

# NCERT Assignment

EE22BTECH11009-ANUPAMA KULSHRESHTHA

There are 5% defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than one defective item?

**Solution:** We use binomial distribution to solve this question, whose formula is given by

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

where  $n$  is the number of trials,  $k$  is the number of successful outcomes, and  $p$  is the probability of single successful outcome

As defective rate is 5%,  $p = 0.05$  We need to find the probability of having 0 or 1 defective items in a sample of 10.

For  $k = 0$ ;

$$\Pr(X = 0) = \binom{10}{0} * 0.05^0 * (1 - 0.05)^{10-0} \quad (1)$$

$$= 1 * 1 * 0.95^{10} \quad (2)$$

$$= 0.5987 \quad (3)$$

For  $k = 1$ ;

$$\Pr(X = 1) = \binom{10}{1} * 0.05^1 * (1 - 0.05)^{10-1} \quad (4)$$

$$= 10 * 0.05 * 0.95^9 \quad (5)$$

$$= 0.3151 \quad (6)$$

To find the probability of event E which is not having more than 1 defective item, we sum the probabilities of having 0 or 1 defective items.

$$\Pr(E) = \Pr(X = 0) + \Pr(X = 1) \quad (7)$$

$$= 0.5987 + 0.3151 \quad (8)$$

$$= 0.9138 \quad (9)$$