Assignment-II

Probability and Statistics

Copying answers and steps are strictly forbidden. Evidence of copying results in zero for copied and copier. Working together is encouraged, share ideas not calculations. Explain your steps. The calculations and answers should be written neatly on paper which is attached as a single pdf. Box your answers where appropriate. Thanks!

Q1.   A biased coin has a probability of head on one toss equal to 0.7. If the coin tossed 13 times in succession, determine:

    a. The probability of obtaining exactly 5 heads.
    b. The probability of obtaining no more than seven heads.
    c. The mean and standard deviation of the distribution.

Q2.   On average, 6 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection?

    a.   exactly 6 accidents will occur?
    b.   fewer than 5 accidents will occur?
    c.   at least 4 accidents will occur

Q3. A shipment of 9 similar microcomputers to a retail outlet contains 3 that are defective. If a college makes a random purchase of 2 of these computers,

    Consider X= # of defective in the sample,:
    a. Determine the different values of random variable X
    b. Find the probability distribution of x ; f(x)

    c. Find , $P(1 \leq x \leq 2), P(x \leq 1), P(0 < x \leq 2), f\ (2), f\ (5)$

Q4.   For the given data

x	0	1	2
$f(x)$	$10/28$	$15/28$	$3/28$

    Find :a) $Var(x)$ b) $F\ (1)$ c) $P(1 \leq x \leq 2)$

Q5(a)   The probability that a certain medication will cause a bad reaction in young children is

0.16. Find the probability that out of 15 children that receive the medication, at most 1

will have a bad reaction

  (b)   A team of 3 is to be chosen from 3 boys and 4 girls. If X is the random variable "the number of girls in the team", find its probability distribution, Mean and variance.

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Q6 Suppose that the error in the reaction temperature in ^0C for a controlled laboratory experiment is a continuous random variable X having the probability density function:

$$f(x) = \begin{cases} \dfrac{x^2}{9} & , -1 < x < 2 \\ 0 & , \ otherwise \end{cases}$$

a) Show that $\int_{-\infty}^{\infty} f(x)\,dx = 1$

b) Find $P(0 < X \leq 1)$

c) Find $P(0 < x < 3), P(x = 2), F(x), F(0.5)$

Q7. Find Coefficient of correlation between x and y if the Joint probability functions of random variables of x and y are defined as

$$a)\ \ f(x, y) = \begin{cases} \dfrac{2}{7}(x + 2y), 0 < x < 1, 0 < y < 2 \\ \\ 0, \qquad\qquad\qquad otherwise \end{cases}$$

(b)

x	y 0	1	2
0	0.12	0.04	0.04
1	0.08	0.19	0.05
2	0.06	0.12	0.30

Q8 A pharmaceutical lab states that a drug causes negative side effects in 8 of every 200 Patients. To confirm this affirmation, another laboratory chooses 8 people at random who have consumed the drug. What is the probability of the following events?

a. None of the four patients experience side effects.

b. At least three experience side effects.

c. What is the average number of patients that laboratory should expect to experience side effects if they choose 100 patients at random?

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Q9a) Consider a computer system with Poisson job-arrival stream at an average of 5 per minute. Determine the probability that in any one-minute interval there will be

    i. 0 jobs;
    ii. exactly 4 jobs;
    iii. at most 6 arrivals.

  b) It is known from the past experience that in a certain plant there are on the average of 5 industrial accidents per month. Find the probability that in a given year will be less than3accidents.

Q10.a) The heights of 1000 students are normally distributed with a mean of 174.5centimeters and standard deviation of 6.9 centimeters. Assuming that the heights are recorded to nearest half centimeter. How many of these students would you expect to have heights?

    a) Less than 160 centimeters
    b) Between 171.5 and 182.0 centimeters inclusive
    c) Equal to 175.0 centimeters
    d) Greater than or equal to 188 centimeters

  b) The monthly income of 5000 workers at the Microsoft plant are distributed normally. Suppose the mean monthly income is $1250 and the standard deviation is $250.

    a) What percentages of workers earn more than $1500 per month?
    b) What percentages of workers earn less than $750 per month?
    c) What percentage of the workers earn between $750 and $1500 per month?

Due Date : 12th May , 2022