Indian Statistical Institute

BSDS Ist Year

Academic Year 2024 - 2025: Semester I

Course: Probability Theory I

Instructor: Antar Bandyopadhyay

Assignment # 2

Date Given: August 28, 2024 **Date Due: September 05, 2024**
Total Points: 10

1.3.10 Events A, B, and C are defined in an outcome space. Find expressions for the following probabilities in terms of $\mathbf{P}(A), \mathbf{P}(B), \mathbf{P}(C), \mathbf{P}(A \cap B), \mathbf{P}(A \cap C), \mathbf{P}(B \cap C)$, and $\mathbf{P}(A \cap B \cap C)$.

(a) The probability that exactly one of these events occurs.

(b) The probability that exactly two of A, B, C occur.

(c) The probability that none of these events occur.

1.3.14 Show that $\mathbf{P}(A \cap B) \geq \mathbf{P}(A) + \mathbf{P}(B) - 1$.

1.4.6 Suppose two cards are dealt from a deck of 52 cards. What is the probability that the second card is a *spade* given that the first card is *black*?

1.4.8 A hat contains a number of cards, with (i) 30% white on both sides; (ii) 50% black on one side and white on the other; and (iii) 20% black on both sides. The cards are mixed up, then a single card is drawn at random and placed on the table. If the top side is black, what is the chance that the other side is white?