

EECE 574: Probability and Random Processes

Quiz #04 (Mar. 26, 2015)

Time allowed \leq 30 minutes

Student #: _____

Name: _____

Problem 1: _____ / 10

Problem 2: _____ / 10

Problem 3: _____ / 10

Problem 4: _____ / 10

Total: _____ / 40

Score: _____ / 100

Problem 1. (10 points: 2 points each) Answer the following questions.

(a) (2 points) Given a probability space (Ω, \mathcal{A}, P) , a real-valued random variable X is a _____ from Ω into _____.

(b) (2 points) Given a random variable X , _____ is fully characterized by the cumulative distribution function of X defined as

$$F_X(x) \triangleq \Pr(X \leq x), \forall x \in \bar{\mathcal{R}}.$$

(c) (2 points) Given a random variable X , its cdf $F_X(x)$ has following properties.

- (i) The cdf $F_X(x)$ always _____ and _____.
- (ii) right _____, and non_____.
- (iii) $F_X(-\infty) = ______$, and $F_X(\infty) = ______$.

(d) (2 points) Classify the set of all real-valued random variables into three categories.

(e) (2 points) The _____ of a discrete random variable X is defined as

$$P_X(x) \triangleq \Pr(X = x) = P(\{\omega \in \Omega : X(\omega) = x\})$$

Problem 2. (5 points) We have three coins. The first is fair, the second is two-headed, and the third is biased in that the probability of heads is $1/3$. We pick one of the coins at random, and toss it three times. In this situation, let the random variable X represent the number of heads. Find and sketch $F_X(x)$.

Problem 3. (5 points) A submarine attacks an aircraft carrier. Assume that the submarine fires n torpedoes and that the probability of a hit is p for each torpedo. Find the probability that the number of hit torpedo is k .

Problem 4. (10 points) 1982년 어느날, 준호와 원찬이는 부산 금강공원에 놀러갔다. 놀이동산을 돌아다니던 준호와 원찬이는 장난감 총을 쏘 물건을 맞추면 상품을 주는 총쏘기 게임을 보고, 같이 총쏘기 게임을 하기로 했다. 준호와 원찬이는 각각 10발의 총알을 쏠 기회가 있다. 하지만, 준호와 원찬이가 각각 자신의 상품에 9발을 쏘았지만 상품을 맞추지 못했고, 각자 1발의 기회만 남게되었다. 마지막 한 번의 기회가 남아 준호가 원찬이에게 “각자 원하는 상품에 총을 쏘지 말고, 하나의 상품에 총을 같이 쏘자”라고 제안했다. 준호가 원찬이에게 제안한 방법은 기존의 방법보다 상품을 얻을 확률이 높아지겠는가? 이 과목에서 배운 내용을 사용하여 서술하시오.