King Fahd University of Petroleum & Minerals
Electrical Engineering Department

EE570 Stochastic Processes
Assignment II

November 5, 2007 — Due Date: November 12, 2007

Question 1

Consider a random variable obeying the normal probability law with parameters m=2 and σ = 2.
(a) Find the probability that the observed value of **x** of the random phenomenon will have a value between 0 and 3.
(b) Probability that the observed value is between -1 and 1.
(c) Find conditional probability that an observed value **x** of the random variable will have value between -1 and 1, given that it has a value between 0 and 3.

Question 2

The Poisson probability distribution with parameter l is given by

$$p_k = \frac{\lambda^k}{k!}e^{-\lambda} \tag{1}$$

(a) Find the characteristic function $\Phi_{\mathbf{x}}(\omega)$, the mean and variance.
(b) Find the moment generating function $\psi(t)$ and the mean and variance of the random variable.

Question 3

Suppose that the number of airplanes arriving at a certain airport in any 20 minutes period obeys Poisson probability law with mean 100. Use Chebyshev's inequality to determine a lower bound for the probability that the number of planes arriving in a given 20 minutes will be 80 and 120.

Question 4

Suppose a retailer discovers that the number of items of a certain kind demanded by customers in a given time obeys a Poisson probability law with known parameter l.
What stock K of these items should the retailer have on hand at the beginning of time period in order to have a probability 0.99 that he will be able to supply immediately all customers who demand the items during the period under consideration.

Question 5

The joint probability density function of **x** and **y** be given by

$$f_{\mathbf{x},\mathbf{y}}(x, y) = \begin{cases} 2e^{-(x+y)} & 0 < x < y < \infty \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

Define **z**=**x**+**y**, **w**=**y**/**x**. Find the pdf of **z** and **w**. Show that **z** is not an exponential random variable?