CmpE 343: Introduction to Probability and Statistics for Computer Engineers (Fall 2020)

Homework #1

Due November 24, 2020 by 11:59pm on Moodle

Important note: Please type your answers and submit your homework as PDF. We do not accept hand-written answers. The deadline is strict. To get full points, please show your steps clearly.

Question 1(30)

We throw a normal dice K times. D_i denotes the event for $K = i$ and $P(D_i) = 2^{-i}$ where $i \geq 1$. The sum of scores we obtained is denoted with S. Find the probability that:

(a) $K = 2$ given that $S = 3$. (5 points)

(b) $S = 5$ given that K is even. (5 points)

(c) $K = 2$ given that $S = 5$ and first dice showed 2. (5 points)

(d) the largest number we obtained by a single throw is r where S is unknown. (15 points)

Question 2 (20)

There are 8 gift boxes in a room but 2 of them are empty. I will select 3 boxes and x is the number of empty boxes that I get.

1. Find the cumulative distribution function of the random variable X express it as a histogram. (10 points)

2. Then using F(x), find

(a) $P(X = 1)$ (5 points)

(b) $P(0 < X \leq 2)$ (5 points)

Question 3 (25)

$$f(x) = \begin{cases} c\,x^{-5} \text{ , } 1 < x \\ 0 \text{ , } elsewhere \end{cases}$$

(a) What is the value of c that makes $f(x)$ is a valid density function? (10 points)

(b) Evaluate $F(x)$ (10 points)

(c) Find $P(X > 2)$ (5 points)

Question 4 (25)

$$f(x,y) = \begin{cases} x - y \text{ , } 1 < x < 2, 0 < y < 1 \\ 0 \text{ , } elsewhere \end{cases}$$

(a) Find the marginal density functions of X and Y (10 points)

(b) Are X and Y independent? (5 points)

(c) Find $P(X > 1.5|Y = 0.5)$ (10 points)