Assignment - 4

EE23010: Probability and Random Processes
Indian Institute of Technology,Hyderabad

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Question 12.13.10.6 - How many times must a man toss a fair coin so that the probability of having at least one head is more than 90% ?

Solution: Given,

$$\Pr(H) = \frac{1}{2} \tag{1}$$

$$\Pr(T) = \frac{1}{2} \tag{2}$$

Let, total number of trials = n and Z be the random variable that represents the number of heads in n trials.

So,

$$\Pr(Z \geq 1) > 0.9 \tag{3}$$

$$1 - \Pr(Z = 0) > 0.9 \tag{4}$$

$$1 - {}^{n}C_0 (0.5)^n (0.5)^0 > 0.9 \tag{5}$$

$$1 - (0.5)^n > 0.9 \tag{6}$$

$$0.1 > (0.5)^n \tag{7}$$

$$(2)^n > 10 \tag{8}$$

On solving we get

$$n > 0.33 \tag{9}$$

As we know, n can be a positive integer value.

So, n = 4.