淡江大學 105 學年度碩士班招生考試試題

421

系別：企業管理學系　　科目：統計學

考試日期：3 月 5 日(星期六) 第 2 節　　本試題共 3 大題， 2 頁

一、是非題 (10%)

1. 在固定樣本下，降低假設檢定的型 I 誤差機率α，會減少型 II 誤差機率β。
2. 常態分配的平均數、中位數與眾數皆相同。
3. 樣本比例為母體比例的不偏估計量。
4. 增加樣本數會提升檢定力。
5. 樣本平均數之標準誤等於母體標準差。

二、選擇題 (15%)

1. 當迴歸線 $\hat{y}=2-3x$ 時，其判定係數(coefficient of determination)為0.81，則相關係數(correlation coefficient)等於
   (1) -0.9　(2) -0.81　(3) 0.81　(4) 0.9
2. 下列何者不為變異數分析(ANOVA) F 檢定之基本假設?
   (1) 常態母體　(2) 獨立樣本　(3) 母體變異數相同　(4) 期望次數大於 5
3. 在下列那個條件下，二項機率分配可應用常態機率分配近似?
   (1) $np\geq 5$　(2) $nq\geq 5$　(3) $np\geq 5$ 或 $nq\geq 5$　(4) $np\geq 5$ 且 $nq\geq 5$
4. 對於 t 分配的性質，下列敘述何者不為真?
   (1) 鐘形　(2) 對稱　(3) $\sigma>1$　(4) $\mu=1$
5. 假設某班級學生智商分數為常態分配，平均智商為 110，標準差為 5。若某學生智商至少 120，試問該生智商是在班上的前多少比率?
   (1) 2.5%　(2) 5%　(3) 95%　(4) 97.5%

三、計算題 (75%)　**請詳述計算過程，否則不予計分，答案請計算至小數點第 2 位。**

1. (20%) In a random sample of 10 people, the mean body mass index (BMI) was 27 and the standard deviation was 6.
   (a) (4%) Find an unbiased estimate for the population mean.
   (b) (7%) Construct a 95% confidence interval for the population mean.
   (c) (7%) Based on the *p*-value, test whether the population mean is different from 24 at $\alpha=0.05$.
   (d) (2%) What assumption about the population is required for the previous procedures?

2. (20%) Two innovative processes are developed to replace the existing process. In a test, both processes are used to produce 100 components. Of the 100 components produced by process 1, 20 are found to be defective, whereas 25 out of the 100 produced by process 2 are defective.
   (a) (16%) Test whether there are differences between the defective proportions of these two processes at $\alpha=0.05$ by the z test and χ^2 test.
   (b) (4%) What is the relationship of the test statistics in part (a)?

背面尚有試題

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3. (20%) An experiment was conducted to compare the mean lengths of time required for the bodily absorption of two drugs A and B. Six people were randomly selected and assigned to receive one of the drugs. The length of time (in minutes) for the drug to reach a specified level in the blood was recorded, and the data summary is as follows.

Drug A	Drug B
$\bar{x}_1 = 27$	$\bar{x}_2 = 20$
$s_1^2 = 16$	$s_2^2 = 19$

(a) (16%) Assume that the population variances are equal. Test whether there is a difference in the mean absorption time between drugs A and B at α=0.05 by the *t* test and *F* test.

(b) (4%) What are the similarity and difference for the two tests in part (a)?

4. (15 pt.) Observations of 100 litters, each containing 2 rabbits, reveal the following frequency distribution of the number of male rabbits per litter. Under the model Bernoulli trials for the sex of rabbits, the probability distribution of the number of males per litter should be binomial with 2 trials and p = probability of a male birth. Perform the chi-square test for goodness-of-fit at α=0.05.

Number of males in litter	0	1	2
Number of litters	25	40	35

查表值（下標表示該分配右尾之機率，括號內為自由度）

$z_{0.025} = 1.96$ ， $z_{0.05} = 1.645$ ， $t_{0.025}(4) = 2.78$ ， $t_{0.05}(4) = 2.13$ ， $t_{0.025}(9) = 2.26$ ， $t_{0.05}(9) = 1.83$ ， $t_{0.025}(10) = 2.23$ ， $t_{0.05}(10) = 1.81$ ， $\chi^2_{0.025}(1) = 5.02$ ， $\chi^2_{0.05}(1) = 3.84$ ， $\chi^2_{0.025}(2) = 7.38$ ， $\chi^2_{0.05}(2) = 5.99$， $F_{0.025}(1,4) = 12.2$， $F_{0.05}(1,4) = 7.71$.