ENEE324-03. Problem set 5

Date due March 31, 2015

1. In a box there are 30 long, 12 medium and 10 short pegs. Four pegs are selected at random and used in 4 different projects (one per project). What is the expected number of projects that receive long pegs?

2. The number of cars passing through a toll gate during any time period of length t is an RV with the pmf

$$p_N(n) = a\frac{(2t)^n}{n!}, \quad n = 0, 1, 2, \ldots.$$

Find a and compute $P(X < 4)$ and $P(X > 1)$.

3. Let N be the random number of failures in a sequence of t independent Bernoulli experiments woth probability of success p. Let X be the number of successes appearing before the first failure. Find the joint pmf $p_{N,X}(n, x)$.

4. Suppose that X and Y are independent RVs with pmf

$$p_X(k) = p_Y(k) = p(1-p)^{k-1}, \quad k = 1, 2, \ldots.$$

Find the conditional pmf $p_{X|A_n}(k|A_n)$, where $A_n = \{X + Y = n\}, n = 2, 3, \ldots.$

5. Let X be an RV such that $p_X(n) > 0$ for all $n \in \mathbb{Z}$. Find $E[\cos(X\pi)], E[\sin(X\pi)]$.

6. We are rolling a 6-sided die several times. What is the expected number of rolls before each of the possible outcomes appears at least once?