EE23010 Assignment

Sayyam Palrecha* EE22BTECH11047

Question 62
Let X be a random variable with the probability density function $f(x)$ such that

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

Then the variance of X is? (GATE XH-C1 2023)
Solution:
The mean of X

$$\mu_X = \int_{-\infty}^{\infty} x f(x) dx \tag{2}$$

As the integrand is odd

$$\implies \mu_X = 0 \tag{3}$$

The variance of X is:

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

From (3)

$$\implies \sigma_X^2 = \mathbb{E}\left(X^2\right) \tag{5}$$

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

$$= 1 \tag{7}$$