Assignment6

CS20Btech11035 -NYALAPOGULA MANASWINI

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GATE 2019 ME SET-2 QUESTION 28

The variable x takes a value between 0 and 10 with uniform probability distribution. The variable y takes a value between 0 and 20 with uniform probability distribution.The probability that sum of variables $(x + y)$ being greater than 20 is

SOLUTION

Given variable x takes a value between 0 and 10,Variable y takes a value between 0 and 20 using uniform probability distribution. We know that probability distribution function of a variable $x \in [a, b]$ is given as follows

$$f_X(x) = \begin{cases} \frac{1}{b-a} & a \le x \le b \\ 0 & otherwise \end{cases} \tag{0.0.1}$$

$$f_X(x) = \begin{cases} \frac{1}{10} & 0 \le x \le 10 \\ 0 & otherwise \end{cases} \tag{0.0.2}$$

$$f_Y(y) = \begin{cases} \frac{1}{20} & 0 \le y \le 20 \\ 0 & otherwise \end{cases} \tag{0.0.3}$$

$$\Pr(x + y \le 20) = \int_{x=0}^{10} \int_{y=0}^{20-x} f_X f_y \mathrm{dydx} \tag{0.0.4}$$

$$= \frac{1}{200} \int_{x=0}^{10} \int_{y=0}^{20-x} \mathrm{dydx} \tag{0.0.5}$$

Solving (0.0.4)

$$\Pr(x + y \le 20) = \frac{3}{4} \tag{0.0.6}$$

We need to find $\Pr(x + y > 20)$

$$\Pr(x + y > 20) = 1 - \Pr(x + y \le 20) \tag{0.0.7}$$

$$= \frac{1}{4} \tag{0.0.8}$$

$$\therefore \Pr(x + y > 20) = \frac{1}{4} = 0.25 \tag{0.0.9}$$

actual probability:0.25
simulated probability: 0.2499731