AI1110 Assignment-1

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***Abstract*—This document provides the solution to question 14 in Chapter 13 of the 12th grade NCERT textbook, Exercise 13.5.**

Question :

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

(A) 10^{-1}

(B) $\left(\frac{1}{2}\right)^5$

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

(D) $\frac{9}{10}$

Solution :

Let X be a random variable that represents the number of defective bulbs.

This experiment of picking bulbs follows the binomial distribution.

So,

$$\Pr(X = k) = \binom{n}{k} p^k (1-p)^{n-k} \tag{1}$$

where,

n = sample size = 5

k = number of defective bulbs in the sample = 0

$$\mathbf{p} = \frac{\text{No.of defective bulbs}}{\text{Total no.of bulbs}} = \frac{10}{100} = \frac{1}{10}$$

We need to find the probability that no bulb is defective i.e $\Pr(X = 0)$.

$$\begin{aligned} P(X=0) &= \binom{5}{0}\left(\frac{1}{10}\right)^0\left(1-\frac{1}{10}\right)^{5-0} \\ &= 1 \times 1 \times \left(\frac{9}{10}\right)^5 \\ &= \left(\frac{9}{10}\right)^5 \end{aligned}$$

Therefore, **(C)** is the correct answer.