# Assignment 2

Amaan - EP20BTECH11003

Download all python codes from

https://github.com/amaan28/Assignment2/blob/main/Assignment2/codes/Assignment2.py

and latex-tikz codes from

https://github.com/amaan28/Assignment2/blob/main/Assignment2/Assignment2.tex

GATE 2012 EE Q.47

A fair coin is tossed till head appears for the first time. The probability that the number of required tosses is odd, is,

A)1/3
B)1/2
C)2/3
D)3/4

Solution

Let $X \in \mathbb{N}$ denote a random variable whose value represents the number of tosses after which Heads appear for the first time. Then, we can find,

$$Pr(X = r) = \frac{1}{2^r} \tag{0.0.1}$$

Defining E as the event when the number of tosses required to obtain Heads for the first time is an odd number, then,

$$Pr(E) = \sum_{k=1}^{\infty} Pr(X = 2k-1) \tag{0.0.2}$$

$$Pr(E) = \sum_{k=1}^{\infty} \frac{1}{2^{2k-1}} \tag{0.0.3}$$

For a Geometric Progression,

$$S_\infty = \frac{a}{1-r} \tag{0.0.4}$$

where, a is the first term and r is the common ratio of the geometric progression, Hence,

$$Pr(E) = \frac{1/2}{1-1/4} = \frac{2}{3} \tag{0.0.5}$$

Therefore, option (C) is correct.