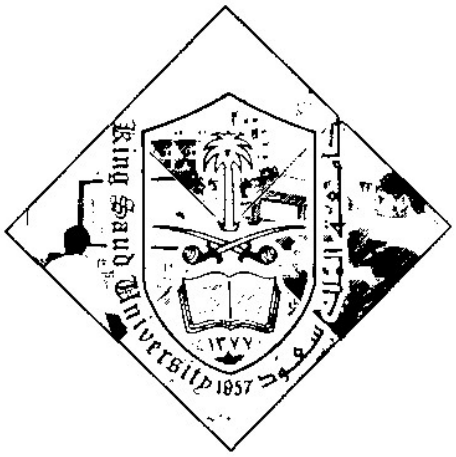
Department of Statistics and Operations Research

College of Science

King Saud University



First-term 1424/1425 Probability and Statistics for Engineering
Second Mid-term Exam Time: 2 hours Total 30 Marks

Student name: **Student number:**

Serial number ( )

Instructor: Dr. **Section Number:**

1		**8**		**15**		**22**	
2		**9**		**16**		**23**	
3		**10**		**17**		**24**	
4		**11**		**18**		**25**	
5		**12**		**19**		**26**	
6		**13**		**20**		**27**	
7		**14**		**21**		**28**	

Question 1

I. Given a standard normal distribution Z,

1) the area under the curve to the left of $z = 1.43$ is:
   (A) 0.0764 (B) 0.9236 (C) 0 (D) 0.8133
2) the area under the curve to the right of $z = -0.89$ is:
   (A) 0. 7815 (B) 0.8133 (C) 0.1867 (D) 0.0154
3) the area under the curve between $z = -2.16$ and $z = -0.65$ is:
   (A) 0.7576 (B) 0.8665 (C) 0.0154 (D) 0.2424
4) the value of *k* such that $P(0.93 < Z < k) = 0.0427$ is:
   (A) 0.8665 (B) -1.11 (C) 1.11 (D) 1.00

II. The finished inside diameter of a piston ring is normally distributed with a mean 12 centimeters and a standard deviation of 0.03 centimeter. Then,

5) the proportion of rings that will have inside diameter less than 12.05 centimeters is:
   (A) 0.0475 (B) 0.9525 (C) 0.7257 (D) 0.8413
6) the proportion of rings that will have inside diameter exceeding 11.97 centimeters is:
   (A) 0.0475 (B) 0.8413 (C) 0.1587 (D) 0.4514
7) the probability that a piston ring will have an inside diameter between 11.95 and 12.05 centimeters is:
   (A) 0.905 (B) -0.905 (C) 0.4514 (D) 0.7257

Question 2

8) The average life of a certain type of small motor is 10 years with a standard deviation of 2 years. Assume the live of the motor is normally distributed. The manufacturer replaces free all motors that fail while under guarantee. If he is willing to replace only 1.5% of the motors that fail, then he should give a guarantee of :
   (A) 10.03 years (B) 8 years (C) 5.66 years (D) 3 years

Question 3

Suppose the failure time (in hours) of a specific type of electrical insulation in an experiment in which the insulation was subjected to a continuously increasing voltage stress is distributed with a probability density function:

$$f(x) = \frac{1}{70} e^{-x/70}, \quad x > 0,$$

Then,

9) the probability that a randomly selected insulation will fail within the first 50 hours is:

(A) 0.4995 (B) 0.7001 (C) 0.5105 (D) 0.2999

10) the probability that a randomly selected insulation will last more than 150 hours is:

(A) 0.8827 (B) 0.2788 (C) 0.1173 (D) 0.8827

11) the average failure time of the electrical insulation is:

(A) 1/70 (B) 70 (C) 140 (D) 35

12) the variance of the failure time of the electrical insulation is:

(A) 4900 (B) 1/49000 (C) 70 (D) 1225

Question 4

The average life of a manufacturer's blender is 5 years, with a standard deviation of 1 year. Assuming the live of the battery follows approximately a normal distribution. So,

13) If a random sample of 5 batteries (to be selected from this production) has a mean of 3 years with a standard deviation of one year, then: the random variable $\overline{X}$ (the mean of all possible samples of size 5 batteries) has a mean $\mu_{\overline{x}}$ equal to:

(A) 0.2 (B) 5 (C) 3 (D) None of these

14) the variance $\sigma_{\overline{x}}^2$ of this random sample is equal to:

(A) 0.2 (B) 5 (C) 3 (D) None of these

15) the probability that the mean life of a random sample of size 16 of such batteries will be between 4.5 and 5.4 years is:

(A) 0.1039 (B) 0.2135 (C) 0.7865 (D) None of these

16) the probability that the mean life of a random sample of size 16 of such batteries will be less than 5.5 years is:

(A) 0.9772 (B) 0.0228 (C) 0.9223 (D) None of these

17) the probability that the mean life of a random sample of size 16 of such batteries will be not less than 4.75 years is:

(A) 0.8413 (B) 0.1587 (C) 0.9452 (D) None of these

18) If $P(\overline{X} > a) = 0.1492$ where $\overline{X}$ represents the sample mean for a random sample of size 9 to be selected from the production lot, then the numerical value of a is:

(A) 4.653 (B) 6.5 (C) 5.347 (D) None of these

Question 5

I. A machine is producing metal pieces that are cylindrical in shape. A sample is taken and the diameters are 1.70, 2.11, 2.20, 2.31 and 2.28 centimeters. Then,

19) The sample mean is:

(A) 2.22 (B) 2.32 (C) 2.90 (D) 2.20 (E) None of these

20) The sample variance is:

(A) 0.597 (B) 0.285 (C) 0.356 (D) 0.534 (E) None of these

II. The tensile strength of type I thread is approximately normally distributed with standard deviation of 6.8 kilograms. A sample of 20 pieces of the thread has an average tensile strength of 72.8 kilograms. Then,

21) To be 95% confident that the error of our estimate of the mean of tensile strength will be less than 3.4 kilograms, the minimum sample size should be:

(A) 4 (B) 16 (C) 20 (D) 18 (E) None of these

22) For 98% confidence interval for the mean of tensile strength we have the lower bound equal to:

(A) 68.45 (B) 69.26 (C) 71.44 (D) 69.68 (E) None of these

23) For 98% confidence interval for the mean of tensile strength we have the upper bound equal to:

(A) 74.16 (B) 77.15 (C) 75.92 (D) 76.34 (E) None of these

III. The tensile strength of type II thread is approximately normally distributed with standard deviation of 6.8 kilograms. A sample of 25 pieces of the thread has an average tensile strength of 64.4 kilograms. Then for the 98% confidence interval of the difference in tensile strength means between type I and type II , we have:

24) the lower bound equal to:

(A) 2.90 (B) 4.21 (C) 3.65 (D) 6.58 (E) None of these

25) the upper bound equal to:

(A) 13.90 (B) 13.15 (C) 12.59 (D) 10.22 (E) None of these

Question 6

I. In a study involved 1200 car drivers it was found that 50 car drivers do not use seat belt. Then,

26) A point estimate for the proportion of car drivers that do not use seat built is:

(A) 50 (B) 0.0417 (C) 0.9583 (D) 1150 (E) None of these

II. Using part (I), the 95% confidence interval of the proportion of car drivers that do not use seat built has

27) the lower bound equal to:

(A) 0.0322 (B) 0.0416 (C) 0 .0304 (D) –0.3500 (E) None of these

28) the upper bound equal to:

(A) 0.0417 (B) 0.0530 (C) 0.0512 (D) 0.4333 (E) None of these