



第一部份：單選題（每題2分，計10分）

1. The term heteroskedasticity:
  - (a) refers to autocorrelated error terms.
  - (b) refers to error terms not having the same variance.
  - (c) can only be applied when there is more than one independent variable.
  - (d) all of the above.
  
2. A randomized block design
  - (a) is an extension of the paired t-test.
  - (b) does not require assuming that block variances are equal.
  - (c) can be performed even if the number of blocks exceeds n.
  - (d) is a nonparametric technique.
  
3. A one-sided test at the 5% level of significance will:
  - (a) reject the null hypothesis for test statistic values beyond 1.96.
  - (b) reject the null hypothesis for test statistic values beyond 1.645.
  - (c) will have a minimum power of 0.05.
  - (d) will reject the null hypothesis 5 percent of the time.
  
4. In testing whether the proportion of defectives is within the allowable limit of 2%, a quality control manager selects a random sample of 400. His practice has been to use a significance level of 5%.
  - (a) He will reject the null hypothesis if more than 8 defectives are found.
  - (b) He will reject the null hypothesis if more than 13 defectives are found.
  - (c) He will not reject the null hypothesis only if fewer than 8 defectives are found.
  - (d) He will only reject the null hypothesis if more than 14 defectives are found.
  
5. The ratio of two random variables, each of which follows a Chi-square distribution, will follow a :
  - (a) normal distribution.
  - (b) Chi-square distribution.
  - (c) F-distribution.
  - (d) t-distribution.

第二部份：計算及問答題（計90分）

1. 何謂 Poisson 分配？並說明 Poisson 分配與二項分配在使用上的差異。(10分)
  
2. 何謂無母數統計方法？其優點及缺點有哪些？(10分)
  
3. 常態母群體  $N(\mu, \sigma^2)$ ,  $\sigma^2=9$ 。就假說檢定  $H_0: \mu=1, H_a: \mu>1$ 。(10分)
  - (a) 若  $n=16, \bar{x}=2.5$ , 求 p-value。
  - (b) 若  $\alpha=0.05, n=16$  和  $\bar{x}=2.5$  時，其檢定結果如何？
  - (c) 若在  $\alpha=0.05$  下，試求 power of test at  $\mu=1.5$ 。
  
4. (a) 請說明那些問題可以利用變異數分析 (analysis of variance) 來處理，並說明使用變異數分析的基本假設 (assumptions)。(5分)
  - (b) 變異數分析中若每一樣本資料均加上一定數，是否會影響其分析結果？若每一樣本資料均乘上一非零定數，是否會影響其分析結果？請說明。(5分)
  
5. Two independent random samples selected from normal populations  $N(\mu_i, \sigma_i^2)$ ,  $i=1,2$ , produced the accompanying data summary
 

sample 1 :  $\bar{x}_1 = 22.1, s_1 = 4.8$ , and  $n_1 = 16$

sample 2 :  $\bar{x}_2 = 18.2, s_2 = 3.5$ , and  $n_2 = 12$  (15分)

  - (a) Do the data contain sufficient evidence to conclude that the two population variances are different? ( $\alpha=0.05$ )
  - (b) Suppose  $\sigma_1 = \sigma_2$ . Test the hypothesis  $H_0: \mu_1 = \mu_2, H_a: \mu_1 > \mu_2$  at the  $\alpha = 0.05$  level of significance.

# 國立中央大學八十四學年度碩士班研究生入學試題卷

所別：資訊管理研究所 甲乙組 科目：統計學 共 2 頁 第 2 頁

參考用

6. 收集到25組資料點 (data points)，以多元回歸方法分析以下模式：

$$y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + \varepsilon$$

而此模式之

$$SSE \text{ (誤差項平方和, sum of squared errors)} = 1586.2$$

$$SSR \text{ (回歸項平方和, sum of squares due to regression)} = 6311.7$$

$$\text{Total SS (總平方和, total sum of squares)} = 7897.9$$

(a) 建立回歸分析的變異數分析表 (ANOVA table)。(5分)

(b) 若顯著水準  $\alpha = 0.01$ ，試問  $x_1, x_2, x_3, x_4$  在預測  $y$  時的說明能力。(5分)

(c) 計算  $R^2$  (判定係數)。(5分)

7. 為測試甲、乙兩種輪胎的耐磨程度 (其數字愈高，表示其磨損愈多)，使用兩種不同方式測試：

(a) 第一種方式：將甲、乙兩種輪胎裝置於同一部車子後輪，其測試所得資料如次表

測試車編號	1	2	3	4	5
輪胎甲	8.8	9.7	9.8	10.6	12.3
輪胎乙	8.3	9.1	9.4	10.2	11.8

試問是否有足夠證據說明此兩種輪胎之耐磨程度不一樣？試以完整步驟 (即從 check assumptions 開始) 檢定。(10分)

(b) 第二種方式：將甲、乙兩種輪胎分別裝置於不同車子後輪，其測試所得資料如次表

測試車編號	11	12	13	14	15
輪胎甲	9.8	9.7	8.8	10.6	12.3
輪胎乙	9.4	9.1	8.3	10.2	11.8

試問是否有足夠證據說明此兩種輪胎之耐磨程度不一樣？試以完整步驟 (即從 check assumptions 開始) 檢定。(10分)

參考資料：

$F_{0.025,11,15} = 3.01$	$F_{0.05,11,15} = 2.51$	$F_{0.025,12,16} = 2.89$	$F_{0.05,12,16} = 2.42$
$F_{0.025,15,11} = 3.33$	$F_{0.05,15,11} = 2.72$	$F_{0.025,16,12} = 3.16$	$F_{0.05,16,12} = 2.61$
$F_{0.01,4,20} = 4.43$	$F_{0.01,5,24} = 3.90$	$F_{0.01,5,21} = 4.04$	$F_{0.05,4,20} = 2.87$
$F_{0.05,5,24} = 2.62$	$F_{0.05,5,21} = 2.68$		

$z_{0.1685} = 0.96$	$z_{0.166} = 0.97$	$z_{0.1635} = 0.98$	$z_{0.1611} = 0.99$
$z_{0.0062} = 2.5$	$z_{0.05} = 1.645$	$z_{0.025} = 1.96$	$z_{0.0228} = 2$

$t_{26,0.025} = 2.056$	$t_{26,0.05} = 1.706$	$t_{27,0.025} = 2.052$	$t_{27,0.05} = 1.703$
$t_{28,0.025} = 2.048$	$t_{28,0.05} = 1.701$	$t_{4,0.025} = 2.776$	$t_{5,0.025} = 2.571$
$t_{8,0.025} = 2.306$	$t_{9,0.025} = 2.262$	$t_{4,0.05} = 2.132$	$t_{5,0.05} = 2.015$
$t_{8,0.05} = 1.860$	$t_{9,0.05} = 1.833$		