國立嘉義大學100學年度

管理學院碩士班招生考試試題

科目：統計學

1. An illusionist claims that she has the ability to toss a coin so that it turns up heads. Listed below are results from a test of her abilities.

(1) Consider only the results from the tosses of a quarter. What is the probability of getting nine heads in nine tosses if the outcomes are determined only by chance？What does that result suggest about the claim that a coin can be tossed so that it turns up heads? Explain. (10 分)

(2) Are the results from the quarter independent of the results from the penny, or are the sample data matched pairs? Explain. (5 分)

(3) Using all of the results combined with a 0.05 significance level, test the claim that a coin can be tossed so that heads turn up more often than can be expected by chance. (10 分)

Quarter:	H	H	H	H	H	H	H	H	H
Penny:	H	H	T	H	T	H	H	T	T

2. The accompanying table lists the amounts of greenhouse gases emitted by different cars in one year.

Emission of Greenhouse Gases (tons/year)

	4 Cylinders	6 Cylinders	8 Cylinders
Automatic	10	12	14
Manual	10	12	12

Note：$F_{1, 2, 0.05}=18.513$　　$F_{2, 2, 0.05}=19.000$

(1) Assuming that there is no interaction effect, is there sufficient evidence to support the claim that amounts of emitted greenhouse gases are affected by the type of transmission (automatic/manual)? (α=0.05) (10 分)

(2) Assuming that there is no interaction effect, is there sufficient evidence to support the claim that amounts of emitted greenhouse gases are affected by the number of cylinders? (α=0.05) (10 分)

(3) Based on the results from parts (1) and (2) , can we conclude that greenhouse gas emissions are not affected by the type of transmission or the number of cylinders? Why or why not? (5 分)

3. Consider the following simple linear regression model,

$y_i=\alpha+\beta x_i+\varepsilon_i$

where y_i is the dependent variable, x_i is the independent variable, and ε_i is a random error with mean zero and variance σ^2 .

(1) Prove that SST=SSR+SSE. SST is the total sum of squares. SSR is the explained sum of squares. SSE is the unexplained sum of squares. (10 分)

(2) What is the relationship between R^2 and the sample correlation coefficient between y_i and x_i ? R^2 is the coefficient of determination. (10 分)

(3) What is the relationship between R^2 and the sample correlation coefficient between y_i and $\hat{y}_i=\hat{\alpha}+\hat{\beta}x_i$? R^2 is the coefficient of determination. $\hat{\alpha}$ and $\hat{\beta}$ are the least squared estimators of α and β , respectively. (10 分)

4. Suppose $P(A)=0.55$ and $P(B)=0.2$.

(1) Find $P(A\cup B)$ if A and B are independent. (5 分)

(2) Find $P(A\cup B)$ if A and B are mutually exclusive. (5 分)

(3) Find $P(A\cap B^c)$ if A and B are mutually exclusive. B^c is the complement of an event B. (5 分)

(4) Find $P(B\cap A^c)$ if A and B are mutually exclusive. A^c is the complement of an event A. (5 分)