

EE 464

Homework 3

Due Monday February 24, 2003

Work all 11 problems.

Problem 1. Leon-Garcia Ch.2 problem 72.

Problem 2. Leon-Garcia Ch.2 problem 73.

Problem 3. Leon-Garcia Ch.3 problem 3.

Problem 4. Leon-Garcia Ch.3 problem 4.

Problem 5. Leon-Garcia Ch.3 problem 12.

Problem 6. Leon-Garcia Ch.3 problem 15.

Problem 7. Leon-Garcia Ch.3 problem 17.

Problem 8. Suppose that f and g are probability density functions (pdf's) defined on the same interval $[a, b]$.

- Show that $f + g$ is not a valid pdf on the same interval.
- For any number β , $0 < \beta < 1$, show that $\beta f(x) + (1 - \beta)g(x)$ is a valid pdf on the interval $[a, b]$.

Problem 9. If the random variable K is uniformly distributed over $(0, 5)$, what is the probability that the roots of the equation $4x^2 + 4Kx + K + 2 = 0$ are real.

Problem 10. Suppose that the random variable X has possible values 1, 2, 3,... and that

$$P(X = r) = k(1 - \beta)^{r-1}, \quad 0 < \beta < 1.$$

- Determine the constant k .
- Find the *mode* of this distribution, i.e., find that value of r which makes $P(X = r)$ maximum.

Problem 11. Say someone has two coins and tells you that one of the coins has 2 heads and the other coin is fair (you cannot see the coins).

- a. Suppose the person flips the coins one after another. Let $X = 1$ if the first toss is heads and $X = 0$ if the first toss is tails. Let $Y = 1$ if the second toss is heads and let $Y = 0$ if the second toss is tails. Are X and Y independent random variables? Explain your answer.
- b. Suppose the person flips just one of the coins and it turns up heads. Based only on this information can you say which coin is most likely the fair coin? If so, justify your answer. If not, explain why.