

國立成功大學

111學年度碩士班招生考試試題

編 號： 290

系 所： 環境醫學研究所

科 目： 機率與統計

日 期： 0220

節 次： 第 2 節

備 註： 可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Please provide complete and detailed calculations. If only answers are provided, then no credits are to be given.

**A. (10%)**

A shipment of 20 DVD players contains 5 that are defective. If 10 of them are randomly chosen for inspection, what is the probability that 2 out of the 10 will be defective?

**B. (20% with 10% each)**

It is known that 5% of the books are defective in binding. Find the probability that 2 of the 100 books will be defective in binding, using

1. the binomial distribution;
2. the Poisson approximation to the binomial distribution.

**C. (30% with 10% each)**

If the joint probability density function of 2 random variables is given by

$$f(x_1, x_2) = \begin{cases} 6e^{-2x_1-3x_2}, & \text{for } x_1 > 0, x_2 > 0 \\ 0, & \text{elsewhere} \end{cases}$$

Find the probability that

1. The first random variable will take on a value less than 2 and the second random variable will take on a value greater than 2.
2. Find the joint distribution function of the 2 random variables.
3. Check whether the 2 random variables are independent.

**D. (20%)**

If 2 random variables have the joint probability density given below, find the conditional density function of the first variable given that the second variable takes on  $x_2$ ,

$$f(x_1, x_2) = \begin{cases} 2/3(x_1 + 2x_2), & \text{for } 0 < x_1 < 1, 0 < x_2 < 1 \\ 0, & \text{elsewhere} \end{cases}$$

**E. (20% with 10% each)**

If  $X_1$  has mean 4 and variance 9, while  $X_2$  has mean -2 and variance 5. The 2 random variables are independent, find

1.  $E(2X_1 + X_2 - 5)$
2.  $\text{Var}(2X_1 + X_2 - 5)$