Math 310 Practice Exam 2 Sheet (Spring 2021)

Material included : Section 3.4 and Chapters 4, 5 and 6

Question 1:

Let X and Y be two discrete random variables with a joint probability distribution given by

	X = 2	X = 4
Y = 1	k	0.15
Y = 3	0.15	0.2
Y = 5	0.35	0.1

The value of k is:

(a) k = 0.1
(b) k = 0.05
(c) k = 0.3
(d)None of the above.

Question 2:

Let X and Y be 2 random variables with joint probability distribution given in the following table:

$f(x,y)$		X	
		0	1
Y	3	0.3	0.2
	4	0.1	0.4

Then f(Y = 3|X = 0) is equal to:

a. 0
b. 0.5
c. 0.75
d. 1

Question 3:

Let X and Y denote the lengths of life, in hours, of two viruses. Suppose that X and Y are random variables with the joint density function:

$$f(x,y) = \begin{cases} ke^{\frac{-x}{2}}e^{\frac{-y}{2}} & \text{if } x > 0 \text{ and } y > 0; \\ 0 & \text{otherwise.} \end{cases}$$

Then

a. $k = \frac{1}{4}$
b. $k = \frac{1}{2}$
c. $k = 1$
d. $k = 2$

Question 4:

Given the joint density function:

$$f(x,y) = \begin{cases} \frac{6-x-y}{8} & if\ 0 < x < 2\ and\ 2 < y < 4; \\ 0 & otherwise. \end{cases}$$

The marginal distribution h(y) is:

a. $h(y) = \begin{cases} \frac{6-y}{8} & if\ \ 2 < y < 4; \\ 0 & otherwise. \end{cases}$
b. $h(y) = \begin{cases} \frac{5-y}{4} & if\ \ 2 < y < 4; \\ 0 & otherwise. \end{cases}$
c. $h(y) = \begin{cases} \frac{5+y}{4} & if\ \ 2 < y < 4; \\ 0 & otherwise. \end{cases}$
d. $h(y) = \begin{cases} \frac{5-y}{4} & if\ \ 2 < y < 4; \\ 1 & otherwise. \end{cases}$

Question 5:

Let X and Y be two independent random variables such that E[X]=3, E(Y)=4, V(X)=10 and V(Y)=20. Then $E\left[(X-Y)^2\right]$ is equal to:

a. 55
b. 31
c. 20
d. 15

Question 6:

Let X and Y be two random variables such that: $Y = 75 - 3X - X^2, E(X^2) = 12$ and $E(Y) = 54$. Then $V(X) =$

a. 6
b. 12
c. 3
d. 9

Question 7:

Let X be a random variable such that $E(X-2)^2 = 10$ and $E(X+1)^2 = 4$, then

a. $E(X) = -\frac{1}{2}$
b. $E(X) = \frac{1}{2}$
c. $E(X) = \frac{1}{4}$
d. $E(X) = -\frac{1}{4}$

Question 8:

Let X and Y be a random variables such that $E(X) = 2$, $E(Y) = 5$, $V(X) = 9$, $V(Y) = 8$ and $Cov(X, Y) = 3$. Then $E(3X^2 - 2Y^2 + XY) =$

a. 15
b. 0
c. -14
d. None of the above

Question 9:

80% of people those who purchase pet insurance are women. If the owners of 10 pet insurance are randomly selected, then the probability that more than 3 are women:

(a) 0.9991
(b) 0.9999
(c) 0.0009
(d) None of the above

Question 10:

The probability that a patient recovers from Covid'19 is 0.9. A group of 7 people that are known to have contracted this virus are selected randomly. Let X be the number of people who recovered from Covid'19. The probability that at least 6 recovered is:

a. 0.1497

b. 0.5217

c. 0.8503

d. 0.9

Question 11:

Let X be a random variable representing the number of Vitamin C packs, that a pharmacist sells per hour. It is known that the pharmacist sells on the average 5 Vitamin C packs per hour. The probability that more than 6 Vitamin C packs are selling in an hour is:

a. 0.6160

b. 0.7622

c. 0.2378

d. 0.384

Question 12:

On average, a certain intersection results an average of 3 traffic accidents **per day**.

What is the probability that at this intersection exactly 5 accidents will occur in a period of **two days?**

a. 0.1606
b. 0.4457
c. 0.2851
d. 0.6063

Question 13:

The length of human pregnancies from conception to birth approximates a normal distribution with a mean of 266 days and a standard deviation of 16 days. What proportion of all pregnancies will last between 242 and 270 days?

a. 0.5319
b. 0.5332
c. 0.6235
d. None of the above

Question 14:

A bottling company uses a filling machine to fill plastic bottles with an orange juice. In fact, the contents of bottles vary according to a normal distribution with mean $\mu = 298$ *ml* and standard deviation $\sigma = 3$ *ml*. The probability of bottles that contain less than 301.12 *ml* is equal to:

(a) 0.0158.
(b) 0.1492.
(c) 0.8508
(d) None of the above.

Question 15:

Suppose that the height of LIU female students has normal distribution with mean 62 inches and standard deviation 8 inches. The height below which is the shortest 30.15% of the female students is:

a. 66.16 inches
b. 30.15 inches
c. 72.65 inches
d. 57.84 inches