Ceng 272 Statistical Computations
Final
June 07, 2012 12:40 – 14:20
Good Luck!

Answer all the questions.
Write the solutions explicitly and use the statistical terminology.
Calculator is allowed.
You are not allowed to use any other electronic equipment in the exam.

1. i (5 pts) What is the total number of different ways of wearing 5 blouses, 3 pants, and 2 pairs of socks?

   ii (5 pts) How many ways are there to put 5x's and 4o's on a tic-tac-toe board (9 squares) ?

   (a) Find number of ways to place 5 x's in 9 squares leaving 4 squares blank.

   (b) Find number of ways to put 4 o's in the remaining 4 empty slots.

2. i (8 pts) If 3 books are picked at random from a shelf containing 5 novels, 3 books of poems, and a dictionary, what is the probability that

   (a) the dictionary is selected?

   (b) 2 novels and 1 book of poems are selected?

   ii (7 pts) Compute $P(\mu - 2\sigma < X < \mu + 2\sigma)$, where X has the density function

$$f(x) = \begin{cases} 6x(1-x), & 0 < x < 1 \\ 0, & elsewhere \end{cases}$$

   and compare with the result given in Chebyshev's theorem.

3. (15 pts) To avoid detection at customs, a traveler places 6 narcotic tablets in a bottle containing 9 vitamin pills that are similar in appearance. If the customs official selects 3 of the tablets at random for analysis, what is the probability that the traveler will be arrested for illegal possession of narcotics.

4. (15 pts) Let X and Y denote the position of an electron in the 2 dimensional Cartesian plane. Due to the uncertainty principle X and Y can't be measured exactly and are random variables. You are told that the measurement along the X-axis is **independent** from the measurement along the Y-axis. Furthermore, let X have a normal marginal density function with μ_X, σ_X and let Y have a normal marginal density function with μ_Y, σ_Y. What is the joint density function for X, Y ?
(Hints: for normal marginal density function $\rightarrow n(x; \mu, \sigma) \rightarrow g(x), h(y)$; joint density function $\rightarrow f(x, y)$)

5. (15 pts) The time-length to charge of an electric shaver has a normal distribution with a mean of 60 minutes and standard deviation of 15 minutes. When the battery is charged completely, the indicator lights up. Find the probability that the electric shaver's indicator lights up within 40 minutes.

6. (20 pts) Evaluate $P(1 \leq X \leq 4)$ for a binomial variable with n = 15 and p = 0.2 by using

   i From corresponding Table.

   ii From normal-curve approximation.

7. (20 pts) The heights of 1000 students are approximately normally distributed with a mean of 174.5 centimetres and a standard deviation of 6.9 centimetres. If 200 random samples of size 25 are drawn from this population and the means recorded to the nearest tenth of a centimetre, determine

   i the mean and standard deviation of the sampling distribution of $\overline{X}$;

   ii the number of sample means that fall between 172.5 and 175.8 centimetres inclusive;

   iii the number of sample means falling below 172.0 centimetres.