13.12.2021

SMTA1402 - Probability and Statistics

Sample space (S) :-

The set of all possible outcomes in an experiment is called sample space.

For example, In tossing a coin the sample space is,

$S = \{H, T\}$

In throwing a die, $S = \{1, 2, 3, 4, 5, 6\}$

Probability :-

The probability of an event is the ratio between no. of favourable to the event and the total no. of exhaustive events.

ie) $P(\text{Event}) = \frac{\text{No. of favourable to the event}}{\text{The total no. of exhaustive events}}$

$P(E) = \frac{n(E)}{n(S)}$

for example, In tossing a coin $S = \{H, T\}$

$P(\text{getting head}) = \frac{1}{2}$, $P(\text{getting tail}) = \frac{1}{2}$

$\therefore$ the total prob $= P(H) + P(T) = \frac{1}{2} + \frac{1}{2} = 1$

(ii) In throwing a die, $S = \{1, 2, 3, 4, 5, 6\}$

$P(\text{getting } 1) = \frac{1}{6}$, $P(\text{getting } 2) = \frac{1}{6}$, $P(\text{getting } 3) = \frac{1}{6}$

$P(\text{getting } 4) = \frac{1}{6}$, $P(\text{getting } 5) = \frac{1}{6}$, $P(\text{getting } 6) = \frac{1}{6}$

$\therefore$ the total prob $= P(1) + P(2) + P(3) + P(4) + P(5) + P(6)$

$= \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$

$= \frac{6}{6} = 1$

Axioms of Probability:-

(i) $P(E) \geq 0$

(ii) $0 \leq P(E) \leq 1$

(iii) $P(S) = 1$ i.e) $\sum P(E) = 1$ (or) $\sum_{i=1}^{n} P(x_i) = 1$

(iv) If $A_1, A_2, A_3 \cdots A_n$ are Mutually Exclusive Events (M.E.E) then

$$P(A_1 \cup A_2 \cup A_3 \cup \cdots \cup A_n) = P(A_1) + P(A_2) + P(A_3) + \cdots + P(A_n)$$

i.e) Probability of their union = Sum of individual probabilities.

Mutually Exclusive Events (M.E.E):-

In an experiment if one event happened then there is no chance for happen the other events at that time. (OR)

Two events are said to be M.E.E if they cannot occur at the same time (or) simultaneously.

Ex:- In tossing a coin, Head and tail are M.E.E's.
In throwing a die, all the 6 events are M.E.E's.

Equally Likely Events:-

In an experiment all the possible outcomes probabilities are equal then the events are said to be Equally likely Events.

Ex:- ① In tossing a coin, $P(H) = \frac{1}{2}$, $P(T) = \frac{1}{2}$

∴ H, T are said to be equally likely events.

② In throwing a die, $P(1) = \frac{1}{6}$, $P(2) = \frac{1}{6}, \cdots P(6) = \frac{1}{6}$

② In throwing a die, $P(1) = \frac{1}{6}$, $P(2) = \frac{1}{6}, \cdots P(6) = \frac{1}{6}$

∴ 1, 2, 3, 4, 5, 6 all the events are said to be equally likely events.