mg,two months after applying known amounts of fertilizer in milligrams, x. The amounts of fertilizer used for the study in milligrams were, 0, 1,2, 3 and 5 per plant and the researcher had used four replicates at each level.

   $\sum x_i = 44.0, \sum y_i = 68.5, \sum x_i y_i = 185.66, \sum x_i^2 = 156.0, \sum y_i^2 = 255.5.$

   The researcher wants to fit a simple linear regression model for y,using the method of least squares,with$x$ as the predictor variable.

   i) Obtain estimates for the slope and the intercept parameters.

   ii) Write down the equation of the fitted line.

   iii) Clearly explain what the intercept parameter represents, in relation to this study.

   iv) If the dried weight of a 5-week old medicinal plant was 5 mg, estimate the amount of the fertilizer applied to the plant.

   v) A student stated that the estimated dried weight of a plant receiving 10mg of the fertilizer will be almost four times as the estimated dried weight of a plant receiving no fertilizer. Do you agree with this statement? Give reasons for your answer.

2. A researcher had fitted a simple linear regression model using the method of least squares for the reaction times (minutes), y, measured in 25 chemical samples maintained at different temperatures (^0C), x. The temperatures used for the study measured in ^0C were 0, 2, 4, 8 and 10. The researcher had obtained five replicates at each temperature.

   i) Find the sample mean of the x values used for the study.

   ii) If the sum of the fitted values for the reaction times is 237 minutes, find the sample mean of the observed reaction times.

   iii) Based on the least squares fitted line, the researcher had found that an increase in the temperature by $2\,^0C$, reduces the reaction time by 0.922 minutes. Find the slope of the fitted regression line.

   iv) Find the equation of the fitted regression line, the researcher had found from the method of least squares.

   v) If the observed reaction time of a sample at $5\,^0C$ is 10 minutes, find the residual. Clearly explain what the residual measures in relation to this study.