

※ 考生請注意：本試題不可使用計算機

共計 10 題，每題 10 分，共計 100 分

- 寫下完整的「中央極限定理」(Central Limit Theorem) 定義(含其平均數與變異數)。(10 分)
- 某農場生產蘋果，其重量為一常態分配，平均數為 520 公克，標準差為 10 公克，試求下列問題的抽樣分配(含其平均數與變異數)為何：(a) 抽取 8 個蘋果，8 個蘋果平均重量的抽樣分配。(b) 若 4 個蘋果裝成一盒，則一盒的水梨重量的抽樣分配。(各 5 分)
- 某本英文教科書第一章(共有 5 頁)，平均每頁有 2 個打字錯誤，試問這本英文教科書第一章內發生打字錯誤的分配為何？(6 分)(先寫出分配名稱，並完整列出其分配函數，例如：均等分配， $f(x)=1/6, x=1,2,3,4,5,6$ )，以及其平均數、變異數。(各 2 分)
- 自某市四所大學中各隨機抽出 20 個男學生，並量測他們的體重(公斤)，彙整資料如下： $\bar{X}_1 = 68, \bar{X}_2 = 74, \bar{X}_3 = 70, \bar{X}_4 = 68; S_1 = 11, S_2 = 12, S_3 = 8, S_4 = 10$ 。假設四所大學男學生體重分別來自不同常態分配且  $\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \sigma_4^2$  下，分別求其 MSE (均方差) & Pooled sample variance (混合變異數)。(各 5 分)
- 如果已知下列 6 筆資料 X 與 Y 有線性關係：
 

X:	6	3	7	3	9	4
Y:	16	9	17	12	22	13

 (a) 寫出這簡單線性迴歸理論模型與其誤差假設條件；(b) 若其誤差條件為我們一般所熟知的，檢定這簡單線性迴歸模型的參數  $\beta_0$  及  $\beta_1$  時(如  $H_0: \beta_0 = 0$  或是  $H_0: \beta_1 = 0$ ) 一般用 t 來檢定。請說明使用 t 檢定之理由。(各 5 分)
- You're a time study analyst in manufacturing. You've recorded the following task times (min.): 4.1, 3.9, 3.8, 4.5, 4.6 ( $\bar{x} = 4.18$  and  $s = 0.36$ ). If we know the data from normal distribution and  $\sigma = 0.6$ , what is the 90% confidence interval estimate of the population mean task time? (列出式子即可) (10 分)
- Find the approximate sample size required to conduct a 95% confidence interval for  $p$  (Population proportion) that has sampling error 0.10 in each case. (a). Assume  $p$  is near 0.4. (b). Assume you have no prior knowledge about  $p$ , but you wish to be certain that your sample is large enough to achieve the specific accuracy for the estimate. (各 5 分)

(背面仍有題目,請繼續作答)

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8. A government agency conducts a study on the performance of two makes of cars in a similar price range, Accord and Honda. Random samples of 25 cars of each make were obtained and the miles per gallon (mpg) for each car was observed with the following results:

Accord: Sample mean=28.5, sample standard deviation=1.6

Honda: Sample mean=24.0, sample standard deviation=1.0

The government agency announced plans to purchase a fleet of one of these types of cars if they are 98% confidence that its mean mpg is at least 4 above that of the other type of car. Otherwise the government agency will conduct further analysis and study. Based on the right statistical analysis we obtained the interval (3.25, 5.75), what should the government agency do? (10 分)

9. A study was performed to see if stress therapy seemed to benefit individuals. Measurements were made by obtaining scores on a stress test taken on 8 subjects before and after therapy. The results were:

Pretest:  $\bar{x}_1 = 29, s_1^2 = 3$

Posttest:  $\bar{x}_2 = 31, s_2^2 = 5$

The value  $t=3.125$  was reported as the test statistics and it's p-values was said to be significant. Is this given test statistics a two independent sample t-statistics (Assume the data from normal distributions and  $\sigma_1^2 = \sigma_2^2$ )? (5分)  
Show why or why not. (3分) Should it be? (2分)

10. Five types of cloth for making sails were examined for strength by the team of "Stars and Stripes". Four pieces of each type of cloth were measured for "pounds of pressure withstood before tearing". The following completely randomized analysis of variance resulted:

Source of Variation	d.f.	SS	MS	F
Treatment (type of cloth)	4	520		
Error			20	
Total	19	820		

(a) Complete the ANOVA Table. (b) What assumption must be made about the sampled distributions for this type of analysis to be valid? (各 5 分)