Department of Statistics & Operations Research
College of Science
King Saud University
STAT-324: Probability and Statistics for Engineers
First Mid-Term Exam
Summer Semester 1436 – 1437

Student's Name (In Arabic):		Section's Number:	
Student's Number:		Attendance number:	
Teacher's Name:			

Instructions:

- There are 25 multiple choice questions.
- Time allowed is 90 minutes (1.5 Hour).
- For each question, put the code of the correct answer in the following table beneath the question number.
- Please, use capital letters: A, B, C, and D.
- Do not copy answers from your neighbors; they have different question forms.
- Mobile Telephones are not allowed in the classroom.

1	2	3	4	5	6	7	8	9	10
C	**A**	**B**	**D**	**D**	**B**	**C**	**C**	**A**	**A**

11	12	13	14	15	16	17	18	19	20
A	**B**	**C**	**D**	**C**	**A**	**B**	**D**	**B**	**A**

21	22	23	24	25
B	**D**	**C**	**C**	**D**

Question (1-3):

(1) For any sample: $x_1, x_2, \ldots, x_n$, which one of the following statements is always correct:

(A) $(\sum x_i)^2 = \sum x_i^2$ (B) $S^2 = n(\bar{x})^2$ **(C)** $\boldsymbol{\sum(x_i - \bar{x})=0}$ (D) $\sum(x_i - \bar{x})^2=0$

(2) If $n = 10$ and $\bar{x} = 40$ and $\sum x_i^2 = 23344$, then the sample standard deviation (S) equals:

(A) 28.57 (B) 5.89 (C) 12.4 (D) 0.075

(3) The number of ways to distribute 8 students into two groups so that 3 students will be in the first group and the other 5 students will be in the second group equals:

(A) 449 **(B) 56** (C) 122 (D) 501

Question (4-5)

Suppose that two balls are randomly and independently selected in succession with replacement from a box containing 4 similar balls numbered 5, 10, 15, and 20.

(Note: with replacement = the first ball is returned back to the box before selecting the second ball.)

(4) The probability that the sum of the two numbers is equal to 25 is:

(A) 0.16 (B) 0.32 (C) 0.50 **(D) 0.25**

(5) The probability that the sum of the two numbers is at least 25 is:

(A) 0.095 (B) 0.976 (C) 0.375 **(D) 0.625**

Question (6-9)

Two machines (A and B) are operated independently in the same time. The first machine (A) fails with probability 0.03, while the second machine (B) fails with probability 0.08.

(6) The probability that both machines will fail equals:

(A) 0.0110 **(B) 0.0024** (C) 0.2031 (D) 0.0730

(7) The probability that at least one machine will fail equals:

(A) 0.3284 (B) 0.0620 **(C) 0.1076** (D) 0.0779

(8) The probability that only the first machine will fail equals:

(A) 0.6 (B) 0.9 **(C) 0.0276** (D) 0.05

(9) If it is known that the first machine has failed, then the probability that the second machine will fail equals:

(A) 0.0800 (B) 0.1105 (C) 0.0002 (D) 0.5248

Question (10- 14)

Suppose that we have two events (A) and (B) with: $P(A) = 0.6$, $P(B) = 0.4$, and $P(A|B) = 0.25$.

(10) The probability $P(A \cap B)$ equals:

(A) 0.10 (B) 0.34 (C) 0.25 (D) 0.20

(11) The probability $P(A \cup B)$ equals:

(A) 0.90 (B) 1.00 (C) 0.20 (D) 0.5

(12) The probability $P(A^C \cap B^C)$ equals:

(A) 0.05 **(B) 0.10** (C) 0.15 (D) 0.75

(13) The events A and B are:

(A) mutually exclusive (B) disjoint **(C) not disjoint** (D) sure events

(14) The events A and B are:

(A) complement (B) impossible events (C) independent **(D) not independent**

Question (15- 16)

Suppose that the random variable X has the following probability distribution:

x	1	2	3	4	5
f(x)	0.4	0.3	K	K	K

(15) The value of K equals:

(A) 0.01 (B) 0.05 **(C) 0.1** (D) 0.2

(16) If $F(x)$ is the cumulative distribution function (CDF) of X, then $F(2.9)$ equals:

(A) 0.7 (B) 0.4 (C) 0.1 (D) 0.3

Question (17- 18)

Suppose that the random variable X has the following probability distribution:

x	1	2	3
f(x)	0.6	0.3	0.1

(17) The mean or the expected value of X ($\mu_X = E(X)$), equals:

(A) 2.0 **(B) 1.5** (C) 1.1 (D) 2.8

(18) The variance of X ($\sigma_X^2 = Var(X)$), equals:

(A) 0.95 (B) 0.55 (C) 1.75 **(D) 0.45**

Question (19- 20)

Suppose that the random variable X has the following probability density function:

$$f(x) = \begin{cases} \frac{1}{12}(x+5) \ ; \ 0 < x < 2 \\ 0 \ ; \ elsewhere \end{cases}$$

(19) The probability $P(X > 1)$ equals:

(A) 0.1222 **(B) 0.5417** (C) 0.7604 (D) 0.0397

(20) The mean or the expected value of X ($\mu_X = E(X)$), equals:

(A) 1.056 (B) 1.917 (C) 0.0636 (D) 1.500

Question (21-23)

Suppose that the random variable X has a mean $\mu_X = E(X)$=15 and a variance $\sigma_X^2 = Var(X) = 4$.

(21) Using Chebyshev's inequality, the probability $P(7 < X < 23)$ is greater than or equal to:

(A) 0.9600 **(B) 0.9375** (C) 0.8889 (D) 0.7500

(22) $E\left(\frac{X-5}{2}\right)$, the expected value or mean of $\frac{X-5}{2}$, equals:

(A) 10.0 (B) 2.5 (C) 7.5 **(D) 5.0**

(23) $Var\left(\frac{X-5}{2}\right)$, the variance of $\frac{X-5}{2}$, equals:

(A) 4.0 (B) 2.0 **(C) 1.0** (D) –0.5

Question (24-25)

A factory produces four types of bulbs (*A*, *B*, *C*, and *D*) with percentages 10%, 40% , 20%, and 30% of the total production, respectively. It is known that the percentages of defectives for each type are 12%, 4%, 8%, and 6%, respectively. Suppose that one bulb of the products of this factory has been selected at random.

(24) The probability that the bulb is defective equals:

(A) 0.322 (B) 0.250 **(C) 0.062** (D) 0.079

(25) If it is known that the selected bulb was found to be defective, then the probability that it is of type (*A*) equals:

(A) 0.1000 (B) 0.1200 (C) 0.0120 **(D) 0.1935**