ENEE324. Problem set 2

Date due September 24, 2014

1. Prof. encounters two traffic lights on his way to campus in the morning. On a good day the first light is red with a probability 0.2 and green with a probability 0.8. On a bad day he gets a red or green light with equal probabilities. The probability of being stopped by a red light at the second traffic light is the same as the probability at the first light. With a probability 0.7, he will have a good day, and with a probability 0.3 he will have a bad day.

(a) What is the probability that Prof. will drive to campus without having to stop at a traffic light?

(b) Given that he had to stop at only one of the lights, what is the probability that he had a bad day?

2. Consider the following probability law defined on integer numbers $k \in \mathbb{Z}$:

$$P(k) = \begin{cases} \frac{1}{b-a-1} & \text{if } k = a+1, a+2, ..., b-1 \\ 0 & \text{otherwise} \end{cases}$$

where $a < 0$ and $b > 0$ are integers. Let $z_1 = \max(0, k); z_2 = \min(0, k)$. Find $P(z_1), P(z_2)$ for all integer numbers z_1, z_2.

3. A codeword over the ternary alphabet is an arbitrary sequence of ten 0's, 1's and 2's. For instance, 0120122010 is a codeword. Find

(a) The total number of codewords.

(b) The number of codewords that contain just 1's and 2's and do not contain 0's.

(c) The number of codewords that contain exactly 4 zeros.

(d) Consider the codeword $x = 121101121$. Find the number of codewords that differ from x in exactly 4 positions (regardless of the location of these positions).

4. The events A_1, A_2, A_3, A_4 form a partition of the sample space. We are given that $P(A_1) = p_1$, $P(A_2) = p_2$. Given that the events A_3 and A_4 did not occur, what is the probability of A_1?

5. Die A has 4 red and 2 white faces, die B has 2 red and 4 white faces. A coin that shows up H with probability $\frac{1}{4}$ and T with probability $\frac{3}{4}$ is tossed once. If H shows up then we roll only die A, if T shows up, then we roll only die B.

(a) What is the probability to see a red face in one roll?

(b) In the first 3 rolls we obtained 3 red faces. What is the probability that we were rolling die A?