AI1103
Assignment 3

Nagubandi Krishna Sai
MS20BTECH11014

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 = $0.02 = \dfrac{1}{50}$.
Total number of resistors = n = 50.
Let X be number of defective resistors.
By Binomial distribution,

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

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

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

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

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

$\Pr(X \geq 2) = 1 - \Pr(X < 2)$
$\implies \Pr(X \geq 2) = 1 - (\Pr(X = 0) + \Pr(X = 1))$
$\implies \Pr(X \geq 2) = 0.2642$
Hence, The probability of two or more defective resistors in the circuit is 0.26.