KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES
DHAHRAN, SAUDI ARABIA

STAT 212: BUSINESS STATISTICS II

Semester 173
Second Major Exam
Tuesday July 24, 2018

Name: ID#: Section: Serial:

Question No	Full Marks	Marks Obtained
1	**15**	
2	**9**	
3	**6**	
4	**8**	
5	**15**	
6	**15**	
Total	**70**	

Q1. (3+5+2+7+4+3=24 *pts*) The director of cooperative education at a state college wants to examine the effect of cooperative education job experience on marketability in the work place. She takes a random sample of 4 students. For these 4, she finds out how many times each had a cooperative education job and how many job offers they received upon graduation. Given that; Sxx= 2 , Syy= 13 , Sxy= 5 , $\bar{x} = 1$, $\bar{y} = 3.5$

a. (3 *pts*) Find the Least Squares Estimates equation.

b. (5 *pts*) Complete the following table:

ANOVA

Source of variation	d.f.	SS	MS	F
Regression	?	12.5	?	
Errors	?	?	?	
Total	?	?		

c. (7 pts) The director claims that the number of job offers received by the student is directly related to the number of cooperative education jobs he had. Do the data support her claim? Explain.

d. (2 *pts*) Calculate the percentage of variation in the number of job offers received by the student that was explained by the variation in the number of cooperative education jobs he had.

e. (4 pts) If it was shown in the sample data that a student, who had two cooperative education job, he received six job offers, then what is the error in predicting the number of job offers received by the student who had two cooperative education jobs?

f. (3 pts) The director wants to obtain a 99.8% confidence interval estimate for the number of job offers received by a student who has had exactly two cooperative education jobs.

Q2. (2+2+2+2+3+3+2+2=18 *pts*) The superintendent of a school district wanted to predict the percentage of students passing a sixth-grade proficiency test. She obtained the data on percentage of students passing the proficiency test (*% Passing*), daily average of the percentage of students attending class (*% Attendance*), average teacher salary in dollars (*Salaries*), and instructional spending per pupil in dollars (*Spending*) of 47 schools in the state.

Following is the multiple regression output with Y = *% Passing* as the dependent variable, X_1 =: *% Attendance*, X_2 = *Salaries* and X_3 = *Spending*:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-753.4225	101.1149	-7.4511	2.88E-09
% Attendance	8.5014	1.0771	7.8929	6.73E-10
Salary	6.85E-07	0.0006	0.0011	0.9991
Spending	0.0060	0.0046	1.2879	0.2047

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	7965.08	2655.03	24.2802	2.3853E-09
Residual	43	4702.02	109.35		
Total	46	12667.11			

a. (2 *pts*) What is the average change in the percentage of students passing the proficiency test when daily average of the percentage of students attending class increases by 1% holding constant the effects of all the remaining independent variables?

b. (2 *pts*) How much of the total variation in the percentage of students passing the proficiency test can be explained by the variation in the daily average of the percentage of students attending class, average teacher salary, and instructional spending per pupil after adjusting for the number of predictors and sample size?

c. (2 *pts*) Predict the percentage of students passing the proficiency test for a school which has a daily average of 95% of students attending class, an average teacher salary of 40,000 dollars, and an instructional spending per pupil of 2000 dollars.

d. (*3 pts*) Test whether instructional spending per pupil has any effect on percentage of students passing the proficiency test?

e. (*3 pts*) Test whether there is a significant relationship between percentage of students passing the proficiency test and the entire set of explanatory variables?

f. (*2 pts*) What are the lower and upper limits of the 96% confidence interval estimate for the effect of a one dollar increase in average teacher salary on average percentage of students passing the proficiency test?

g. (2 *pts*) Can we conclude that average teacher salary has no impact on average percentage of students passing the proficiency test at a 4% level of significance? **Why?**

Q2. (5+2+6=13 *pts*) In order to investigate the correlation between the weight of final product (Y in pounds) and the volume of impurities in raw materials (X in grams), a dataset is collected for thirteen sample points. The summarized information on Y and X are given as: $\sum x = 641$, $\sum y = 388$, $\sum x^2 = 41831$, $\sum y^2 = 15302$, and $\sum xy = 15081$. Using these information answer the following:

a. (5 *pts*) Compute the estimated correlation coefficient between the weight of final product and the volume of raw materials.

b. (2 *pts*) Comment on the number you obtained in part a.

c. (6 *pts*) Can you conclude that the volume of impurities and the weight of final product are inversely correlated at the 1% level of significance? Justify your answer.

Q3. (2+8+3+2=15 *pts*) The resale price in thousand dollars (Y) of a car depends on the number of kilometers (in thousands) it has already travelled (X_1). The color of the car is also an important factor that affects the resale price. The three potential colors of the car are black, white and grey (X_2 =1 if black and 0 otherwise; X_3 =1 if white and 0 otherwise). Based on a dataset of 30 values on (Y, X_1, X_2, X_3) the multiple regression model regressing Yon X_1, X_2 and X_3 is given by:

$$\hat{Y} = 38.43 - 0.6045X_1 + 22.53X_2 + 38.34X_3$$

a. (2 *pts*) Write the regression model for black cars.

b. (8 *pts*) Interpret the regression coefficients b_0, b_1, and b_2.

c. (3 *pts*) What is the expected resale price for a grey car that already traveled a hundred thousand miles?

d. (2 *pts*) If an interaction term $1.145X_1X_2$ is present in the model given above then find the coefficient of X_1 for white cars.

With My Best Wishes