淡江大學九十四學年度碩士班招生考試試題

系別：經濟學系　　科目：統　計　學

准帶項目請打「V」	
V	簡單型計算機

本試題共 3 頁

本試題雙面印製

依題號(大題、小題)順序作答，順序錯亂者不計分。

I. (每題8分，共40分)

1. Let $P(A)=0.5$, $P(B)=0.6$, and $P(A\cap B)=0.3$. Then $P(A^C \cup B^C)=$

   (a) 0.4　(b) 0.6　(c) 0.7　(d) 0.8　(e) 0.9

2. A system has two components placed in series so that the system fails if either of the two components fails. The first component is twice as likely to fail as the second. If the two components operate independently, and if the probability that the entire system will fail is 0.28, then what is the probability that the first component will fail?

   (a) 0.1　(b) $\frac{0.28}{3}$　(c) 0.2　(d) $\frac{0.56}{3}$　(e) 0.14

3. There are 5 boys and 5 girls waiting to be interviewed. In determining an interview order for these boys and girls, a girl must be interviewed first, and successive candidate must be of opposite sex. How many different interview orders are possible for these boys and girls?

   (a) 5!　(b) $(5!)^2$　(c) 2(5!)　(d) 10!　(e) $\frac{10!}{2}$

4. Let X and Y be independent random variables with E(X) = -2, E(Y) = 3, and Var(X) = 4Var(Y) = σ^2. If $X^2+m(X^2-4Y^2)$ is an unbiased estimator for σ^2, then what is the value of m?

   (a) $\frac{-1}{10}$　(b) $\frac{1}{8}$　(c) $\frac{3}{13}$　(d) $\frac{1}{9}$　(e) $\frac{4}{13}$

5. Let $X_1,\ldots,X_m$ and $Y_1,\ldots,Y_n$ be independent random samples from a normal distribution with unknown mean μ and unknown variance σ^2.

   Let $\bar{X}=\frac{\sum_1^m x_i}{m}$, $\bar{Y}=\frac{\sum_1^n y_i}{n}$, $S_X^2=\frac{\sum_1^m (X_i-\bar{X})^2}{m-1}$, and $W=\alpha\frac{\bar{Y}-\bar{X}}{S_X}$,

   where α is a constant. If W has a Student's t-distribution with appropriate degrees of freedom, what will be the value of α?

   (a) $\left[\frac{mn}{(m+n)(m-1)}\right]^{\frac{1}{2}}$　(b) $\sqrt{\frac{mn}{m+n}}$　(c) $\frac{1}{\sqrt{2}}$

   (d) $\sqrt{\frac{mn}{(m+n-1)}}$　(e) $\left[\frac{(m-1)n}{(m+n-1)}\right]^{\frac{1}{2}}$

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II. (每題 10 分，共 20 分)

6. Let $Y_1,\ldots,Y_n$ be random variables. $E(Y_i) = 2 + \beta x_i$, $i = 1,\ldots,n$. Given observations $(x_1, y_1),\ldots,(x_n, y_n)$, find the least square estimate for β.

7. Data come in different formats. Assume that there are three basic data types, namely cross-sectional, time series, and panel (or longitudinal) data.
Fill in an appropriate type name for the following data (a), (b), and (c)..

(a)

Observation	Person	Year	Income
1	John	2000	$356,000
2	John	2001	$423,540
3	John	2002	$410,900
4	John	2003	$432,500

(b)

Observation	Person	Year	Income
1	John	2000	$356,000
2	Mary	2000	$ 321,000
3	John	2001	$423,540
4	Mary	2001	$382,900
5	John	2002	$410,900
6	Mary	2002	$385,400
7	John	2003	$432,500
8	Mary	2003	$400,100
Etc.	Etc.	Etc,	Etc.

(c)

Observation	Person	age	Income
1	John	28	$356,000
2	Mary	28	$323,540
3	Tom	30	$410,900
4	George	31	$432,500

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III. ((a) 小題27分，(b) 小題3分，(c) 小題5分，及(d) 小題5分，共40分)

8. Consider some observations on y and x. Assume that observations (y, x) can be described by the simple linear regression model $y = \beta_1 + \beta_2 x + e$ and that all the assumptions of the simple linear regression model hold. We obtain the following results:

Source	SS	df	MS
Model	23.9499	(*1)	23.9499
Residual	.608072954	(*2)	(*3)
Total	24.557973	14	(*4)

Number of obs	= (*5)
F((*6) , (*7))	=512.03
Prob > F	= 0.0000
R-squared	= 0.9752
Adj R-squared	= 0.9733
Root MSE	= .21627

y	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
x	.2924643	.0129249	(*8)	0.000	.2645417	.3203868
_cons	.4656191	(*9)	3.96	0.002	.2117439	.7194942

(a) Fill in the value through (*1) to (*9).(小數點以下，四捨五入至第三位)

(b) We have known that Adj R-squared (= 0.9733) can be expressed as $\left[1-\frac{(*m)}{(*n)}\right]$, where $(*m)$ and $(*n)$ are one of the (*1),...,(*9) respectively, find (m,n).

(c) With a 1 percent significance level, test the hypothesis $H_0 : \beta_1 = 0$ against the alternative that $H_1 : \beta_1 \neq 0$, and then test the hypothesis $H_0^* : \beta_2 = 0$ against the alternative that $H_1^* : \beta_2 \neq 0$.

(d) With the same data set, if we create a new variable $z = cx$, where c is a positive number, and run $y = \alpha_1 + \alpha_2 z + e$, find the least square estimate for α_2.