**Department of Statistics and Operations Research**
College of Science
King Saud University
STAT 106
Second Mid-term Examination
Semester  2, 1426/27 H

Name of Student: _____     Student's  Number: _____

Teacher's name: Dr.  _____       Section number:_____

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|----|
|   |   |   |   |   |   |   |   |   |    |

| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|----|----|----|----|----|----|----|----|----|----|
|    |    |    |    |    |    |    |    |    |    |

➤➤ Mobile Telephones are not allowed in the classrooms
➤➤ Time allowed is 2 hours
➤➤ Attempt all questions
➤➤ Choose the nearest number to your answer
➤➤ For each question, put the code of the correct answer in the above table under the question number.

1

**Let A and B be events defined on the same sample space of an experiment such that P(A) = 0.65,   P(B) = 0.4,      and      P(A∩B) = 0.26.  Use the information to answer Questions 1 – 3.

(1)     P(A│B) =

(A)  0.45          (B)   0.4          (C)   0.65                    (D)   0.55

(2)     The events A and B are:

(A) equal   (B)  independent       (C)  not independent        ( D)  mutually exclusive

(3)       $P(A \cup B) =$

(A)  0.79          (B) 0. 69          (C)  0.85                    (D) 0.95

** Let A and B be independent events defined on the same sample space such that P(A) =0.3, P (B) =0.6. Use this information to answer Questions 4 and 5.

4.   $P(A \cap \bar{B}) =$
(A) 0.12                (B) 0.5                        (C) .3            (D) 0.18

5.   $P(A \cup \bar{B}) =$
(A) 0.5                (B) .3                        (C) 0.58          (D) .75

** The random variable X  has  the following mass function. Use the information to answer Questions 6 - 10

| $x$ | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|
| $P(X = x)$ | $\dfrac{1}{12}$ | $\dfrac{1}{12}$ | $\dfrac{1}{4}$ | $\dfrac{1}{4}$ | $\dfrac{1}{6}$ | $\dfrac{1}{6}$ |

6. The expected value of X is:

(A) 5.5          (B) 6.8333                    (C) 1          (D) 8.6333

7. P (X > 3) =

(A) 1.0    (B) 0.25    (C) 0.337777    (D) 0.0

8. P (4 < X < 7) =

(A) 0.667    (B) 0.25    (C) 1.00    (D) 0.3333

9. P ( X = 6.5) =

(A) 0.5    (B) 1.0    (C) 0    (D) 0.25

10. P ( X < 5.5 ) =

(A) $\dfrac{1}{6}$    (B) $\dfrac{1}{4}$    (C) $\dfrac{1}{12}$    (D) 0.44

**In a large city, 15% of the people have high depression. A random sample of 3 persons is drawn from the city. Let X denote the number of people, out of the 3, who have high depression. Use the information to answer Questions 11 – 14.

11. P(X=0)

(A) 0.000001    (B) 0.614125    (C) 1    (D) 0

12. P(X=2)

(A) 0.057375    (B) 0.97    (C) 0.455    (D) 0.7898

13. P(X >1)

(A) 0.729401    (B) 0.97    (C) 0.06075    (D) 0.7001

3

14. If 50 people are selected at random from the city, how many of them are expected to have high depression?

   (A) <u>7.5</u>      (B) 9      (C) 40      (D) 0

**In a certain population, an average of 3 new cases of AIDS are diagnosed each year. If the number of new diagnosed cases of this disease in the population follows the Poisson distribution, use the information to answer Questions 15 – 18.

15. The probability that no new case of AIDS is diagnosed in a year is.
   (A)      0.29401  (B)      0.097  (C)   <u>0.049787</u>  (D)      0.27031

16. The probability that less than two new cases of AIDS are diagnosed in a year is.
   (A)      0.39401  (B)   <u>0.199148</u>  (C)      0.7898  (D)      0.67031

17. The probability that three new cases of AIDS are diagnosed in 6 months is.
   (A)      0.39456  (B)      0.199148  (C)      0.7345  (D)      <u>0.125511</u>

18. The expected number of new cases of AIDS in the population in 2 years is.
   (A) <u>6</u>      (B) 3      (C) 1.5      (D) 2

19. Find  $(0!) \times (3!)$

   (A) 0      (B) <u>6</u>      (C) 3      (D) 4

** Let X be a continuous random variable with $P(X < 1.4) = 0.2$, $P(X > 3.8) = 0.1$, and $P(2.5 < X < 3.8) = 0.6$. Use the information to answer Questions 20 – 22.

20. $P(X > 1.4) =$

(A)  0.7        (B)  0.9        (C) 0.8        (D)  0.5

21.  P ( X < 2.5 )  =

  (A)  0.2        (B) 0.3        (C)  0.7        (D) 0.45

22. P ( 1.4 < X < 3.8 ) =

  (A) 0.7        (B) 0.5        (C)  0.9        (D) 0.75


** Let Z have the standard normal distribution. Use this information to answer Questions 23 – 26.

23.  P ( Z = 0 ) =

  (A) 0        (B) 0.5        (C)  0.8        (D) 1.0


24. P ( - 1.51 < Z < 3.45) =

  (A) 0.9997        (B) 0.9342        (C) 0.0655        (D) 0.9242


25.  P ( Z < -2.55 )  =

  (A) 0.0054        (B) 0.54        (C)  0.954        (D) 0. 543


26.  The value of $a$ such that $P(0.93 < Z < a) = 0.0427$ is

  (A)  0.8665        (B) 2.06        (C) 1.00        (D) 1.11


** The ages X (years) of students who attend a certain school are normally distributed with mean 12 years and standard deviation 4 years. Use this information to answer Questions  27 – 30.


27. P ( 8 < X < 14 ) =

  (A) 0.823        (B) 0.6915        (C) 0.734        (D) 0.5328

28. P (X < 10 ) =

    (A) <u>0.3085</u>      (B) 0.4085      (C) 0.5689      (D) 0.9984


29. P (X > 9 ) =

    (A) 0.7743      (B) 0.8864      (C) <u>0.7734</u>      (D) 0.2266

30. P ( X = 12) =

    (A) 0.5      (B) <u>0</u>      (C) 1.0      (D) 0.7