國立中山大學102學年度碩士暨碩士專班招生考試試題

科目名稱：商用統計學丙【企管系甲班碩士班丙組選考】　　題號：441004

※本科目依簡章規定「不可以」使用計算機　　

所有的答案請不要寫在試題紙上，而要寫在答案卷上。在計算中，您可能會用到的機率分布數值如下:

$Z_{0.1401}=1.08$ $Z_{0.025}=1.96$ $Z_{0.0228}=2$ $Z_{0.02}=2.05$ $Z_{0.01}=2.323$ $Z_{0.001}=3.09$

$t_{16;0.025}=2.12$ $t_{3;0.025}=3.182$ $t_{21;0.025}=2.08$ $t_{18;0.05}=1.734$ $t_{4;0.025}=2.776$

$F_{3,16;0.05}=3.24$ $F_{3,16;0.025}=4.08$ $F_{4,17;0.05}=2.96$ $F_{2,21;0.05}=3.47$

$\chi^2_{15;0.025}=27.48$ $\chi^2_{16;0.025}=28.84$ $\chi^2_{16;0.05}=26.29$ $\chi^2_{15;0.05}=24.99$

一、 單選題（每題2分，共有25題，合計50分）

(1) A graph showing the probability of accepting the lot as a function of the percent of defective in the lot is called
a. a power curve
b. a control chart
c. an operating characteristic curve
d. None of these alternatives is correct.

(2) Normal or natural variations in process outputs that are due purely to chance are
a. common causes
b. assignable causes
c. control causes
d. None of these alternatives is correct.

(3) In multiple regression analysis,
a. there can be any number of dependent variables but only one independent variable
b. there must be only one independent variable
c. the coefficient of determination must be larger than 1
d. there can be several independent variables, but only one dependent variable

(4) A measure of the effect of an unusual x value on the regression results is called
a. Cook's D
b. Leverage
c. odd ratio
d. unusual regression

(5) The adjusted multiple coefficient of determination is adjusted for
a. the number of dependent variables
b. the number of independent variables
c. the number of equations
d. detrimental situations

(6) An ANOVA procedure is applied to data obtained from 6 samples where each sample contains 20 observations. The degrees of freedom for the critical value of F are
a. 6 numerator and 20 denominator degrees of freedom
b. 5 numerator and 20 denominator degrees of freedom
c. 5 numerator and 114 denominator degrees of freedom
d. 6 numerator and 20 denominator degrees of freedom

（7）In hypothesis testing,
a. the smaller the Type I error, the smaller the Type II error will be
b. the smaller the Type I error, the larger the Type II error will be
c. Type II error will not be effected by Type I error
d. the sum of Type I and Ttype II errors must equal to 1

（8）For a two-tail test, the *p*-value is the probability of obtaining a value for the test statistic as
a. likely as that provided by the sample
b. unlikely as that provided by the sample
c. likely as that provided by the population
d. unlikely as that provided by the population

（9）For a lower tail test, the *p*-value is the probability of obtaining a value for the test statistic
a. at least as small as that provided by the sample
b. at least as large as that provided by the sample
c. at least as small as that provided by the population
d. at least as large as that provided by the population.

（10）The *p*-value is a probability that measures the support (or lack of support) for the
a. null hypothesis
b. alternative hypothesis
c. either the null or the alternative hypothesis
d. sample statistic

（11）If a hypothesis is rejected at the 5% level of significance, it
a. will always be rejected at the 1% level
b. will always be accepted at the 1% level
c. will never be tested at the 1% level
d. may be rejected or not rejected at the 1% level

（12）The degrees of freedom for a contingency table with 10 rows and 11 columns is
a. 100
b. 110
c. 21
d. 90

（13）Given an actual demand of 61, forecast of 58, and an α of .3, what would the forecast for the next period be using simple exponential smoothing?
a. 57.1
b. 58.9
c. 61.0
d. 65.5

（14）For the following time series, you are given the moving average forecast.

Time Period	Time Series Value	Moving Average Forecast
1	23	
2	17	
3	17	
4	26	19
5	11	20
6	23	18
7	17	20

The mean squared error equals

a. 0
b. 6
c. 41
d. 164

（15）Consider the following time series.

t	1	2	3	4
Y_i	4	7	9	10

What is the slope of the linear trend equation ?

a. 2.5
b. 2.0
c. 1.0
d. 1.25

（16）Referring to the time series in problem （15）, the forecast for period 5 is

a. 10.0
b. 2.5
c. 12.5
d. 4.5

（17）The sales of a grocery store had an average of $8,000 per day. The store introduced several advertising campaigns in order to ***increase*** sales. To determine whether or not the advertising campaigns have been effective in increasing sales, a sample of 64 days of sales was selected. It was found that the average was $8,300 per day. From past information, it is known that the standard deviation of the ***population*** is $1,200.

The correct null hypothesis for this problem is

a. $\mu \leqq 8000$
b. $\mu \geqq 8000$
c. $\mu = 8000$
d. $\mu \geqq 8250$

（18）Referring to problem (17), the *p*-value is closest to

a. 0.025
b. 0.01
c. 0.0228
d. 0.05

（19）Approximate the binomial probabilities $P(12 \leq X \leq 18, n = 50, p = 0.3)$ by the use of normal approximation.

a. 0.7805
b. 0.7596
c. 0.7206
d. 0.7198

（20）$H_0: \mu = 120$ and $H_1: \mu \neq 120$ are used to test whether a bath soap production process is meeting the standard output of 120 bars per batch. Use a 0.05 level of significance for the test and a planning value of 5 for the standard deviation. Now, if the mean output drops to 117 bars per batch, the firm wants to have a 98% chance of concluding that the standard production output is not being met. How large a sample should be selected?

a. 47
b. 48
c. 45
d. 44

（21）An insurance company selected samples of clients under 18 years of age and over 18 and recorded the number of accidents they had in the previous year. The results are shown below.

Under Age of 18	**Over Age of 18**
$n_1 = 500$	$n_2 = 600$
Number of accidents = 180	Number of accidents = 150

We are interested in determining if the accident proportions differ between the two age groups. Let p_u represent the proportion under and po the proportion over the age of 18. The null hypothesis is

a. $p_u - p_o \leqq 0$
b. $p_u - p_o \geqq 0$
c. $p_u - p_o \neq 0$
d. $p_u - p_o = 0$

（22）Continuing with problem （21）, the pooled proportion is

a. 0.305
b. 0.300
c. 0.027
d. 0.450

（23）Continued, what is the test statistic

a. 0.96
b. 1.96
c. 2.96
d. 3.96

（24）Having the results of problem （21） to （23）, the *p*-value is

a. less than 0.001
b. more than 0.10
c. 0.0228
d. 0.3

(25) The range of the Durbin-Watson statistic is between

a. -1 to 1
b. 0 to 1
c. -infinity to + infinity
d. 0 to 4

二、 計算題（共四題，合計50分）

(1) Shown below is a partial computer output from a regression analysis.〔20分〕

	Coefficient	Standard Error
Constant	10.00	2.00
X_1	-2.00	1.50
X_2	6.00	2.00
X_3	-4.00	1.00

ANOVA

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Regression		60		
Error				
Total	19	140		

a. Use the above results and write the regression equation.
b. Compute the coefficient of determination and fully interpret its meaning.
c. At $\alpha = 0.05$, test to see if there is a relation between X_1 and Y.
d. At $\alpha = 0.05$, test to see if there is a relation between X_3 and Y.
e. Is the regression model significant? Perform an F test and let $\alpha = 0.05$.

(2) The following is the incomplete ANOVA table from a completely randomized design consisting of 3 treatments. 〔8分〕

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Treatments	390.58			
Within Treatments (Error)	158.4			
Total	548.98	23		

a. Using $\alpha = .05$, test to see if there is a significant difference among the means of the three populations. The sample sizes for the three treatments are equal.
b. If in Part a you concluded that at least one mean is different from the others, determine which means are different. The sample means are $\bar{x}_1 = 17.000$, $\bar{x}_2 = 21.625$, and $\bar{x}_3 = 26.875$. Use Fisher's LSD procedure and let $\alpha = .05$.

（3）A company attempts to evaluate the potential for a new bonus plan by selecting a sample of 4 salespersons to use the bonus plan for a trial period. The weekly sales volume before and after implementing the bonus plan is shown below. (For the following **matched samples**, let the difference "d" be d = after - before.)　〔12分〕

	Weekly Sales	
Salesperson	**Before**	**After**
1	48	44
2	48	40
3	38	36
4	44	50

a. State the hypotheses.
b. Compute the test statistic.
c. Use $\alpha = .05$ and test to see if the bonus plan will result in an **increase** in the mean weekly sales.

（4）Let $X_1, X_2, \ldots X_{16}$ be a random sample from a normal distribution $N(77, 5^2)$. Then, compute the probabilities below:　〔10分〕

a. $P(77 < \overline{X} < 79.5)$
b. $P(S^2 < 45.8)$