AI1103-Assignment 1

Name : Aayush Patel, Roll No.: CS20BTECH11001

Python codes :

https://github.com/Aayush−2492/Assignments/blob/main/Assignment%201/codes/Assignment1.py

Latex codes :

https://github.com/Aayush−2492/Assignments

Question 1.6

In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs, none is defective is?

Solution

Let p be the probability of finding a defective bulb.

$$p = \frac{10}{100} = \frac{1}{10} \tag{0.0.1}$$

Let q be the probability of not finding a defective bulb.
By Complement Law,

$$q = 1 - p = 1 - \frac{1}{10} = \frac{9}{10} \tag{0.0.2}$$

Let X be the random variable function for number of defective bulbs out of a sample of 5 bulbs and k be the number of defective bulbs out of a sample of five bulbs

By Binomial Distribution,

$$P(X = k) = \binom{5}{k} p^k q^{5-k} \tag{0.0.3}$$

where $P(X = k)$ is the probability of finding k defective bulbs out of a sample of 5 bulbs.

Probability of finding zero defective bulbs
$= P(X = 0)$

$= \binom{5}{0} p^0 q^5$

Substituting values of p and q from equation 0.0.1 and 0.0.2, we get,

$$P(X = 0) = \left(\frac{9}{10}\right)^5 \tag{0.0.4}$$

Therefore, required probability is

$$= \left(\frac{9}{10}\right)^5$$