國立臺北科技大學 102 學年度碩士班招生考試

系所組別：4300 資訊與運籌管理研究所

第二節　統計學　試題

注意事項：

1. 本試題共六大題，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。

Note:

Standard Normal	t Distribution	Chi-Square	F Distribution
$Z_{0.025} = 1.96$ $Z_{0.05} = 1.645$ $Z_{0.005} = 2.601$	$t_{0.05}(9) = 1.833$ $t_{0.05}(8) = 1.860$ $t_{0.025}(9) = 2.262$ $t_{0.025}(8) = 2.306$	$\chi^2_{.01}(2) = 9.21034$ $\chi^2_{.01}(3) = 11.3449$ $\chi^2_{.025}(2) = 7.3776$ $\chi^2_{0.25}(3) = 9.34840$	$F_{0.05}(3,14) = 3.335$ $F_{0.05}(3,12) = 3.490$ $F_{0.05}(2,14) = 3.739$ $F_{0.05}(2,12) = 3.885$

1. An educational economist takes a random sample of 10 individuals and asks for their income (in $1,000s).

Sample	Income y ($1000)
1	25
2	33
3	22
4	41
5	18
6	28
7	32
8	24
9	53
10	26

a) What is the best estimate of the income for sample 11? (5%)

b) What is the standard error of estimate in question a? (5%)

c) What is the 95% confidence interval estimator of the expected value of y based on t distribution? (10%)

2. Continue question 1. This economist collects the education years of these 10 samples.

Sample	education x (in years)
1	11
2	12
3	11
4	15
5	8
6	10
7	11
8	12
9	17
10	11

a) What is the regression line of income y and education x? (10%)

$$\sum x = 118, \sum x^2 = 1450, \sum y = 302, \sum y^2 = 10072, \sum xy = 3779$$

b) Does variable x, education, improve the estimate of income for sample 11 if we know his education is 16 years and why? What is the estimate? (10%)

Hit: You could use the regression line to help this estimate.

c) Please interpret the coefficients of this regression line. (10%)

d) How much does the variable x, education, improve the precision of income estimate in sample 11? What is the R^2 and how to explain it? Hint: Use the standard error without education and with education to explain the precision improvement. (10%)

ANOVA

	自由度	SS	MS	F	顯著值
迴歸	1	805.5063	805.5063	44.10901	0.000162
殘差	8	146.0938	18.26172		
總和	9	951.6			

3. A professor has announced that the grades on a statistics exam have a mean value of 72 and a standard deviation of 6. Not knowing anything about the shape of the distribution of grades, what can we say about the proportion of grades that are between 60 and 84? Hint: use Chebyshev's

theorem. (10%)

4.The local taxation office claims that 10% of the income tax forms processed this year contain errors. Suppose that two of these forms are selected at random. Find the probability distribution of the random variable X, defined as the number of forms selected that contain an error.(10%)

5. A study of the scholastic aptitude test (SAT) revealed that in a random sample of 100 males the mean SAT score was 431.5 with a standard deviation of 93.7. A random sample of 100 female SAT scores produced a mean of 423.9 with a standard deviation of 88.6. Can we conclude at the 1% significance level that male and female scores differ? Hint: 1.use pooled standard deviation. 2.t distribution using z distribution to approach. (10%)

6. The records of an investment banking firm show that, historically, 60% of its clients were primarily interested in the stock market, 36% in the bonds market, and 4% in the futures market. A recent sample of 200 clients showed that 132 were primarily interested in stocks, 52 in bonds, and 16 in futures. Is there sufficient evidence to conclude, at the 1% level of significance, that there has been a shift in the primary interest of clients?(10%)