

King Fahd University of Petroleum and Minerals  
Department of Mathematics  
**Stat 319**  
**Major Exam II**  
**233**  
**July 28, 2024**  
**Net Time Allowed: 90 Minutes**

**USE THIS AS A TEMPLATE**

Write your questions, once you are satisfied upload this file.

1. The diameter of a particle of contamination (in micrometers) is modeled with the probability density function  $f(x) = \frac{2}{x^3}$ ,  $x > 1$ , then the third quartile is
  - (a) 2
  - (b) 1.5
  - (c) 2.5
  - (d) 3
  - (e) 3.5
  
2. The diameter of a particle of contamination (in micrometers) is modeled with the probability density function  $f(x) = \frac{2}{x^3}$ ,  $x > 1$ , then the expected value of the diameter of a particle of contamination (in micrometers).
  - (a) 2
  - (b) 1
  - (c) 2.5
  - (d) 1.5
  - (e) 0

3. Assume that in the detection of a digital signal the background noise follows a normal distribution with a mean of 0 volt and standard deviation of 0.45 volt. Determine symmetric bounds about the mean that include 98.86% of all noise readings.
- (a) Between  $-1.1385$  and  $1.1385$
  - (b) Between  $-0.882$  and  $0.882$
  - (c) Between  $-0.738$  and  $0.738$
  - (d) Between  $-2.58$  and  $2.58$
  - (e) Between  $-1.96$  and  $1.96$
4. The compressive strength of samples of cement can be modeled by a normal distribution with a mean of 6000 kilograms per square centimeter and a standard deviation of 100 kilograms per square centimeter. What is the probability that a sample's strength is less than  $6250 \text{ Kg/cm}^2$ .
- (a) 0.99379
  - (b) 0.00621
  - (c) 0.99180
  - (d) 0.00820
  - (e) 0.50000

5. The distance between major cracks in a highway follows an exponential distribution with a mean of 10 km. Given that there are no cracks in the first 10 km inspected, what is the probability that there are no major cracks in the next 30 km inspected?
- (a) 0.1353
  - (b) 0.2707
  - (c) 0.3679
  - (d) 0.7647
  - (e) 0.500
6. Suppose that  $x$  has a Weibull distribution with  $\beta = 2$  and  $\delta = 8.6$ , then the value of  $a$  such that  $P(X > a) = 0.9$  will be
- (a) 2.791
  - (b)  $-0.1054$
  - (c) 7.7925
  - (d) 13.0498
  - (e) 170.299

7. Suppose that  $X$  has a lognormal distribution with parameters  $\theta = 2$  and  $\omega^2 = 4$ . Then the conditional probability that  $X < 1500$  given that  $X > 1000$  equals to
- (a) 0.4524
  - (b) 0.0102
  - (c) 0.9846
  - (d) 0.9744
  - (e) 0.5000
8. An electronics company manufactures resistors that have a mean resistance of 100 ohms and a standard deviation of 10 ohms. The distribution of resistance is normal, for a sample of size 25 resistors, then
- (a) The sampling distribution of the sample mean is normal with mean 100 and standard error 2
  - (b) The sampling distribution of the sample mean is normal with mean 100 and standard error 10
  - (c) The sampling distribution of the sample mean is normal with mean 20 and standard error 2
  - (d) The sampling distribution of the sample mean is normal with mean 20 and standard error 10
  - (e) The sampling distribution of the sample mean is student- $t$  with mean 100 and standard error 2

9. The amount of time that a customer spends waiting at an airport check-in counter is a random variable with mean 8.2 minutes and standard deviation 2 minutes. Suppose that a random sample of size 49 customers is observed. Find the probability that the average time waiting in line for these customers is more than 540 seconds

- (a) 0.00256
- (b) 0.99744
- (c) 0.65542
- (d) 0.34458
- (e) 0.41629

10. For a normal population with known variance, what is the confidence level for the interval  $\bar{x} \pm 2.14 \frac{\sigma}{\sqrt{n}}$

- (a) 96.76%
- (b) 98.76%
- (c) 98.72%
- (d) 93.56%
- (e) 95%

11. The diameter of holes for a cable harness is known to have a normal distribution with standard deviation of 0.01 inch. A random sample of size 10 yields an average diameter of 1.5045 inch. A 99% confidence interval on the mean hole diameter is given by
- (a) Between 1.496 inch and 1.513 inch
  - (b) Between 1.498 inch and 1.511 inch
  - (c) Between 1.499 inch and 1.509 inch
  - (d) Between 1.494 inch and 1.514 inch
  - (e) Between 1.498 inch and 1.510 inch
12. An Izod impact test was performed on 20 specimens of PVC pipe. The sample mean is 1.25 and the sample standard deviation is 0.25. Assuming the population is normal, then the length of a 99% confidence interval on Izod impact strength is
- (a) 0.3199
  - (b) 0.193420
  - (c) 0.233669
  - (d) 0.283981
  - (e) 0.148699

13. The life in hours of a 75-watt light bulb is known to be normally distributed with variance 225 hours<sup>2</sup>. If we wanted the error in estimating the mean life from the confidence interval to be three hours at 95% confidence, what sample size should be used?
- (a) 97
  - (b) 10
  - (c) 9
  - (d) 68
  - (e) 4
14. The fraction of defective integrated circuits produced in a photolithography process is being studied. A random sample of 350 circuits is tested, revealing 336 non-defective circuits. A 95% confidence interval on the percentage of defective circuits produced by this particular tool is given by
- (a) Between 1.95% and 6.05%
  - (b) Between 2.28% and 5.72%
  - (c) Between 1.30% and 6.70%
  - (d) Between 1.80% and 6.20%
  - (e) Between 1.48% and 6.52%