國立臺北科技大學101學年度碩士班招生考試

系所組別：4410、4420服務與科技管理研究所甲、乙組

第一節　統計學　試題

注意事項：

1. 本試題共兩大題五十小題，配分共100分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

A. **MULTIPLE CHOICE QUESTIONS (Total 50 points and each question 2 points)**

1. In testing the hypotheses $H_0: \mu = 100$ vs. $H_1: \mu < 100$, the sample mean is found to be 58. The null hypothesis:
   a. should be rejected at α=0.05
   b. should not be rejected at α=0.05
   c. should be rejected only if $n > 30$
   d. None of the above

2. Consider the following ANOVA table:

Source of Variation	*SS*	*df*	*MS*	*F*
Treatments	192	4	48	1.778
Error	405	15	27	
Total	597	19		

   The number of observations in all samples is:
   a. 15
   b. 19
   c. 20
   d. 27

3. Which of the following is not an advantage of multiple regression as compared with analysis of variance?
   a. Multiple regression can be used to estimate the relationship between the dependent variable and independent variables.
   b. Multiple regression handles qualitative variables better than analysis of variance.
   c. Multiple regression handles problems with more than two independent variables easier than analysis of variance.
   d. None of the above is advantages of multiple regression as compared with analysis of variance.

4. In a multiple regression model, the standard deviation of the error variable ε is assumed to be:
   a. constant for all values of the independent variables
   b. constant for all values of the dependent variable
   c. 1.0
   d. not enough information is given to answer this question

5. What do we mean when we say that a simple linear regression model is "statistically" useful?
   a. All the statistics computed from the sample make sense
   b. The model is an excellent predictor of y
   c. The model is "practically" useful for predicting y
   d. The model is a better predictor of y than the sample $\bar{y}$

6. In a goodness-of-fit test, suppose that a sample showed that the observed frequency f_i and expected frequency e_i were equal for each cell i. Then, the null hypothesis is
   a. rejected at $\alpha = 0.05$ but is not rejected at $\alpha = 0.025$
   b. not rejected at $\alpha = 0.05$ but is rejected at $\alpha = 0.025$
   c. rejected at any level α
   d. not rejected at any α level

7. Which of the following statements is false?
   a. The sum of squares for treatments (SST) explains some of the variation.
   b. The sum of squares for error (SSE) measures the amount of variation that is unexplained.
   c. The total sum of squares SS(Total) = SST + SSE
   d. The total sum of squares SS(Total) measures the amount of variation within the samples.

8. In an ANOVA test, the test statistic is $F = 6.75$. The rejection region is $F > 3.97$ for the 5% level of significance, $F > 5.29$ for the 2.5% level, and $F > 7.46$ for the 1% level. For this test, the p-value is
   a. greater than 0.05
   b. between 0.025 and 0.05
   c. between 0.01 and 0.025
   d. approximately 0.05

9. In a single-factor analysis of variance, *MST* is the mean square for treatments and *MSE* is the mean square for error. The null hypothesis of equal population means is rejected if:
   a. *MST* is much smaller than *MSE*
   b. *MST* is much larger than *MSE*
   c. *MST* is equal to *MSE*
   d. None of the above

注意：背面尚有試題

10. The analysis of variance is a procedure that allows statisticians to compare two or more population
    a. means
    b. proportions
    c. variances
    d. standard deviations
11. If we want to conduct a test to determine whether a population mean is greater than another population mean, we
    a. can use the analysis of variance
    b. must use the independent samples *t*-test for difference between two means
    c. must use the chi-squared test
    d. All of the above.
12. In a one-way ANOVA, error variability is computed as the sum of the squared errors, *SSE*, for all values of the response variable. This variability is the:
    a. the total variation
    b. within-group variation
    c. between-groups variation
    d. None of the above
13. In the one-way ANOVA where there are k treatments and n observations, the degrees of freedom for the F-statistic are equal to:
    a. n and k
    b. k and n
    c. n-k and k-1
    d. k-1 and n-k
14. One-way ANOVA is applied to three independent samples having means 10, 13, and 18, respectively. If each observation in the third sample were increased by 30, the value of the F-statistics would:
    a. increase
    b. decrease
    c. remain unchanged
    d. increase by 30
15. Which of the following is not a required condition for one-way ANOVA?
    a. The populations are normally distributed
    b. The population variances are equal
    c. The samples are selected independently of each other
    d. The population means are equal
16. After calculating the sample size needed to estimate a population proportion to within 0.05, you have been told that the maximum allowable error must be reduced to just 0.025. If the original calculation led to a sample size of 1000, the sample size will now have to be:
    a. 2000
    b. 4000
    c. 1000
    d. 8000
17. Based on sample data, the 95% confidence interval limits for the population mean are LCL = 124.6 and UCL = 148.2. If the 5% level of significance were used in testing the hypotheses: $H_0 : \mu = 140$ vs. $H_1 : \mu \neq 140$, the null hypothesis:
    a. would be rejected
    b. would not be rejected
    c. would have to be revised
    d. None of the above
18. In testing for the equality of two population variances, when the populations are normally distributed, the 5% level of significance has been used. To determine the rejection region, it will be necessary to refer to the F table corresponding to an upper-tail area of:
    a. 0.950
    b. 0.050
    c. 0.025
    d. 0.100
19. In testing the hypotheses: $H_0 : \mu = 76.5$ vs. $H_1 : \mu > 76.5$, suppose that we rejected the null hypothesis at $\alpha = .05$. Then for which of the following α values do we also reject the null hypothesis?
    a. 0.025
    b. 0.010
    c. 0.100
    d. All α values that are smaller than .05
20. For a sample of size 25 observations taken from a normally distributed population with standard deviation of 6, a 95% confidence interval estimate for the population mean would require the use of:
    a. $t = 2.064$
    b. $t = 1.711$
    c. $z = 1.40$
    d. $z = 1.96$

21. In testing the difference between two population means, for which the population variances are unknown and assumed to be equal, two independent samples are drawn from the populations. Which of the following tests is appropriate?
    a. z-test
    b. Equal-variances t-test
    c. F-test
    d. Matched pairs t-test
22. In testing the difference between two population means using two independent samples, the population standard deviations are assumed to be known and the calculated test statistic equals 1.05. If the test is upper-tail and 10% level of significance has been specified, the conclusion should be:
    a. reject the null hypothesis
    b. do not to reject the null hypothesis
    c. choose two other independent samples
    d. None of the above
23. Random samples of size 49 are taken from an infinite population whose mean is 300 and standard deviation is 21. The mean and standard error of the sample mean, respectively, are:
    a. 300 and 21
    b. 300 and 3
    c. 70 and 230
    d. 49 and 21
24. If a random sample of size n is drawn from a normal population, then the sampling distribution of the sample mean $\overline{X}$ will be:
    a. normal for all values of n
    b. normal only for $n > 30$
    c. approximately normal for all values of n
    d. approximately normal only for $n > 30$
25. If the random variable X is uniformly distributed between 40 and 50, then $P(35 \leq X \leq 45)$ is
    a. 1.0
    b. 0.5
    c. 0.25
    d. 10

B. TRUE / FALSE QUESTIONS (Total 50 points and each question 2 points)

1. For a sample of size 15 taken from a normally distributed population with a standard deviation equal to 4.75, a 90% confidence interval for the population mean would require the use of a table value $z = 1.645$.
2. In a simple linear regression analysis, the least squares regression line has a y-intercept of 8.0, and a slope of 3.50. Then, when $x = 2$, the actual value of y must be 12.
3. The model $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$ is referred to as simple linear regression model.
4. Most statistical software print a second R^2 statistic, called the coefficient of determination adjusted for degrees of freedom, which has been adjusted to take into account the sample size and the number of independent variables.
5. The method of least squares requires that the sum of the squared deviations between actual y values in the scatter diagram and y values predicted by the regression line be minimized.
6. In applying the chi-squared goodness-of-fit test, the rule of thumb for all expected frequencies is that each expected frequency equals or exceeds 5.
7. Statistics practitioners use the analysis of variance (ANOVA) technique to compare two or more populations of interval data.
8. Three tennis players, a beginner, an experienced, and a professional, have been randomly selected from the membership of a large city tennis club. Using the same ball, each person hits four serves with each of five racquet models, with the five racquet models selected randomly. Each serve is clocked with a radar gun and the result recorded. Among ANOVA models, this setup is most like the moving average model.
9. A study will be undertaken to examine the effect of two kinds of background music and of two assembly methods on the output of workers at a fitness shoe factory. Two workers will be randomly assigned to each of four groups, for a total of eight in the study. Each worker will be given a headphone set so that the music type can be controlled. The number of shoes completed by each worker will be recorded. Does the kind of music or the assembly method or a combination of music and method affect output? The ANOVA model most likely to fit this situation is the multiple regression model.
10. The sum of squares for error is also known as the between-treatments variation.
11. In ANOVA, a factor is an independent variable.
12. When the F test is used for ANOVA, the rejection region is always in the right tail.
13. If you are comparing the average sales among 4 different brands you are dealing with a four-way ANOVA design.
14. The number of degrees of freedom for the denominator of a one-way ANOVA test for 5 population means with 12 observations sampled from each population is 60.

注意：背面尚有試題

15. A completely randomized design with 4 groups would have 6 possible pairwise comparisons.
16. If a sample of size 400 is selected, the value of A for the probability $P(-A \leq t \leq A) = 0.95$ is 1.96.
17. If we reject a null hypothesis at the 0.05 level of significance, then we must also reject it at the 0.10 level.
18. If a null hypothesis about the population proportion p is rejected at the 0.05 level of significance, it must be rejected at the 0.10 level.
19. There is an inverse relationship between the probabilities of Type I and Type II errors.
20. The statement of the null hypothesis always contains equality.
21. A sampling distribution is defined as the probability distribution of possible sample sizes that can be observed from a given population.
22. The amount of bleach a machine pours into bottles has a mean of 50 ounces with a standard deviation of 0.25 ounces. Suppose we take a random sample of 36 bottles filled by this machine. The sampling distribution of the sample mean has a standard error of 0.25 ounces.
23. A university employs 2500 faculty and staff. To ascertain how the employees feel regarding a health insurance plan, 250 of the employees are surveyed. The proportion of the 250 employees who favor the health insurance plan is a parameter.
24. A statistics professor bases his final grade on homework, two midterm examinations, and a final examination. The homework counts 10% toward the final grade, while each midterm examination counts 30%. The remaining portion consists of the final examination. If a student scored 95% in homework, 75% on the first midterm examination, 95% on the second midterm examination, and 80% on the final, his final average is 84.5%.
25. A continuous random variable X is uniformly distributed between 5 and 25 (inclusive), then $P(X = 15) = 0.05$.