AI 1110 Assignment 1

Name: Shreyas Premkhede
Roll no.: CS22BTECH11053

12.13.2.12 Question: A die is tossed thrice. Find the probability of getting an odd number at least once.

Answer: $\frac{7}{8}$

Solution:

Let X,Y,Z be three Bernoulli random variables defined as follows -

X = 1 , if odd number occurs on the first roll of die.

X = 0 , otherwise

Y = 1 , if odd number occurs on the second roll of die.

Y = 0 , otherwise

Z = 1 , if odd number occurs on the third roll of die.

Z = 0 , otherwise

Let $'Pr'$ be the probability of getting an odd number atleast once.

Then $'Pr'$ is equal to the compliment of getting an even number on every die toss.

Now since,

$$P(A) + P(\bar{A}) = 1 \tag{1}$$

This implies that,

Pr(getting an odd number at least once on the die) = 1 - Pr(getting an even number on every die toss)

Pr(X=1∪Y=1∪Z=1) = 1 - Pr(X=0∩Y=0∩Z=0)

∴ For this event, (i.e. of getting an even number on all the three outcomes),

The total favourable outcomes are 3 {2,4,6} out of all the possible outcomes 6 {1,2,3,4,5,6}.

∴ From Equation 1,

$$Pr = 1 - \left(\frac{3}{6} * \frac{3}{6} * \frac{3}{6}\right)$$

$$\implies Pr = 1 - \left(\frac{1}{2}\right)^3$$

$$\implies Pr = 1 - \frac{1}{8}$$

$$\implies Pr = \frac{7}{8}$$

Hence,

Answer: The probability of getting an odd number atleast once on tossing the die three times is equal to $\frac{7}{8}$.