King Fahd University of Petroleum and Minerals
Department of Mathematics

CODE00 **CODE00**

STAT 214
Major Exam II
Term 241
18-November-2024
Net Time Allowed: 90

Name: ______________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 14 questions.

Important Instructions:

1. All types of calculators may be used, provided that they cannot store text.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1 The distribution of salaries (in SAR per annum) in the building industry is represented by a random variable X with pdf

$$f(x) = \begin{cases} \frac{k}{x^4} & x \geq 10000, \\ 0 & \text{otherwise.} \end{cases}$$

Given that $E[X^2] = 3 \times 10^8$ and $k = 3 \times 10^{12}$, find the standard deviation (square root of the variance) of the employees' salaries.

(a) 8660

(b) 15000

(c) 6000

(d) 1007

(e) 8888

2 Toby's Trucking Company determined that the distance traveled per truck per year is normally distributed, with a mean of 50 thousand miles and a standard deviation of 12 thousand miles. How many miles will be traveled by at least 80% of the trucks?

(a) 39920 miles

(b) 399 miles

(c) 4088 miles

(d) 40880 miles

(e) 25088 miles

3 Which of the following is **not** a type of probability sampling method?

(a) Judgment Sampling
(b) Systematic Sampling
(c) Stratified Sampling
(d) Simple Random Sampling
(e) Cluster Sampling

4 Suppose that customers arrive at a bank's ATM at a rate of 30 per hour. If a customer has just arrived, what is the probability that the next customer will arrive within 6 minutes.

(a) 0.9502
(b) 0.6321
(c) 0.8647
(d) 0.9933
(e) 0.1010

5 In statistical inference, which of the following is the main focus when using sample statistics?

(a) Estimating population parameters
(b) Reaching conclusions about the sample
(c) Examining the individual characteristics of the sample
(d) Collecting all possible samples from the population
(e) Determining the exact value of a sample statistic

6 For a normal distribution with a population mean of 100 and a standard deviation of 10, and a sample size of 25, determine the value such that there is a 65% probability that the sample mean will be greater than this value.

(a) 99.22
(b) 98.83
(c) 97.54
(d) 100.1
(e) 95.25

7 You want to have 90% confidence of estimating the proportion of office workers who respond to e-mail within an hour to within ± 0.05. Because you have not previously undertaken such a study, there is no information available from past data. Determine the sample size needed

(a) 271
(b) 260
(c) 370
(d) 101
(e) 300

8 The data below contains the amount (SAR) that a sample of nine customers spent for lunch at a fast-food restaurant

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4.20, 5.03, 5.86, 6.45, 7.38, 7.54, 8.46, 8.47, 9.87
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Construct a 95% confidence interval estimate for the population mean amount spent for lunch (SAR) at a fast-food restaurant, assuming a normal distribution.

(a) (5.64, 8.42)
(b) (5.80, 8.75)
(c) (6.31, 8.42)
(d) (5.80, 7.87)
(e) (5.64, 7.87)

9 The telephone company has the business objective of wanting to estimate the proportion of households that would purchase an additional telephone line if it were made available at a substantially reduced installation cost. Data are collected from a random sample of 500 households. The results indicate that 135 of the households would purchase the additional telephone line at a reduced installation cost. Construct a 99% confidence interval estimate for the population proportion of households that would purchase the additional telephone line.

(a) (0.2188, 0.3212)
(b) (0.2310, 0.3090)
(c) (0.2373, 0.3027)
(d) (0.2413, 0.2987)
(e) (0.2268, 0.3132)

10 Given that a random sample of 64 light bulbs has a sample mean life of 350 hours, with a known population standard deviation of 100 hours, calculate the p-value for the hypothesis test to determine if the mean life of the light bulbs differs from 375 hours at 5% level of significance.

(a) 0.0456
(b) 0.0309
(c) 0.0237
(d) 0.0629
(e) 0.4560

11 If in a random sample of 400 items, 88 are defective. if the null hypothesis is that 20% of the items in the population are defective, i.e.

$$H_0 : \pi = 0.20 \quad \text{vs} \quad H_1 : \pi \neq 0.20 \tag{1}$$

and you choose the level of significance $\alpha = 0.05$. What is your statistical decision?

(a) Decision: Since $Z = 1.00$ is between the critical bounds of ± 1.96, do not reject H_o

(b) Decision: Since $Z = 1.00$ is not between the critical bounds of ± 1.96, do not reject H_o

(c) Decision: Since $Z = 1.00$ is between the critical bounds of ± 1.96, do reject H_o

(d) Decision: Since $Z = 1.00$ is not between the critical bounds of ± 1.96, do reject H_o

(e) Decision: Since $Z = 1.00$ is between the critical bounds of ± 1.96, do not reject H_1

12 A company that manufactures chocolate bars is concerned that the mean weight of a chocolate bar is not greater than 6.03 ounces. A sample of 50 chocolate bars is selected; the sample mean is 6.034 ounces, and the sample standard deviation is 0.02 ounces. Particularly, the company is interested to see if there is evidence that the population mean weight of the chocolate bars is greater than 6.03 ounces using $\alpha = 0.01$ level of significance. What is the correct formulation of the null and alternative hypotheses?

(a) $H_0 : \mu \leq 6.03, \quad H_1 : \mu > 6.03$

(b) $H_0 : \mu \geq 6.03, \quad H_1 : \mu > 6.03$

(c) $H_0 : \mu \geq 6.03, \quad H_1 : \mu < 6.03$

(d) $H_0 : \mu = 6.03, \quad H_1 : \mu \neq 6.03$

(e) $H_0 : \mu > 6.03, \quad H_1 : \mu \leq 6.03$

13 If, in a sample of $n = 16$ selected from a normal population, $\bar{X} = 56$ and $S = 12$, what is the correct degree of freedom and p-value if you are testing the null hypothesis $H_0 : \mu \geq 50$?

(a) df=15 and $0.950 \leq$ p-value ≤ 0.975
(b) df=16 and $0.025 \leq$ p-value ≤ 0.050
(c) df= 15 and $0.005 \leq$ p-value ≤ 0.010
(d) df=16 and $0.990 \leq$ p-value ≤ 0.995
(e) df =15 and $0.000 \leq$ p-value ≤ 0.500

14 Suppose the manager of a local bank branch determines that 40% of all depositors have multiple accounts at the bank. A random sample of 200 depositors is selected. Since $np = 200(0.40) = 80 \geq 5$ and $n(1-p) = 200(0.60) = 120 \geq 5$, the sample size is large enough to assume that the sampling distribution of the sample proportion is approximately normally distributed. To calculate the probability that the sample proportion of depositors with multiple accounts is less than 0.30, we first need to determine the corresponding Z-value. The Z-value is:

(a) -2.89
(b) 2.89
(c) -0.10
(d) 0.10
(e) 2.00