King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
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Quiz #5

Name: *ID:* *Serial:*

Q 1. In reference to the data below, the independent variable x is SO2 deposition rate (mg/m2/day) and the dependent variable y is steel weight loss (g/m2).

X	14	18	40	43	45	112
Y	280	350	470	500	560	1200

with summary statistics: $\sum x = 272$, $\sum y = 3360$, $\sum x^2 = 18538$, $\sum y^2 = 2425400$, $\sum xy = 210120$

a) Find the equation of the estimated regression line between deposition rate and steel weight loss.
b) What is the expected change in the steel weight loss if the deposition rate is increased by 2 mg/m2/day?
c) Test, at 5% level of significance, the hypothesis that the higher the deposition rate, the more is the steel weight loss.
d) Compute the correlation coefficient and explains what it means.
e) Estimate, with 95% confidence, the expected steel weight loss if the deposition rate is 50.

Q 2. The pull strength of a wire bond is an important characteristic. A computer output of fitting a multiple linear regression model on the pull strength (y), die height (x_1), post height (x_2), loop height (x_3), wire length (x_4), bond width on the die (x_5), and bond width on the post (x_6).

Predictor	Coef	SE Coef	T	P
Constant	3.137	8.110	8.110	0.706
x_1	0.6444	0.5889	1.09	0.295
x_2	-0.0104	0.2667	-0.04	0.970
x_3	0.5046	0.1423	3.55	0.004
x_4	-0.1197	0.0562	-2.13	0.055
x_5	-2.462	2.598	-0.95	0.362
x_6	1.504	1.519	0.99	0.342

S = _____ $R^2 =$ _____

Analysis of Variance

Source	DF	SS	MS	F
Regression	___	_____	_____	_____
Residual	___	9.5924	_____	
Total	18	33.2211		

a) Fill in the blanks in the above output.
b) Write the fitted regression equation.
c) Write the hypothesis of the significance of the regression model, and test it. Use α = 0.05.
d) Which one of the regression coefficients is significant, and why? Use α = 0.1.
e) What is the amount of variation that explained by the model?
f) What is the amount of variation that explained by the model taking into account number of independent variables in the model and the sample size?

Q 3. Consider the following partial output from a multiple regression problem,

$$(X'X) = \begin{pmatrix} 7 & 51 & 32 \\ 51 & 471 & 235 \\ 32 & 235 & 163.84 \end{pmatrix}, \quad SS_E = 27.58, \text{ and}$$

$$(X'X)^{-1} = \begin{pmatrix} 1.7996 & -0.06854 & -0.25316 \\ -0.06854 & 0.01008 & -0.00107 \\ -0.25316 & -0.00107 & 0.05708 \end{pmatrix}$$

Use the above to answer the following three problems

a) The number of independent (regressor) variables equals to:
b) Find the estimate of the variance of the error is
c) Test $\beta_1 = 0$, if the estimated value is 1.4974.