

# 中原大學 100 學年度 碩士班 入學考試

3 月 19 日 10:30~12:00 會計學系乙組

誠實是我們珍視的美德，  
我們喜愛「拒絕作弊，堅守正直」的你！

科目：統計學

(共 2 頁第 1 頁)

可使用計算機，惟僅限不具可程式及多重記憶者

不可使用計算機

1.

(1) (15 分) 試說明  $Z$ 、 $T$ 、 $\chi^2$ 、 $F$  四種分配的定義及四者間的關係。

(2) (10 points) In regression analysis, explain why the predicted values have larger variances if the independent variables are situated further from  $\bar{X}$

2. (25 points) A statistician estimated the multiple regression model

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$$

with 45 observations. The computer output is shown below. However, because of a printer malfunction, some of the results are not shown. These are indicated by the boldface letters  $a$  to  $l$ .

(1) Fill in the missing results (up to three decimal places).

<i>Predictor</i>	<i>Coef</i>	<i>StDev</i>	<i>T</i>
Constant	<b><math>a</math></b>	3.51	2.03
$x_1$	21.6	<b><math>b</math></b>	4.73
$x_2$	-12.5	7.61	<b><math>c</math></b>

$S = d$        $R\text{-Sq} = e$

## ANALYSIS OF VARIANCE

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	<b><math>f</math></b>	<b><math>i</math></b>	<b><math>j</math></b>	<b><math>l</math></b>
Error	<b><math>g</math></b>	388	<b><math>k</math></b>	
Total	<b><math>h</math></b>	519		

(2) Use the expected values of mean squares to explain why F test is used to test the null hypothesis of no linear relationship between dependent and independent variables.

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3. (25 points) A marketing research trainee in the national office of a chain of shoe stores used the following response function to study seasonal (winter, spring, summer, fall) effects on sales of a certain line of shoes:

$E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$ , the  $X$ 's are indicator variables defined as follows:  $X_1=1$  if season is winter and 0 otherwise;  $X_2=1$  if season is spring and 0 otherwise;  $X_3=1$  if season is fall and 0

otherwise. After fitting the model he tested the regression coefficients  $\beta_j (j = 0, \dots, 3)$  and came to

the following set of conclusions at an 0.05 family level of significance:

$\beta_0 \neq 0, \beta_1 = 0, \beta_2 \neq 0, \beta_3 \neq 0$ . In his report he then wrote: "Results of regression analysis show that climatic and other seasonal factors have no influence in determining sales of this shoe line in the winter. Seasonal influences do exist in the other seasons." Do you agree with this interpretation of the test results? Why?

4. (25 points) The manufacturers of two competing brands of batteries have been arguing about which one is best. To help resolve the dispute a consumer magazine performed an experiment. A battery of each type (or group of batteries when necessary) was inserted into four types of radios and five types of toys. The radios and toys were turned on and the amount of time (in hours) until the batteries wore out was recorded. These data are shown in the accompanying table.

Time to Battery Wear Out

		Brand A	Brand B
Radio	1	7.3	6.8
	2	6.5	6.4
	3	9.7	9.7
	4	10.4	10.2
Toy	1	4.5	4.1
	2	7.3	7.9
	3	6.1	6.0
	4	12.5	12.0
	5	15.8	13.3

- (1). Assume that the times are normally distributed. Can we conclude at the 5% significance level that the two brands of batteries differ?
- (2). Assume that the times are normally distributed. Estimate with 90% confidence the mean difference in times between the two brands of batteries.
- (3). Assume that the times are not normally distributed. Can we conclude at the 5% significance level that the two brands of batteries differ?