

# 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,

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

where,

$n$  = sample size = 5

$k$  = number of defective bulbs in the sample = 0

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

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.