Solution of Q12.13.3.107

SUJAL GUPTA - EE22BTECH11052

Let X be a random variable taking values x_1, x_2,..., x_n with probabilities p_1, p_2, ..., p_n, respectively. Then var (X) =

Solution: X is the random variable with values x_1, x_2,..., x_n taking probabilities p_1, p_2, ..., p_n. By definition,

$$Var(X) = E(X^2) – [E(X)]^2 \tag{1}$$

Since

$$E(X^2) = \sum_{i=1}^{n} (X)^2 \Pr(X) \tag{2}$$

$$= \sum_{i=1}^{n} (x_i)^2 p_i \tag{3}$$

$$E(X) = \sum_{i=1}^{n} X \Pr(X) \tag{4}$$

$$= \sum_{i=1}^{n} x_i p_i \tag{5}$$

$$Var(X) = \sum_{i=1}^{n} (x_i)^2 p_i - \left\{ \sum_{i=1}^{n} x_i p_i \right\}^2 \tag{6}$$