ME529 **Homework 2**

1. The probability that a driver will have an accident in one month is 0.02. Find the probability P that in 100 months he will have 3 accidents.

2. A telephone call occurs at random in the interval (0,T). The probability that the call occurs in the subinterval (t_1,t_2) is (t_2-t_1)/T. Let a random variable be defined by $X=\sqrt{t}$ (where t is the time of the call), find $F_X(x)$ and $f_X(x)$.

3. Given $f(x)=\alpha e^{-\alpha x}U(x)$, find the conditional distribution and density functions, F(x|m) and f(x|m) with event $m=\{1<X\le 2\}$.

4. A random variable is Binomial-distributed. i.e.,

$$f_X(x)=\sum_{k=0}^{n}\binom{n}{k}p^k q^{n-k}\delta(x-k)$$

find E{X} and σ_X^2 .

5. A random variable is defined by $X(\varepsilon)=b$, with b being a given number. Find the distribution and density functions of random variable X.

6. If X is a normal random variable with zero mean. Show that

$$E\{|X|^n\}=\sqrt{\frac{2}{\pi}}2^k k!\sigma \quad \text{for} \quad n=2k+1.$$

[Hint, $\int_0^\infty y^k e^{-y}dy=k!$.]

7. X is a Poisson random variables with

$$f_X(x)=\sum_{k=0}^{\infty}\frac{e^{-a}a^k}{k!}\delta(x-k).$$

Find the characteristic function of X. Find E{x} and σ_x^2 directly from the properties of the characteristic function.

8. The probability density of a random variable is given by

$$f_X(x)=\begin{cases}1/3 & 0<x\le 1\\ 2/3 & 1<x\le 2\\ 0 & otherwise\end{cases}.$$

Find the mean, variance and the characteristic function of X. Also determine the moment generating function of X.