Indian Statistical Institute

BSDS IInd Year

Academic Year 2025 - 2026: Semester I

Course: Probability II

Instructor: Antar Bandyopadhyay

Assignment # 8

Date Given: October 15, 2025 **Date Due: October 24, 2025**
Total Points: 10

1. Give an example of a sequence of *continuous* non-negative random variables, say, $(X_n)_{n\geq 1}$, such that, $X_n \xrightarrow{\mathbf{P}} 0$, but $\mathbf{E}[X_n] \not\longrightarrow 0$ as $n \to \infty$.

2. Prove by an argument or disprove by a counter example, the statement:

   If $X, Y \in \mathcal{L}_1$ then $XY \in \mathcal{L}_1$.

3. Show that $\mathcal{L}_2 \subseteq \mathcal{L}_1$.

4. Prove by an argument or disprove by a counter example, the statement:

   If $X_n \xrightarrow{\mathcal{L}_2} X$ then $X_n \xrightarrow{\mathcal{L}_1} X$.