Homework #6
Due Su 11/12

Note:

OW	Oppenheim and Wilsky
SSS	Schaum's Signals and Systems
SPR	Schaum's Probability, Random Variables, and Random Processes

Be sure to show all your work for credit.

1. (SPR 2.59)

   Consider the experiment of tossing a coin. Heads appear about once every three tosses. If this experiment is repeated, what is the probability of the event that heads appear exactly twice during the first five tosses?

2. (SPR 2.62)

   Let X denote the number of heads obtained in the flipping of a fair coin twice.

   (a) Find the pmf of X.

   (b) Compute the mean and variance of X.

3. (SPR 2.66)

   Consider an experiment of tossing a fair coin sequentially until "head" appears. What is the probability that the number of tossing is less than 5?

4. (SPR 2.67)

   Given that X is a Poisson r.v. and $p_X(0) = 0.0498$, compute $E[X]$ and $P(X \geq 3)$.

5. (SPR 2.73)

   It is known that the time (in hours) between consecutive traffic accidents can be described by the exponential r.v. X with parameter $\lambda = \frac{1}{60}$. Find (i) $P(X \leq 60)$; (ii) $P(X > 120)$; and (iii) $P(10 < X \leq 100)$.

6. (SPR 2.74)

   Binary data are transmitted over a noisy communications channel in a block of 16 binary digits. The probability that a received digit is in error as a result of channel noise is 0.01. Assume that the errors occurring in various digits positions within a block are independent.

   (a) Find the mean and the variance of the number of errors per block.

   (b) Find the probability that the number of errors per block is greater than or equal to 4.

7. (SPR 2.75)

   Let the continuous r.v. X denote the weight (in pounds) of a package. The range of weight of packages is between 45 and 60 pounds.

   (a) Determine the probability that a package weighs more than 50 pounds.

   (b) Find the mean and the variance of the number of the weight of packages.

8. (SPR 2.77)

   The *median* of a continuous r.v. X is the value of $x = x_0$ such that $P(X \geq x_0) = P(X \leq x_0)$. The *mode* of X is the value of $x = x_m$ at which the pdf of X achieves its maximum value.

   (a) Find the median and mode of an exponential r.v. with parameter λ.

   (b) Find the median and mode of a normal r.v. $X = N(\mu, \sigma^2)$.