

Ceng 272 Statistical Computations
Midterm
Apr 02, 2009 09:40 – 11:30
Good Luck!

Answer all the questions.

Write the solutions explicitly and use the statistical terminology

1. (10 pts) Two cards are drawn in succession from a deck without replacement. What is the probability that both cards are greater than 2 and less than 8?

2. (10 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
 - i the dictionary is selected?

 - ii 2 novels and 1 book of poems are selected?

3. (20 pts) In a certain region of the country it is known from past experience that the probability of selecting an adult over 40 years of age with cancer is 0.03. If the probability of a doctor correctly diagnosing a person with cancer as having the disease is 0.73 and the probability of incorrectly diagnosing a person without cancer as having the disease is 0.04,
- i what is the probability that, a person is diagnosed as having cancer?
 - ii what is the probability that a person diagnosed as having cancer actually has the disease?

4. (20 pts) A tobacco company produces blends of tobacco with each blend containing various proportions of Turkish, domestic, and other tobaccos. The proportions of Turkish and domestic in a blend are random variables with joint density function ($X =$ Turkish and $Y =$ domestic)

$$f(x, y) = \begin{cases} 24xy & , 0 \leq x, y \leq 1; x + y \leq 1 \\ 0 & , elsewhere \end{cases}$$

(Write the correct expressions and *also evaluate the integrals/equations*)

- i Find the probability that in a given box the Turkish tobacco accounts for over half the blend.
- ii Find the marginal density function for the proportion of the domestic tobacco.
- iii Find the probability that the proportion of Turkish tobacco is less than $1/8$ if it is known that the blend contains $3/4$ domestic tobacco.

5. (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 700 hours? Assume that the distribution is symmetric about the mean. (Hint: Use Chebyshev's theorem)

6. (20 pts) Suppose it is known that the life X of a particular compressor in hours has the density function

$$f(x) = \begin{cases} \frac{1}{900}e^{-x/900} & , x > 0 \\ 0 & , elsewhere \end{cases}$$

(Write the correct expressions but *do not evaluate the integrals/equations*)

- i Find the mean life of the compressor.
- ii Find $E(X^2)$.
- iii Find the variance and standard deviation of the random variable X .