AI1103
Assignment 3

Nagubandi Krishna Sai
MS20BTECH11014

Download Python code and Latex from below link : https://github.com/KRISHNASAI1105/demo/tree/main/Assignment3

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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

$$Consider,\ Probability\ of\ a\ defective\ resistor\ = P \tag{0.0.1}$$

$$= 0.02. \tag{0.0.2}$$

Total number of resistors = n = 50.

$$From\ Poisson\ distribution,\ Mean = \lambda = nP \tag{0.0.3}$$

$$\implies \lambda = 50 * 0.02 = 1. \tag{0.0.4}$$

Let X be number of defective resistors.
By Poisson distribution,

$$Pr(X) = \frac{e^{-\lambda}\lambda^X}{X!} \tag{0.0.5}$$

$$Pr(X = 0) = \frac{e^{-\lambda}\lambda^0}{0!} = e^{-1} \tag{0.0.6}$$

$$Pr(X = 1) = \frac{e^{-\lambda}\lambda^1}{1!} = e^{-1} \tag{0.0.7}$$

$\Pr(X \geq 2) = 1 - \Pr(X < 2)$
$\implies \Pr(X \geq 2) = 1 - [\Pr(X = 0) + \Pr(X = 1)]$
$\implies \Pr(X \geq 2) = 1 - [\frac{e^{-\lambda}\lambda^0}{0!} + \frac{e^{-\lambda}\lambda^1}{1!}]$
$\implies \Pr(X \geq 2) = 1 - [e^{-1} + e^{-1}]$
$\implies \Pr(X \geq 2) = 1 - \frac{2}{e}$
$\implies \Pr(X \geq 2) = 0.2642$

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