King Saud University

College of Sciences

Department of Statistics & OR

Mid-1 Exam , Stat 332

2nd Semester 1436-1437H

Time: 90 Minutes

Student Name: **ID#:**

Answer the following problem

Problem 1

For the simple linear regression model

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i,$$

$$\varepsilon_i, i = 1, 2, ..., n, are\ independent, \ Var(\varepsilon_i) = \sigma^2\ and \quad E(\varepsilon_i) = 0$$

    (a) Find the least square estimators of β_0, β_1

(b) Show that the sum of the residuals equal to zero.

(c) Prove that the point $(\bar{X}, \bar{Y})$ will always fall on the fitted line.

(d) Show that the sum of total sum of square errors is the summation of the sum of square errors and the sum of the square regression errors.

Problem 2

The following data represents the income (Inc) and consumption (Con)

in SR of 10 families in a certain city.

Inc	Con
8559.4	6830.4
8883.3	7148.8
9060.1	7439.2
9378.1	7804.0
9937.2	8285.1
10485.9	8819.0
11268.1	9322.7
11894.1	9826.4
12238.8	10129.9
12030.3	10088.5

Use the simple linear regression model to:

    (a) Estimate the regression line and interpret the coefficients.

    (b) Construct 90% confidence intervals for the model coefficients and

        explain the results.

(c) Test the linearity by using two different approaches.

(d) Calculate the residual at Inc = 11268.1 and con = 9322.7

(e) Estimate the standard deviation of the residuals.

Problem 3:

A linear regression was run on a set of data. You are given only the following partial information:

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Predictor       Coef    SE Coef         T
Constant      293.89      5.62
X                         0.13       -13.13


Analysis of Variance
Source              DF            SS            MS            F
P
Regression
Residual Error     5                          44.21
Total
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   (a) Compute the 95% Confidence intervals for β_0 and β_1

   (b) Give the F-statistic and test H_0: $\beta_1 = 0$ vs H_1: $\beta_1 \neq 0$

   (c) Test H_0: $\beta_0 = 0$ vs H_1: $\beta_0 \neq 0$.

   (d) Compute the sum of square errors.