

國立中山大學資訊工程學系  
博士班資格考試

科目：機率學

1. (20%) Chris flips a fair coin. Let  $C$  be the random number of flips until back-to-back heads occur. What is the expected value of  $C$ ?
2. (20%) Let  $U \sim \mathbf{uniform}[1, 365]$  be a discrete uniform random variable that takes an integer value in the range of  $[1, 365]$ . What is the variance of  $U$ ?
3. (20%) John and Paul arrange schedule a dinner at 6 pm. Suppose they arrive at the restaurant with delays  $J$  and  $P$ . Assume  $J$  and  $P$  are independent exponential random variables with expected values of 20 minutes, and the first to arrive will wait for 20 minutes. What is the probability that they eat the dinner together?
4. (20%) In an archery contest, let  $A$  and  $B$  be the distances to the center of the target of the shots by two archers. Suppose  $A$  and  $B$  are independently and uniformly distributed in  $0 - 20$  cm. What is the probability that the winning shot is more than 10 cm from the center of the target?
5. (20%) Let  $X$  be a Gaussian (normal) random variable with mean  $\mu$  and variance  $\sigma^2$ . What are the expectation of  $Y = X^2$  and  $Z = X^3$ ?