

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:

Parameter	Values	Description
n	10	Number of items
k	0,1	Number of defective items
p	0.05	Probability of being defective
X	1 if defective 0 if not defective	Bernoulli Random Variable
Y	$\sum_{i=1}^n X_i$	Binomial Random Variable

TABLE 1: Definition of X and parameters.

The pmf of Y is given by

$$Y \sim \text{Bin}(n, p) \quad (1)$$

$$p_Y(n) = \Pr(Y \leq n) \quad (2)$$

$$= \sum_{k=0}^n {}^{10}C_k p^k (1-p)^{10-k} \quad (3)$$

We require $\Pr(Y \leq 1)$. Since $n = 10$,

$$\Pr(Y \leq 1) = \sum_{k=0}^1 {}^{10}C_k (0.05)^k (0.95)^{10-k} \quad (4)$$

$$= 0.9138 \quad (5)$$