ENGINEERING PROBABILITY

HOMEWORK # 6:
Posted on 02/28/2018

Please work out the ten (10) problems stated below – BT refers to the text: D.P. Bertsekas and J.N. Tsitsiklis, Introduction to Probability (Second Edition), Athena Scientific (2008). Problem 1.55 (BT) refers to Problem 55 for Chapter 1 of BT (to be found at the end of Chapter 1). Show work and explain reasoning.

1. Problem 2.1 (BT)

2. Problem 2.2 (BT) – A well known problem!

3. Problem 2.3 (BT)

4. Problem 2.6 (BT)

5. Problem 2.7 (BT)

6. Problem 2.13 (BT)

7. Problem 2.14 (BT)

8. Problem 2.15 (BT)

9. With $a$ and $b$ integers with $a \leq b$, define the uniform pmf on the integer interval \{a, a = 1, \ldots, b - 1, b\} by

$$p_{a,b}(x) = \frac{1}{b - a + 1}, \quad x = a, a + 1, \ldots, b - 1, b.$$
Give a probability triple \((\Omega, \mathcal{F}, \mathbb{P})\) and a rv \(X : \Omega \rightarrow \mathbb{R}\) such that \(X\) has pmf \(\{p_{a,b}(x), x = a, a + 1, \ldots, b - 1, b\}\) under \(\mathbb{P}\).

10. In this problem \(N\) is a positive integer. Consider the following experiment \(\mathcal{E}\) involving Alice and Bob: Alice selects a subset \(A_1\) (possibly empty) at random from the collection of all subsets of the set \(\{1, 2, \ldots, N\}\). This takes place in Los Angeles at 12:00 noon on October 17, 2013. At exactly that moment, independently of Alice, while at lunch in New York City, Bob selects a subset \(A_2\) (possibly empty) at random from the collection of all subsets of the set \(\{N, N + 1, N + 2, \ldots, 2N - 1\}\).

10.a. Argue for a probability model that describes this situation. Describe explicitly an outcome \(\omega\), the sample space \(\Omega\), the collection \(\mathcal{A}\) of events and the probability assignment \(\mathbb{P}\).

10.b. Compute the probability that \(N\) belongs to \(A_2\).

10.c. Compute the probability that the sets \(A_1\) and \(A_2\) do not intersect.