國立成功大學 104 學年度碩士班招生考試試題

系所組別：環境醫學研究所丙組

考試科目：統計學

考試日期：0212，節次：2

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

A. (10% with 5% each)

Prove that if A and B are independent events,

1. $\bar{A}$ and B are independent.
2. $\bar{A}$ and $\bar{B}$ are independent.

B. (10%)

Suppose that A and B are independent events associated with an experiment. If the probability that A or B occurs equals 0.6. The probability that A occurs equals 0.4. What is the probability that B occurs.

C. (10%)

We have two urns, 1 and 2, each with two drawers. Urn 1 has a gold coin in one drawer and a silver coin in the other drawer. Urn 2 has a gold coin in each coin. One urn is chosen at random; then a drawer is chosen at random from the chosen urn. The coin found in this drawer is a gold coin. What is the probability that the coin came from urn 2?

D. (10%)

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

E. (10% with 5% each)

Assume that $E(X_1) = E(X_2) = 1.5$, $Var(X_1) = Var(X_2) = 0.25$, and the correlation coefficient between X_1 and X_2 is 0.5. Let $D = 3X_1 - 2X_2$,

1. The expected value of D?
2. The variance of D?

F. (15% with 5% each)

Suppose that the two-dimensional random variable (X, Y) has joint pdf

$f(x, y) = kx(x - y)$ for $0<x<2$, $-x<y<x$; $f(x, y) = 0$, elsewhere.

1. Evaluate the constant k.
2. Find the marginal pdf of X.
3. Find the marginal pdf of Y.

G. (20% with 10% each)

Suppose that the joint pdf of the two-dimensional random variable (X, Y) is given by $f(x, y) = x^2 + \frac{xy}{3}$ for $0<x<1$, $0<y<2$; $f(x, y) = 0$, elsewhere. Compute the following.

1. $Pr(X > 0.5)$;
2. $Pr(Y < X)$.

H. (15% with 5% each)

Assume that birthweights are normally distributed with a mean of 3400 g and a standard deviation of 700 g.

1. Find the probability of a low-birthweight child, where low birthweight is defined as ≤ 2500 g.
2. Find the probability of a very low birthweight child, where very low birthweight is defined as ≤ 2000 g.
3. Assuming that successive deliveries by the same woman have the same probability of being low birthweight, what is the probability that a woman with exactly 3 deliveries will have 2 or more low birthweight deliveries?