

參考用

第一部份：選擇題（每題 3 分，計 15 分）

1. Two independent random variables with means 6.0 and 8.0, standard deviations 0.3 and 0.4, respectively, the standard deviation of their sum is (a) 0.25, (b) 0.50, (c) 0.70, and (d) 10.0.
2. When simple random sampling is chosen, the sample mean:
 - (a) will always follow a normal distribution, (b) will be the same for repeated random samples,
 - (c) will have an expected value equal to the population mean, (d) none of the above.
3. A random sample of 121 objects is to be selected from a population of 500. The population variance is known to be 676. The standard error of the sample mean will be: (a) 1.537, (b) 2.364, (c) 2.060, (d) 26.000.
4. The power of a test is:
 - (a) the probability of not making a type I error, (b) the probability of not making a type II error,
 - (c) the same as the level of significance, and (d) the same as the p-value.
5. The Durbin-Watson statistic:
 - (a) has a maximum value of 1.0, (b) cannot have a value less than 2.0,
 - (c) can never be negative, and (d) must be between 0 and 1.

第二部份：問答及計算

1. A company examines three new brands of cereal in selected outlets over a period of 4 months in market. Sales achieved (in thousands of dollars) are given in the table:

	brand a	brand b	brand c
March	47	52	60
April	56	54	52
May	49	63	55
June	41	44	48

- (a) Set out the two-way analysis of variance table. (5分)
- (b) Test the null hypothesis that the population mean sales are the same for all 3 brands of cereal. (5分)
2. 何謂 Poisson 分配？Poisson 分配與二項分配在使用上有何差異？(7分)
3. Compute the value of F that cuts off the lower $1-\alpha$ region of the sampling distribution for the following:
 - (a) $F_{1-0.05; 3, 20}$ (b) $F_{1-0.1; 5, 15}$ (c) $F_{1-0.05; 3, 10}$ (d) $F_{1-0.1; 10, 30}$ (12分)
4. If data are not suitable for ANOVA and an appropriate transformation can not be found, what resources does an experimenter have? (5分)
5. Given a binomial random variable X with $n=25$ and $p=0.6$, find the following probabilities, using an appropriate table. (15分)
 - (a) $P(X \leq 10)$, (b) $P(X \geq 12)$, (c) $P(X=15)$, (d) $P(18 \leq X \leq 21)$, (e) $P(18 < X < 21)$
6. (a) 說明：一個分層 (a stratum) 及一個群落 (a cluster). (7分)
- (b) 說明：分層隨機抽樣 (stratified random sampling) 及群落抽樣 (cluster sampling) 之意義. (7分)
- (c) 說明：分層隨機抽樣及群落抽樣各自應用的場合. (7分)
7. 某研究調查郵寄問卷調查的特性，若 Y = 註冊人數， X_1 = 郵寄家數， X_2 = 郵寄當天與開會相隔時間，樣本數 $n = 25$ 。若考慮以下之二階模式(second-order model)：

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1^2 + \beta_4 X_2^2 + \beta_5 X_1 X_2 + \epsilon$$

參閱以下之電腦 SAS 報表，試問

- (a) 註冊人數可說明的變動占總變動多少百分比？(5分)
- (b) 在 $\alpha = 0.05$ 下，檢驗各係數的顯著性。(5分)
- (c) 最終採用之最簡化模式。(5分)

DEPENDENT VARIABLE: ENROLLMENT

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	1371.723645	274.344774	31.26
ERROR	19	164.174455	8.640760	
CORRECTED TOTAL	24	1535.898100		
R-SQUARE	0.8956			

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR T0	PROB> T
INTERCEPT	1	6.267645	5.916542	1.0582	0.3009
X01: X1(X1)	1	2.362364	0.601247	3.9288	0.0014
X02: X2(X2)	1	0.003566	0.773424	0.0046	0.9945
X1 X2	1	-0.054178	0.032468	-1.6697	0.1179
X2 X2	1	0.052671	0.063483	0.8290	0.4171
(X1)(X2)	1	0.029078	0.064454	0.4511	0.6514

