AI1103-Assignment 6

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QUESTION GATE 2014 ME-SET1, Q.28 (ME SECTION)

In the following table, X is a discrete random variable and $p(X = x)$ is the probability density. The standard deviation of X is

X	1	2	3
$p_X(k)$	0.3	0.6	0.1

SOLUTION

The mean of the distribution (μ) is given as

$$\mu = \sum_{k=1}^{3} k p_X(k) \tag{0.0.1}$$

$$= (0.3 \times 1) + (0.6 \times 2) + (0.1 \times 3) \tag{0.0.2}$$

$$= 0.3 + 1.2 + 0.3 \tag{0.0.3}$$

$$= 1.8 \tag{0.0.4}$$

We know that variance(σ^2) is

$$\sigma^2 = E(X^2) - \mu^2 \tag{0.0.5}$$

$$= \sum_{k=1}^{3} k^2 p_X(k) - \mu^2 \tag{0.0.6}$$

$$= (0.3 \times 1^2) + (0.6 \times 2^2) + (0.1 \times 3^2) - 1.8^2 \tag{0.0.7}$$

$$= (0.3) + (2.4) + (0.9) - 3.24 \tag{0.0.8}$$

$$= 0.36 \tag{0.0.9}$$

We know that standard deviation (σ) is

$$\sigma = \sqrt{\sigma^2} \tag{0.0.10}$$

$$\sigma = \sqrt{0.36} \tag{0.0.11}$$

$$= 0.6 \tag{0.0.12}$$