

AI1103 : Assignment 3

Shashank Anirudh - CS20BTECH11040

Download all python codes from

[https://github.com/shashank-anirudh-rachapalle/
Probability-and-random-variables/blob/main/
Assignment3/codes/Assignment3.py](https://github.com/shashank-anirudh-rachapalle/Probability-and-random-variables/blob/main/Assignment3/codes/Assignment3.py)

and latex-tikz codes from

[https://github.com/shashank-anirudh-rachapalle/
Probability-and-random-variables/blob/main/
Assignment3/Assignment3.tex](https://github.com/shashank-anirudh-rachapalle/Probability-and-random-variables/blob/main/Assignment3/Assignment3.tex)

PROBLEM GATE 2019 (ME), Q. 40:

The probability that a part manufactured by a company will be defective is 0.05. If 15 such parts are selected randomly and inspected, the probability that at least two parts will be defective is

SOLUTION:

Let $X=0,1,2,3,\dots,15$ be the random variable, where X represents the number of defective parts. The distribution is binomial.

$$p = 0.05 \quad (1)$$

$$q = 1 - p = 0.95 \quad (2)$$

Probability that at least two parts will be defective is $\Pr(X > 1)$.

$$\begin{aligned} \Pr(X > 1) &= 1 - \Pr(X = 0) - \Pr(X = 1) \\ &= 1 - {}^{15}C_0 p^0 q^{15} - {}^{15}C_1 p^1 q^{14} \end{aligned}$$

From (1) and (2)

$$\begin{aligned} &= 1 - {}^{15}C_0 \times (0.05)^0 \times (0.95)^{15} - {}^{15}C_1 \times (0.05)^1 \times (0.95)^{14} \\ &= 1 - 0.8291 \end{aligned}$$

$$\Pr(X > 1) = 0.1709$$