

國立中央大學101學年度碩士班考試入學試題卷

所別：資訊管理學系碩士班 甲組(一般生) 科目：統計學 共 2 頁 第 1 頁
 資訊管理學系碩士班 乙組(一般生)

本科考試禁用計算器

*請在試卷答案卷(卡)內作答

Note: A. In case the given data are not enough to compute the result, you may use well-defined symbols to represent.

B. You may use the following statistics to complete the question set.

$$(Z_{0.05} = 1.645, Z_{0.025} = 1.960, t_{df=15,0.025} = 2.131, t_{df=15,0.05} = 1.753, t_{df=16,0.025} = 2.120, t_{df=16,0.05} = 1.746)$$

$$(\chi^2_{df=1,0.05} = 3.8415, \chi^2_{df=2,0.05} = 5.9915, \chi^2_{df=1,0.025} = 5.0239, \chi^2_{df=2,0.025} = 7.3778)$$

- Why is the variance used to measure variability of data? (3 points)
- What does "the coefficient of correlation equals 0" mean? (3 points)
- What is a random variable? (3 points)
- There is a radar, a computer, and a gyroscope on board an airplane. The probability that the radar fails is 0.2. If the radar fails, the gyroscope will also fail, and the probability that the computer fails is 0.3. If the radar functions correctly, then the computer will also function correctly, and the probability that the gyroscope fails is 0.2. (8 points)

(1) Describe the sample space.

(2) What is the probability that the radar functions correctly if one of the other two systems fails?

- Let Y be $b(100, p)$. To test $H_0: p = 0.08$ against $H_1: p < 0.08$, we reject H_0 and do not reject H_1 if and only if $Y \leq 6$. (為節省紙張, 本題未附機率分配表, 請考生假設本題僅附上 Poisson 分配表, 將過程寫至接近答案的計算式後, 最後答案說明若能查表, 考生將依據哪些資料查表即可) (8 points)

(1) Determine the significance level α of the test.

(2) Find the probability of the Type II error if in fact $p=0.04$.

- It is claimed that the median weight m of certain loads of candy is 40,000 pounds. (8 points)

(1) Use the given 13 observations and the Wilcoxon statistic to test, at an approximate significance level of $\alpha = 0.05$ the null hypothesis $H_0: m=40,000$ against the one-sided alternative hypothesis $H_1: m < 40,000$. Those 13 observations are

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 41,195 | 39,485 | 41,229 | 36,840 | 38,050 | 40,890 | 38,345 |
| 34,930 | 39,245 | 31,031 | 40,780 | 38,050 | 30,906 | |

(2) Use the same 13 observations given above and the sign test to test the same hypothesis.

- A student is to compute the standard deviation of the numbers from one to forty-nine. She uses a continuous uniform distribution ranging from one to forty-nine to compute. (1) What is the standard deviation of the continuous uniform distribution? (2) Do you think if the adopted continuous uniform distribution is appropriate? If not, explain why and compute the correct standard deviation. (8 points)

- A region contains four different temperature areas. The lowest temperatures of the four areas are -4, -2, 0, 2 °C, respectively. We choose any two different areas as a sample and compute its average temperature. (1) List the sampling distribution of the average of the samples. (2) Compute the expected value and the variance of the average of the sampling distribution. (3) Describe the relationship between the computed variance of the average of the sampling distribution and the variance of the population distribution with the given data. (9 points)

注意：背面有試題

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9. A random variable, X , of a population is distributed normally with the unknown variance. A sample with a size of 16 is randomly selected. The average and the variance of the sample are 10 and 25, respectively. Compute the confidence interval of the average with a significant level of 0.05. (8 points)
10. A class with 50 students asks each student in class to make three calls to perform market survey. Following table summarizes the number of success to complete a market survey.

| | | | | |
|----------------|----|----|----|---|
| No of success | 0 | 1 | 2 | 3 |
| No of students | 14 | 22 | 10 | 4 |

Test with a significant level of 0.05 if the number of success to complete a market survey for students appears to be a binomial distribution. (9 points)

11. Please give two examples of relationships you would expect to be curvilinear. Give the variables as well as the conditions under which you would expect the curvilinearity to occur. (12 points)
12. What is randomized block design? What are the differences between randomized block design and completely randomized design? Please give an example when randomized block design is more appropriate than completely randomized design and explain the superiority of randomized block design. (11 points)
13. An agency offers students preparation courses for a graduate school entrance examination. As part of an experiment to evaluate the merits of the course, a random sample of thirty male university seniors and another thirty female university seniors is drawn to conduct the test. Should we consider these to be dependent samples, because the two groups are "matched" on the time participating in the course? (10 points)

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