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

STAT 212 BUSINESS STATISTICS II
Semester 181, First Major Exam
Wednesday October 10, 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	15	
2	13	
3	10	
4	14	
5	14	
6	14	
Total	80	

Q1: (15 marks) From old records, it is believed that the average number of overtime hours for a company in Dammam is 20 hours per month. A random sample of 25 employees was selected from a normal distribution and the number of overtime hours for each was registered. The sample gave an average of 22.61 and a standard deviation of 5.226. Do the data support the old records? Use the 1% significance level.

a. State the test hypotheses:

H_0: vs. H_A:

b. Circle your test statistic and its sampling distribution. For t-distribution, specify its degrees of freedom.

z-statistic or t-statistic with _____ degrees of freedom

and its sampling distribution is_____

c. Why you choose this test statistic?

d. Compute the test statistic.

e. What is the decision rule and what is the critical value(s)?

f. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

g. What is your conclusion?

h. Express the rejection region of the above test in terms of the sample mean.

Q2: (13 marks) A hydraulic press is operating correctly when the standard deviation of the pressure is less than 120 pounds-per-square-inch (psi). Suppose you take a random sample of 15 measurements throughout the day of the psi and find the standard deviation to be 148. Suppose you want to test whether the press is operating correctly.

a. The estimate of the overall variance of the pressure for the hydraulic press is:

b. The test hypotheses are:

H_0: vs. H_A:

c. Circle your test statistic and its sampling distribution. Specify its degrees of freedom.

Ch-square-statistic with _____ degrees of freedom

Or F-statistic with _____ degrees of freedom

and its sampling distribution is_____

d. Why you choose this test statistic?

e. Compute the test statistic:

f. What is the decision rule and what is the critical value(s)?

g. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

h. What is your conclusion?

Q3: (10 marks) One of the major automobile makers has developed two new engines. The manager collect the following information's:

	Engine I	**Engine II**
Sample size	7	9
Sample mean	28.7	33.4
Sample standard deviation	3.4	4.12

At 2% significance level, do you think that the two engines have the same *variability* with respect to miles per gallon.

a. The test hypotheses are:

H_0: vs. H_A:

b. Circle your test statistic and its sampling distribution. Specify its degrees of freedom.

Ch-square-statistic with _____ degrees of freedom

Or F-statistic with _____ degrees of freedom

and its sampling distribution is_____

c. Compute the test statistic:

d. What is the decision rule and what is the critical value(s)?

e. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

f. What is your conclusion?

Q4: (14 marks) In the previous question (question 3), At 5% significant level, do you think that there is a difference between the mean miles per gallon.

a. State the test hypotheses:

H_0: vs. H_A:

b. Circle your test statistic and its sampling distribution. For t-distribution, specify its degrees of freedom.

z-statistic or t-statistic with _____ degrees of freedom

and its sampling distribution is_____

c. Why you choose this test statistic?

d. Compute the test statistic.

e. What is the decision rule and what is the critical value(s)?

f. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

g. What is your conclusion?

Q5: (14 marks) Shell Oil office workers were asked which work schedule is most appealing: working five 8-hour days or four 10-hour days. A sample of 105 office workers showed that 67 **do not prefer** the four 10-hour day schedule. Do the given data suggest that Shell workers have no preference for one schedule over the other? Use 1% significance level.

a. The sample proportion for the workers **preferring** four 10-hour days is:

b. State the test hypotheses:

H_0: vs. H_A:

c. Circle your test statistic and its sampling distribution. For t-distribution, specify its degrees of freedom.

z-statistic or t-statistic with _____ degrees of freedom

and its sampling distribution is_____

d. Why you choose this test statistic?

e. Compute the test statistic.

f. Compute the p-value of the test?

g. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

h. What is your conclusion?

Q6: (14 marks) It is believed that the percentage of health insurance firms and casualty insurance firms who did public relations in-house are different. To test that, a random sample of 86 health insurance firms, 61 did public relations in-house, as did 55 of an independent random sample of 86 casualty insurance firms. At 3% significant level, do you support the claim?

a. The pooled estimate for the overall proportion equal to:

b. State the test hypotheses:

H_0: vs. H_A:

c. Circle your test statistic and its sampling distribution. For t-distribution, specify its degrees of freedom.

z-statistic or t-statistic with _____ degrees of freedom

and its sampling distribution is_____

d. Why you choose this test statistic?

e. Compute the test statistic.

f. What is the decision rule and what is the critical value(s)?

g. What is your decision regarding H_0? Why?

Reject H_0 or don't reject H_0

Since _____

h. What is your conclusion?

Formula Sheet

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