University of Arkansas at little Rock

Department of Systems Engineering

SYEN 3314 Probability and Random Signals
Summer 2009

Quiz 1
Wednesday, June 3, 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

Monitor three consecutive phone calls going through a telephone switching office. Classify each one as a voice call (v) if someone is speaking, or a data call (d) if the call is carrying a modem or fax signal. Your observation is a sequence of three letters (each letter is either v or d). For example, two voice calls followed by one data call corresponds to vvd. Write the following sets:

1. $A_1 =$ { first call is a voice call}
2. $A_2 =$ { second call is a voice call }
3. $A_3 =$ { all calls are the same }
4. $A_4 =$ { one or more voice calls }
5. $B_1 =$ { first call is a data call }
6. $B_2 =$ { second call is a data call }
7. $B_3 =$ { voice and data alternate }
8. $B_4 =$ { two or more data calls }

Identify if the pair of events A_1 and B_1, A_2 and B_2, A_3 and B_3, A_4 and B_4 are either mutually exclusive (disjoint) or collectively exhaustive or both.

Question 2

A students' test score T is an integer between 0 and 100. A score of 90 to 100 is an A, 80 to 89 is a B, 70 to 79 is a C, 60 to 69 is a D, and below 60 is a failing grade of F. Given that all scores between 51 and 100 are equally likely and a score of 50 or less never occurs, find the following probabilities:

1. $P[\text{“grade 79”}]$
2. $P[\text{“grade 100”}]$
3. $P[A]$
4. $P[F]$
5. $P[T \geq 80]$
6. $P[T < 90]$
7. $P[\text{“a } C\text{grade or better”}]$
8. $P[\text{“student passes”}]$

Question 3

Monitor a phone call. Classify the call as voice call (V) if someone is speaking, or a data call (D) if the call is carrying a modem or fax signal. Classify the call as long (L) if the call lasts for more than three minutes; otherwise classify the call as brief (B). Based on the data collected by the telephone company, we use the following probability model: $P[V] = 0.7, P[L] = 0.6, P[VL] = 0.35$. Find the following probabilities:

1. P[DL]
2. P[D $\cup$ L]
3. P[VB]
4. P[V $\cup$ L]
5. P[V $\cup$ D]
6. P[LB]