

University of Colorado
Department of Civil, Environmental and Architectural Engineering
CVEN 5454 Quantitative Methods

Homework #2

Due February 8th, 2005

Topics: Probability concepts and Random Variable – Chapters 2 and 3.

1. A water tower is located in an active earthquake region. When an earthquake occurs, the probability that the tower will fail depends on the magnitude of the earthquake and also on the amount of storage in the tank at the time of shaking of the ground. For simplicity, assume that the tank is either full (F) or half-full (H) with relative likelihoods of 1 to 3. The earthquake magnitude may be assumed to be either strong (S) or weak (W) with relative frequencies 1 to 9. When a strong earthquake occurs, the tower will definitely collapse regardless of the storage level. However the tower will certainly survive a weak earthquake if the tank is only half-full. If the tank is full during a weak earthquake, it will have a 50-50 chance of survival. If the tower collapsed during a recent earthquake, what is the probability that the tank was full at the time of the earthquake?

2. For a county in Texas, the probabilities that it will be hit by one or two hurricanes each year are 0.3 and 0.05, respectively. The event that it will be hit by three or more hurricanes in a year may be assumed to have negligible probability. This county may be subjected to floods each year from the melting of snow in the upstream regions, or from the heavy precipitation brought by hurricanes, or both. Normally, the chance of flood in a year, caused by the melting snow only, is 10%. However, during a hurricane there is a 25% probability of flooding. Assume that floods caused by the melting snow and floods caused by hurricanes are independent events. What is the probability that there will be flooding in this county in a year?

3. Problem 23 of Section 2.6 (page 56) - Conditional probability

4. Problem 7 of Section 2.8 (page 61) - Baye's rule

5. Problem 8 (of Section 3.1-3.3) page 73 - Discrete Random Variable

6. Problem 8 of Section 3.4 (page 84) - Continuous Random Variable

7. (i) Draw the joint PDF (ii) Marginal PDF of X and Y and (iii) The conditional PDF of Y given X=43