Ceng 272 Statistical Computations
Midterm
Apr 02, 2010 10:40 – 12:30
Good Luck!

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

1. (5 pts) How many distinct words can be formed using all the letters of the eleven-letter word MISSISSIPPI?

2. (10 pts) Four married couples have bought 8 seats in the same row for a concert. In how many different ways can they be seated

   i With no restrictions?

   ii If each couple is to sit together?

   iii If all the men sit together to the right of all the women?

3. (20 pts) Define events

   - $H = \textit{having a high blood pressure}$,
   - $S = \textit{have had a stroke within } 5 \textit{ years}$.

   Among elderly people who are 70 years of age, suppose we have

   - $P(S) = 0.1$,
   - $P(H|S) = 0.4$,
   - $P(H|S') = 0.2$.

   What is $P(S|H)$?

4. (15 pts) Consider an experiment of rolling a die. Define $E = \{1, 2, 3\}$, $F = \{3, 4, 5, 6\}$, and $G = \{2, 3, 4, 5\}$.

   i Are events E and F independent?

   ii What about E and G?

5. (15 pts) Suppose that X and Y have the following joint probability function:

		x	
	$f(x,y)$	2	4
y	1	0.10	0.15
	3	0.20	0.30
	5	0.10	0.15

   (a) Find the expected value of $g(X,Y) = XY^3$.

   (b) Find μ_X and μ_Y.

6. (20 pts) An electrical firm manufactures a 100-watt light bulb, which, according to specifications written on the package, has a mean life of 900 hours with a standard deviation of 50 hours. At most, what percentage of the bulbs fail to last even 1100 hours? Assume that the distribution is symmetric about the mean. (Hint: Use Chebyshev's theorem)

7. (20 pts) Astronauts on the space shuttle realize that oxygen level is dropping (event, O). There are 3 possible problems that can cause oxygen levels to drop

   i a leak in the fuselage (L),

   ii malfunctioning oxygen pumb (M),

   iii a CO_2 filter in need of replacement (F).

   The astronauts know that $P(L) = 0.02$, $P(M) = 0.49$ and $P(F) = 0.49$. Ground crew runs simulations to find $P(O|L) = 1$, $P(O|M) = 0.4$, $P(O|F) = 0.6$. What should the astronauts try to fix first?