Ceng 272 Statistical Computations
Midterm
Apr 06, 2011 14:40 – 16:30
Good Luck!

Answer all the questions.
Write the solutions explicitly and use the statistical terminology

1. (5 pts) A rigged dice is known to have probability 1/2 for the outcome 6 and all other outcomes are known to be equally likely. What is the probability for outcome 2?

2. (10 pts) Suppose we have a group of 5 candidates

   i Find the number of ways selecting 3 council members.

   ii Find the number of ways selecting chair, vice chair, and treasurer from the group of 5 candidates.

3. (20 pts) Given that

   - A: College graduate. B: Smoker. C: Heartdisease.
   - $P(A) = 0.7$. $P(B) = 0.1$. $P(C) = 0.05$
   - $P(A \cap C) = 0.035$ $P(B \cap C) = 0.03$

   Find that

   i $P(C|A) =?$. Are these two events (A, C) independent?

   ii $P(C|B) =?$. Are these two events (B, C) independent?

4. (15 pts) The shelf life, in days, for bottles of a certain prescribed medicine is a random variable having the density function

$$f(x) = \left\{ \begin{array}{l} \frac{20000}{(x+150)^3},\ x > 0 \\ 0,\ elsewhere \end{array} \right\}$$

   Find the probability that a bottle of this medicine will have a shell life of

   i at least 150 days;

   ii anywhere from 60 to 90 days.

5. (15 pts) A private pilot wishes to insure his airplane for \$200000. The insurance company estimates that a total loss may occur with probability 0.002, a 50% loss with probability 0.01, and a 25% loss with probability 0.1. Ignoring all other partial losses, what premium should the insurance company charge each year to realize an average profit of \$500?

6. (15 pts) Suppose that the probabilities are 0.4, 0.3, 0.2 and 0.1, respectively, that 0, 1, 2 and 3 power failures will strike a certain subdivision in any given year. Find the mean and variance of the random variable X representing the number of power failures striking this subdivision.

7. (20 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.