EE22BTECH11029 - Komakula Sreeja

Question 12.13.3.78

A die is thrown and a card is selected at random from a deck of 52 playing cards. The probability of getting an even number on the die and a spade card.

Solution: We know that 52 playing cards contain 13 spades, 13 clubs, 13 diamonds and 13 hearts.

Let X_1 and X_2 be two random variables denoting the number on dice and card selected respectively:

$$X_1 = \begin{cases} 0, & \text{even number} \\ 1, & \text{odd number} \end{cases} \tag{1}$$

$$X_2 = \begin{cases} 0, & \text{spade} \\ 1, & \text{club} \\ 2, & \text{diamond} \\ 3, & \text{heart} \end{cases} \tag{2}$$

Probability of the number on the dice:

$$p_{X_1}(k) = \frac{1}{2} \quad \{k = 0, 1\} \tag{3}$$

Probability of selecting a card:

$$p_{X_2}(k) = \frac{13}{52} = \frac{1}{4} \quad \{k = 0, 1\} \tag{4}$$

Therefore, the probability of getting an even number on the die and a spade card

$$= p(X_1 = 0.X_2 = 0) \tag{5}$$

$$= p_{X_1}(0) \times p_{X_2}(0) \tag{6}$$

$$= \frac{1}{2} \times \frac{1}{4} \tag{7}$$

$$= \frac{1}{8} \tag{8}$$

TABLE 1: Description of random variables

Parameters	Values	Description
X_1	0	Even number
	1	Odd number
X_2	0	Spade
	1	Club
	2	Diamond
	3	Heart