

EE23010 Assignment

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Question 62

Let X be a random variable with the probability density function $f(x)$ such that

$$f(x) = \begin{cases} \frac{1}{2\sqrt{3}}, & -\sqrt{3} \leq x \leq \sqrt{3} \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

Then the variance of X is? (GATE XH-C1 2023)

Solution:

The mean of X

$$\mu_X = \int_{-\infty}^{\infty} xf(x)dx \quad (2)$$

As the integrand is odd

$$\implies \mu_X = 0 \quad (3)$$

The variance of X is:

$$\sigma_X^2 = \mathbb{E}((X - \mu_X)^2) \quad (4)$$

From (3)

$$\implies \sigma_X^2 = \mathbb{E}(X^2) \quad (5)$$

$$= \frac{1}{2\sqrt{3}} \int_{-\sqrt{3}}^{\sqrt{3}} x^2 dx \quad (6)$$

$$= 1 \quad (7)$$