Name:
Roll Number:
Department:
Program: BTech / MTech TA / MTech RA / PhD   (Tick one)

भारतीय सांकेतिक विज्ञान संस्था हैदराबाद
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

AI5090: Stochastic Processes
Quiz 4
Date: 08 April 2025

Question	1	2	Total
Marks Scored			

Fix a probability space $(\Omega, \mathscr{F}, \mathbb{P})$. Assume that all random variables appearing in the problems below are defined w.r.t. $\mathscr{F}$.

1. **(2 Marks)**

   Let $\{X_n\}_{n=0}^{\infty}$ be a time-homogeneous DTMC on $\mathcal{X} = \{0, 1\}$, with the TPM

   $$P = \begin{bmatrix} 1-p & p \\ 1-p & p \end{bmatrix}$$

   for some fixed $p \in (0, 1)$.
   If $X_0 \sim \text{Ber}(3/4)$, specify the PMF of X_4.

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2. **(3 Marks)**

Out of the 33 students registered for the course AI5090, it is observed that all students turn up to lecture 0, and the number of subsequent lectures for which each student turns up is a Geometric random variable with parameter $p \in (0, 1)$, independent of the number of subsequent lectures to which other students turn up.

Evaluate, in terms of p, the expected number of students who will attend the final lecture of the course, lecture 30.