University of Arkansas at little Rock
Department of Systems Engineering

SYEN 3314 Probability and Random Signals
Summer 2009

Quiz 2
Monday, June 15, 2009

- This is a closed book Quiz.

- Calculators are not allowed.

- The quiz has 3 questions to be answered in 15 mn

- Please be neat, we cannot grade what we cannot decipher.

Name

Question 1

You have a shuffled deck of three cards: 2,3, and 4. You draw one card. Let C_i denote the event that card i is picked. Let E denote the event that card chosen is a even-numbered card.

1. What is $P[C_2|E]$, the probability that the 2 is picked given that an even-numbered card is chosen.

2. What is the conditional probability that an even-numbered card is picked given that the 2 is picked?

Question 2

1. Shuffle a deck and observe each card. The outcome of the experiment is an ordered sequence of the 52 cards of the deck. How many possible outcome are there?

2. What is the number of ways of choosing 5 starters for a basketball team with 1 players?

3. How many binary sequence of length 10 there are?

Question 3

Each time a modem transmits one bit, the receiving modem analyzes the signal that arrives and decides whether the transmitted bit is 0 or 1. It makes an error with probability p, independent of whether any other bit is received correctly. We know that if the transmission continues until the receiving modem makes its first error, what is the PMF of X, the number of bits transmitted, has a geometric distribution

$$P_X(x) = \begin{cases} p(1-p)^{x-1}, & 1, 2, 3, \cdots; \\ 0, & \text{Otherwise.} \end{cases}$$

1. If $p = 0.1$, what is the probability that $X = 10$? What is the probability that $X \geq 10$?

2. If the modem transmits 100 bits, what is the PMF of Y, the number of errors?

3. If $p = 0.01$ and the modem transmits 100 bits, what is the probability of $Y = 2$ errors at the receiver? What is the probability that $Y \leq 2$?

4. If the transmission continues until the receiving modem makes three errors, what is the PMF of Z, the number of bits transmitted?

5. If $p = 0.25$, what is the probability of $Z = 12$ bits transmitted?