KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS

STAT 212 BUSINESS STATISTICS II
Semester 181, First Major Exam
Thursday November 8, 2018

Serial Number

Please circle your instructor's name:

M. Malik M. Saleh

Name: _____ ID #:_____

Important Note:

- Formula sheet will be provided to you in exam. You are not allowed to bring, with you, formula sheet or any other printed/written paper.
- Mobiles are not allowed in exam. If you have your mobile with you, turn it off and put it under your seat so that it is visible to proctor.
- Show all your work including formulas, intermediate steps and final answer. No points for answer without justification.
- Round up to 4 decimal points if needed.
- Make sure you have 7 unique pages of exam paper (including this title page).

Question No	Full Marks	Marks Obtained
1	10	
2	16	
3	22	
4	12	
Total	60	

Q1: A car insurance company performed a study to determine whether an association exists between age of driver and the frequency of car accidents. They obtained the following sample data.

		Under 25	**25 – 45**	**Over 45**
Number of accidents in past three years	0 or 1	84	93	96
	More than 1	16	7	4

At 5% level of significant, determine whether an association exists between age of driver and the frequency of car accidents

a. State the test hypotheses. (2 pts)

b. Compute the test statistic. (2 pts)

c. What is the decision rule and what is the critical value(s)? (2 pts)

d. What is your decision regarding H_0? Why? (2 pts)

Reject H_0 or don't reject H_0

Since

e. What is your conclusion? (1 pt)

f. Is it appropriate to use Marascuilo procedure to determine which groups have a different attitude? (1 pt)

Q2: The managers of a brokerage firm are interested in finding out if the number of new clients a broker brings into the firm affects the sales generated by the broker. They sample 12 brokers and determine the number of new clients they have enrolled in the last year and their sales amounts in thousands of dollars. These data are presented in the table that follows.

Clients	27	10	42	33	15	15	25	36	28	30	17	22
Sales ($1000's)	52	34	64	55	29	34	58	59	44	48	31	38

You may use the following

$$Sxx = 1010, \quad Syy = 1625, \quad Sxy = 1151, \sum x = 300 \quad \& \sum y = 546$$

a. Find the prediction for the amount of sales for a person who brings 25 new clients into the firm. (5 pts)

b. Calculate the standard error of the estimate for this relationship. (2 pts)

c. Do you think that, at 5% level of significant, there is a positive linear relationship between amount of sales and number of clines in the firm? (7 pts)

d. Find an approximate 90% confidence interval for the amount of sales for a person who brings 25 new clients into the firm. (2 pts)

Q3: A Sample of size 22 firms was selected from the industry to examine the relationship between Turnover Rate (in %) and 4 variables:

X1: Innovative index (higher scores indicate a more innovative and creative organizational culture)
X2: Job Growth rate (in %). X3: number of employees.
X4: Industry (0 if financial service sector, 1 if high tech industry).

Using the following MINITAB output:

Predictor	Coef	SE Coef	T	P
Constant	9.2439	0.78710	11.74	0.000
X1	-0.0240	0.01524	-1.58	0.134
X2	-0.5013	0.07287	-6.88	0.000
X3	0.0006	0.00055	1.13	0.276
X4	-2.8329	0.46990	-6.03	0.000

S = 0.74

a. Complete the ANOVA table. (8 pts)

Analysis of Variance

Source	DF	SS	MS	F
Regression				
Residual Error				
Total		211.818		

b. Find the predicted turnover rate for a firm in the financial service sector has 7 employees with a 2% job growth rate when the innovative index is 5. (2 pts)

c. What does the coefficient of Industry tell you about the model? (2 pts)

d. What is the proportion of variation in the Turnover Rate can be explained by these independent variables? (2 pts)

Find a 90% confidence interval for the regression coefficient of Job Growth rate. (2 pts)

f. Would you conclude that, overall, the model is significant? Clearly stat the hypotheses, the decision rule, the decision and your conclusion. (6 pts)

Q4: A real estate builder wishes to determine how house size (Y) is influenced by family income (X1) and family size (X2). House size is measured in hundreds of square feet and income is measured in thousands of dollars. The builder randomly selected 50 families and ran the multiple regression. Partial MINITAB output is provided below:

Regression Analysis: House size (Y) versus family income (X1), family size (X2)

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	37043.3236	18521.6618	60.08715	0.000
Residual Error	47	14487.7627	308.2503		
Total	49	51531.0863			

Given that $SSR_{(family\ income)}$ = 33745.5319 and $SSR_{(family\ size)}$ = 642.691

a. At 5% level of significant, determine whether family size makes a significant **contribution** on the regression model. (8 pts)

b. Compute the coefficients of partial determination, $\boldsymbol{r^2_{y,1,2}}$ and interpret its meaning. (4 pts)

Formula Sheet

- $\bar{x} = \frac{\sum x_i}{n} \quad \& \quad s^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n-1}$
- $Z_0 = \frac{(\bar{x}-\mu)\sqrt{n}}{\sigma} \quad or \quad Z_0 = \frac{(\bar{x}-\mu)\sqrt{n}}{s} \quad or \quad T_0 = \frac{(\bar{x}-\mu)\sqrt{n}}{s} \quad or \quad Z_0 = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$
- $Z_0 = \frac{(\bar{x}_1-\bar{x}_2)-\mu_0}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}} \quad or \; Z_0 = \frac{(\bar{x}_1-\bar{x}_2)-\mu_0}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$
- $T_0 = \frac{(\bar{x}_1-\bar{x}_2)-\mu_0}{s_p\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}} \quad where \; s_p^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$
- $T_0 = \frac{(\bar{x}_1-\bar{x}_2)-\mu_0}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}} \quad where \; df = \frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}}$
- $Z_0 = \frac{(\hat{p}_1-\hat{p}_2)-p_0}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1}+\frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}} \quad or \quad Z_0 = \frac{(\hat{p}_1-\hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$
- $\chi_0^2 = \frac{(n-1)s^2}{\sigma_0^2} \quad where \; df = n-1$
- $F_0 = \frac{s_i^2}{s_j^2} \; where \; df_1 = n_i - 1 \; \& \; df_2 = n_j - 1$