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

1) 10^{-1}
2) $\left(\frac{1}{2}\right)^5$
3) $\left(\frac{9}{10}\right)^5$
4) $\frac{9}{10}$

Solution :

Total Bulbs	Defective	Non Defective	n	k	p
100	10	90	5	0	$\frac{1}{10}$

TABLE 4
GIVEN INFORMATION

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

This experiment of picking bulbs follows the binomial distribution.

So,

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

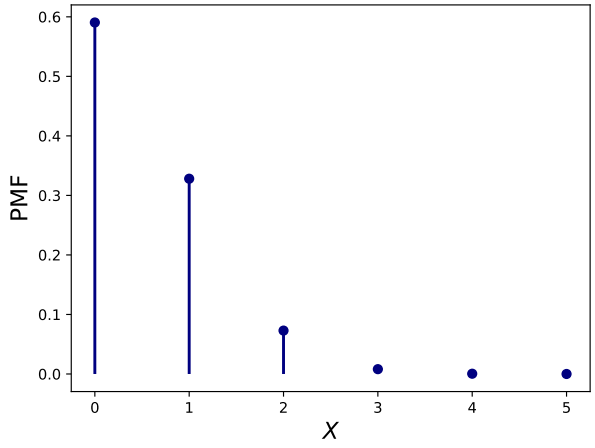

Fig. 4. PMF Plot

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

$$\Pr(X = 0) = \binom{5}{0}\left(\frac{1}{10}\right)^0\left(1 - \frac{1}{10}\right)^{5-0} \tag{2}$$

$$= 1 \times 1 \times \left(\frac{9}{10}\right)^5 \tag{3}$$

$$= \left(\frac{9}{10}\right)^5 \approx 0.59 \tag{4}$$

Therefore, **(3)** is the correct answer.