

國立中山大學資訊工程學系
104學年度第1學期博士班資格考試

科目：機率學

1. (20%) Romeo and Juliet have a date at a given time, and each will arrive at the meeting place with a delay between 0 and 1 hour, with all pairs of delays being equally likely. The first to arrive will wait for 10 minutes and will leave if the other has not yet arrived. What is the probability that they will meet?
2. (20%) A test for a certain rare disease is correct 98% of the time. A person has a probability of 0.002 of having the disease. Given that a person just tested positive, what is the probability that he actually has the disease?
3. (20%) Suppose n people throw their hats in a box and then each picks one hat at random. Let H be the number of people that get back their own hat?
 - What is the expectation of H ?
 - What is the variance of H ?
4. (20%) The time until a small meteorite first lands anywhere in the Sahara desert is modeled as an exponential random variable with a mean of 5 days. The time is currently midnight. What is the probability that a meteorite first lands sometime between 9 a.m. and 6 p.m. of the first day?
5. (20%) Two archers shoot at a target. The distance of each shot from the center of the target is uniformly distributed from 0 to 2, independent of the other shot. What is the probability density function of the distance of the losing shot from the center?