國立成功大學 107 學年度碩士班招生考試試題

系　　所：國際企業研究所

考試科目：統計學

考試日期：0206，節次：3

※ 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。

I.　True or False (30 points, 3 pts each)

1. If Type I error is too large, then Type II error will be smaller. This means that there is a tradeoff between Type I and Type II errors.
2. The correlation measure can be used to evaluate metric variables but cannot be used to non-metric variables.
3. The better stratified sampling is to make the correlation across strata as high as possible.
4. The commonly adopted standardized Z method changes the location and scale of the original variables. Accordingly, the spread size of the original variable will be changed as well.
5. If there are lots of observations on the both ends, then the skewness could be extremely high.
6. A researcher found that the cumulative probabilities are higher at both tails of a distribution. Therefore, this distribution must have large kurtosis.
7. The quantiles of a distribution can be used to measure the spread of a distribution.
8. The mean of a distribution is not affected by the variance of a distribution.
9. If the marginal distribution of two variables are normal, then their joint distribution will be normal.
10. The significance of regression coefficients is invariant to the scale of measured variables.

II. Choose the BEST answer (45 points, 3 pts each)

Use the following information to answer Questions 1 to 3.

The following table contains seven months of returns

Month	1	2	3	4	5	6	7
Return	2.12%	2.35%	3.73%	4.14%	1.25%	0.25%	0.15%

1. What is the geometric mean return?

(A) 1.92%
(B) 1.99%
(C) 2.24%
(D) 2.27%

2. What is the population mean of these returns if the population distribution of returns is normally distributed and the population standard deviation of returns is equal to 2.50%?

(A) 2.02%
(B) 2.00%
(C) 1.95%
(D) 1.85%

3. What is the approximate probability of the portfolio returns less than 5.135% using the sampling information?

(A) 10.50%
(B) 11.25%
(C) 12.50%
(D) 12.85%

Use the following information to answer Questions 4 to 6.

The following information is provided by an economist:

Variable	Mean	Variance	Covariance (x,y)
x	6.0410	9.7096	7.0298
y	4.3737	5.0895	

4. What is the approximate variance of $y^2 + 0.15$?

(A) 389.4339
(B) 388.5440
(C) 387.6551
(D) 386.7662

5. What is the approximate variance of $\log(1 + x)$?

(A) 0.4282
(B) 0.3171
(C) 0.2060
(D) 0.1959

6. What is the approximate covariance of $y^2 + 0.15$ and $\log(1 + x)$?

(A) 7.6223
(B) 8.7334
(C) 9.8445
(D) 10.9556

The Questions from 7th to 9th are of the same group

7. An economist designed a prediction model aiming to predict the number of financial crises happening for a ten-year duration. This prediction model was simulated for 10,000 times and generated 20,000 financial crises. What would be the predicted average number of financial crises happening in a ten-year duration using this prediction model?

(A) zero
(B) one
(C) two
(D) three

8. Based on information of the previous question, what will be the chance of the financial crisis happening again for the next 5 years?

(A) 69.54%
(B) 67.43%
(C) 65.32%
(D) 63.21%

9. Based on information of the previous two questions, the current economy is assumed to have only good and bad economic conditions. If the probability of good economy is 0.7 and the chance of the financial crisis happening under the bad economy is 80%, what is chance of the financial crisis happening under the good economy?

(A) 55.91%
(B) 56.01%
(C) 57.12%
(D) 58.25%

Use the following information to answer Questions 10 to 12.

A semi-conductor foundry currently has the following contingency table:

	Process		
Improvement	Process A	Process B	Total
HI	190	120	310
LO	35	80	115
Total	225	200	425

10. What is the Kendall's tau-b statistic for testing whether these two processes have the similar improvement?

(A) 0.542
(B) 0.453
(C) 0.364
(D) 0.275

11. What is the critical range for the proportion difference between Process A and Process B regarding the improvement if the critical probability of 5% used in the Chi-Square test ($\chi^2(0.95,1)=3.841$)?

(A) 0.083
(B) 0.072
(C) 0.061
(D) 0.059

12. What is the adjusted standardized residual in the cell of Process A and the HI improvement?

(A) 3.48
(B) 4.57
(C) 5.66
(D) 6.75

Use the following information to answer Questions 13 to 15.

The manufacture of LED TVs makes upper and lower specification limits (USL and LSL) according to customers' needs with the following standardized Z value intervals of [Z value of LSL, Z value of USL]=[1.6368, 3.3626].

13. What is the capacity index, defined as (USL-LSL)/(6×SD), meeting specification limits if the standard deviation (SD) is 1.089?

(A) 0.2876
(B) 0.2865
(C) 0.2754
(D) 0.2643

14. If the USL is raised to 14, the Z value of USL becomes 5.08844, what is the approximate average of observations?

(A) 7.3469
(B) 8.4570
(C) 9.5681
(D) 10.6792

15. What is the LSL value?

(A) 7.57
(B) 8.46
(C) 9.35
(D) 10.24

III. Partial Credit Questions and Fill in the Blanks (25points, 5 pts each)

Notes:

(1) Write down your answers along with associated blanks.
(2) Try to write your calculation process with associated blanks
(3) Label blanks in alphabetical order.

1. The following table shows the preference levels of students in different college levels for three computer brands. (1 means the least preference while 7 means the greatest preference) (Type III sum of squares are employed here)

	College Level			
Computer Brand	Freshman	Sophomore	Junior	Senior
A	5	3	6	7
A	4	2	1	5
B	4	6	5	3
B	5	5	4	5
C	2	5	7	7
C	1	6	5	6

(1) What is the sum of squares due to college levels? ___(a)___
(2) What is the sum of squares due to interaction between college levels and computer brands? ___(b)___
(3) What is the F value for testing the interaction effect between levels and computer brands? ___(c)___

2. A cellular phone company tried to understand whether the price reduction program for replacing old batteries can regain the consumers' confidence about their products. They conducted two surveys of the pre-program and the post-program from the same 15 people (1 means the least confidence while 10 means the greatest confidence)

	Program Survey Timing	
Participant ID	Pre-Program	Post-Program
1	6	5
2	3	7
3	5	8
4	4	3
5	3	5
6	8	7
7	2	8
8	4	7
9	6	6
10	7	7
11	2	8
12	5	10
13	8	6
14	4	6
15	9	8

(1) If we perform the Wilcoxon signed-rank test on these surveys, what will be the sum of ranks for constructing the test statistics? ___(d)___

(2) If we classify the consumers' preference levels to the dichotomous values ("No" for 1 to 5 means lower preference while "Yes" for 6 to 10 means higher preference), what is the Chi-square value for the McNemar test? ___(e)___