

AI1103

Assignment 3

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Download Python code and Latex from below link :

<https://github.com/KRISHNASAI1105/demo/tree/main/Assignment3>

Problem number GATE EE 2019 Q.40

The probability of a resistor being defective is 0.02. There are 50 such resistors in a circuit. The probability of two or more defective resistors in the circuit (round off to two decimal places) is —

Solution

Consider, Probability of a defective resistor =

$$P = 0.02 = \frac{1}{50}.$$

Total number of resistors = $n = 50$.

Let X be number of defective resistors.

By Binomial distribution,

$$Pr(X = k) = \binom{n}{k} (P)^k (1 - P)^{n-k} \quad (0.0.1)$$

$$Pr(X = 0) = \binom{50}{0} \left(\frac{1}{50}\right)^0 \left(1 - \frac{1}{50}\right)^{50-0} \quad (0.0.2)$$

$$\Rightarrow Pr(X = 0) = \left(\frac{49}{50}\right)^{50} \quad (0.0.3)$$

$$Pr(X = 1) = \binom{50}{1} \left(\frac{1}{50}\right)^1 \left(1 - \frac{1}{50}\right)^{50-1} \quad (0.0.4)$$

$$\Rightarrow Pr(X = 1) = \left(\frac{49}{50}\right)^{49} \quad (0.0.5)$$

$$Pr(X \geq 2) = 1 - Pr(X < 2)$$

$$\Rightarrow Pr(X \geq 2) = 1 - (Pr(X = 0) + Pr(X = 1))$$

$$\Rightarrow Pr(X \geq 2) = 0.2642$$

Hence, The probability of two or more defective resistors in the circuit is 0.26.