

**KING FAHD UNIVERSITY OF PETROLEUM & MINERALS, DHAHRAN, SAUDI ARABIA**  
**DEPARTMENT OF MATHEMATICS & STATISTICS**

**STAT 214: Statistical Methods for Actuaries**  
 Semester 211, Major Exam II, Sunday October 31, 2021, 7:30 PM  
Allowed time 90 minutes

Name: \_\_\_\_\_ ID #: \_\_\_\_\_ S. #: \_\_\_\_\_

Please mark the correct answer to each of the questions by completely darkening the circle of your choice with a dark pen or pencil.

<b>MULTIPLE CHOICE:</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>MULTIPLE CHOICE:</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
Q.No.1: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.11: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.2: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.12: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.3: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.13: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.4: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.14: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.5: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.15: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.6: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.16: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.7: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.17: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.8: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.18: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.9: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.19: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q.No.10: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Q.No.20: -	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions:

1. Formula sheet is attached at the end of this exam. You are not allowed to bring with you, formula sheet or any other printed/written paper.
2. Mobiles are not allowed in exam. If you have your mobile with you, turn it off and keep it under your seat so that it is visible to proctor. Your mobile(s) should not be in your pocket during the exam.
3. The answers are rounded. If the exact answer is not there in any of the 5 choices, then pick the one that you think is closest to the correct answer.
4. Make sure you have 20 questions in the exam paper.

1. A population with a mean of 1,250 and a standard deviation of 400 is known to be highly skewed to the right. If a random sample of 64 items is selected from the population, what is the probability that the sample mean will be less than 1,325?
  - a. 0.8981
  - b. 0.8141
  - c. 0.7141
  - d. 0.9332
  - e. 0.6273
  
2. Suppose the life of a particular brand of calculator battery is approximately normally distributed with a mean of 75 hours and a standard deviation of 10 hours. What is the probability that 16 randomly sampled batteries from the population will have a sample mean life of between 70 and 80 hours?
  - a. 0.3491
  - b. 0.9544
  - c. 0.5121
  - d. 0.7124
  - e. 0.1512

3. According to the most recent Labor Department data, 10.5% of engineers (electrical, mechanical, civil, and industrial) were women. Suppose a random sample of 50 engineers is selected. How likely it is that the random sample of 50 engineers will contain 16% or more women in these positions?
- a. 0.1612
  - b. 0.0821
  - c. 0.1020
  - d. 0.2513
  - e. 0.0314
4. A popular restaurant takes a random sample  $n = 25$  customers and records how long each occupied a table. They found a sample mean of 1.2 hours and a sample standard deviation of 0.3 hour. Find the 95 percent confidence interval for the mean.
- a.  $1.2 \pm 0.118$
  - b.  $1.2 \pm 0.124$
  - c.  $1.2 \pm 0.219$
  - d.  $1.2 \pm 0.588$
  - e.  $1.2 \pm 0.609$

5. An educational organization in California is interested in estimating the mean number of minutes per day that children between the age of 6 and 18 spend watching television per day. A previous study showed that the population standard deviation was 21.5 minutes. The organization selected a random sample of  $n = 200$  children between the age of 6 and 18 and recorded the number of minutes of TV that each person watched on a particular day. The mean time was 191.3 minutes. If the leaders of the organization wish to develop an interval estimate with 96.6 percent confidence, what will the margin of error be?
- Approximately  $\pm 3.47$  minutes
  - Approximately  $\pm 1.52$  minutes
  - About  $\pm 1.96$  minutes
  - Approximately  $\pm 42.14$  minutes
  - About  $\pm 3.22$  minutes
6. A study was recently conducted to estimate the mean cholesterol for adult males over the age of 55 years. From a random sample of  $n = 10$  men, the sample mean was found to be 242.6 and the sample standard deviation was 73.33. To find the 95 percent confidence interval estimate for the mean, the correct critical value to use is:
- 1.96
  - 2.2281
  - 2.33
  - 2.2622
  - 2.575

7. In order to reduce the cost of a study, a marketing manager wants to reduce the sample size for a study of customer response to a recent advertising campaign. What can she do that would lead to a reduction in sample size?
- Allow a higher margin of error
  - Reduce the level of confidence
  - Somehow reduce the variation in the population
  - All of the above
  - None of the above
8. The administrator at Sacred Heart Hospital is interested in estimating the proportion of patients who are satisfied with the meals at the hospital. A random sample of 250 patients was selected and the patients were surveyed. Of these, 203 indicated that they were satisfied. Based on this, what is the estimate of the standard error of the sampling distribution?
- 0.5381
  - 0.8120
  - 0.0247
  - 0.0006
  - Can't be determined without knowing  $\sigma$
9. A random sample of 340 people in Chicago showed that 66 listened to WJKT-1450, a radio station in South Chicago Heights. Based on this information, what is the upper limit for the 99 percent confidence interval estimate for the proportion of people in Chicago that do not listen to WJKT-1450?
- 1.96
  - Approximately 0.2361
  - About 0.8611
  - About 0.2298
  - Approximately 0.4799

10. The chamber of commerce in a beach resort town wants to estimate the proportion of visitors who are repeat visitors. From previous experience they believe the portion is not larger than 20 percent. They want to estimate the proportion to within  $\pm 0.04$  percentage points with 95 percent confidence. The sample size they should use is:
- $n = 385$
  - $n = 601$
  - $n = 97$
  - $n = 10$
  - $n = 422$
11. If an economist wishes to determine whether there is evidence that average family income in a community near Seattle exceeds \$125,000. An appropriate alternative hypothesis is:
- $\mu = 125,000$ .
  - $\mu > 125,000$ .
  - $\mu \leq 125,000$ .
  - $\mu < 125,000$ .
  - $\mu \geq 125,000$ .
12. If the p value is less than  $\alpha$  in a two-tailed test:
- The null hypothesis should not be rejected.
  - An upper-tailed test should be used.
  - A lower-tailed test should be used.
  - More information is needed to reach a conclusion about the null hypothesis.
  - The null hypothesis should be rejected.
13. A hypothesis test is to be conducted using an alpha = .01 level. This means:
- there is a 1 percent chance that the null hypothesis is true.
  - there is a maximum 1 percent chance that a true null hypothesis will be rejected.
  - there is a 1 percent chance that the alternative hypothesis is true.
  - there is a 99 percent chance that a Type II error has been committed.
  - there is a maximum 1 percent chance that a false null hypothesis will be accepted.

14. A house cleaning service claims that it can clean a four bedroom house in less than 2 hours. A sample of  $n = 16$  houses is taken and the sample mean is found to be 1.97 hours and the sample standard deviation is found to be 0.1 hours. Using a 0.05 level of significance the correct conclusion is:

- a. do not reject the null because the test statistic (-1.7531) is  $>$  the critical value (-1.2).
- b. reject the null because the test statistic (-1.2) is  $<$  the critical value (1.7531).
- c. do not reject the null because the test statistic (1.2) is  $>$  the critical value (-1.7531).
- d. reject the null because the test statistic (-1.7531) is  $<$  the critical value (-1.2).
- e. do not reject the null because the test statistic (-1.2) is  $>$  the critical value (-1.7531).

15. Woof Chow Dog Food Company believes that it has a market share of 25 percent. It surveys  $n = 100$  dog owners and ask whether or not Woof Chow is their regular brand of dog food, and 23 people say yes. Based upon this information, what is the value of the test statistic?

- a. -0.462
- b. 0.359
- c. -0.475
- d. 0.462
- e. 0.475

16. For the following z-test statistic, compute the p-value assuming that the hypothesis test is a one tailed test:  $z = 2.09$ .

- a. 0.0266
- b. 0.0172
- c. 0.0183
- d. 0.0415
- e. 0.0611

17. There have been complaints recently from homeowners in the north end claiming that their homes have been assessed at values that are too high compare with other parts of town. They say that the mean increase from last year to this year has been higher in their part of town than elsewhere. To test this, the assessor's office staff plans to select a random sample of north end properties (group 1) and a random sample of properties from other areas within the city (group 2) and perform a hypothesis test. The following sample information is available:

North End (group 1): Sample Size = 20, Sample Mean Increase = \$4,010, Sample St. Deviation = \$1,800

Other (group 2): Sample Size = 10, Sample Mean Increase = \$3,845, Sample St. Deviations = \$1,750

Assuming that the null hypothesis will be tested using an alpha level equal to 0.05, what is the value of the test statistic?

- a.  $z = 1.578$
- b.  $t = 0.2388$
- c.  $t = 1.7011$
- d.  $t = 1.2863$
- e.  $t = 0.3944$



18. Assume that you are testing the difference in the means of two independent populations at the 0.05 level of significance. The null hypothesis is:  $H_0 : \mu_A - \mu_B \geq 0$  and you have found the test statistic is  $z = -1.92$ . What should you conclude?

- a. The mean of pop. B is greater than the mean of pop. A because  $p\text{-value} < \alpha$ .
- b. The mean of pop. A is greater than the mean of pop. B because  $p\text{-value} < \alpha$ .
- c. The mean of pop. A is greater than the mean of pop. B because  $p\text{-value} > \alpha$ .
- d. There is no significant difference in the two means because  $p\text{-value} > \alpha$ .
- e. The mean of pop. B is not greater than the mean of pop. A because  $p\text{-value} < \alpha$ .

19. Assume that 20 people participated in a weight loss program for 6 months. Each person's weight both before and after the program is determined and recorded. The following summarizes the results for the 20 people:

Mean weight lost = 9 pounds

Sample standard deviation of weight lost = 4.6 pounds

Assume that the hypothesis test will be conducted to determine whether or not the weight loss program is effective using a 0.05 level of significance. What is the value of the test statistic?

- a.  $t = 8.418$
- b.  $t = 1.96$
- c.  $z = 1.96$
- d.  $z = 6.19$
- e.  $t = 8.748$

20. A study was recently conducted at a major university to estimate the difference in the proportion of business school graduates who go on to graduate school within five years after graduation and the proportion of non-business school graduates who attend graduate school. A random sample of 400 business school graduates showed that 75 had gone to graduate school while in a random sample of 500 non-business graduates, 137 had gone on to graduate school. Based on a 95 percent confidence level, what is the upper limit of the confidence interval estimate?
- a. 0.2340
  - b. 0.1034
  - c. 0.3714
  - d. -0.031
  - e. -0.018

