

國立臺灣科技大學

九十學年度碩士班招生考試試題

系所組別：資訊管理系乙組

科目：統計學

1. What is a *sample statistic*? Why is it a random variable? Why do we need to learn the *sampling distribution* of a *statistic*? An unseen animal is weighted 120 kilograms. If the possible answers are a human and a pig, what kind of animal would you guess? If the possible answers are an alien and a pig, what is your guess? Justify your answers. (20%)
2. What is the *Central Limit Theorem*? When and how to use it? (10%)
3. Suppose that a random sample of size $n = 100$ is sampled from a normal population with unknown mean μ and variance $\sigma^2 = 40^2$. The goal is to test $H_0 : \mu = 50$ against $H_1 : \mu > 50$ at 2.5% significance level. Compute the power when $\mu = 62$. If the sample mean $\bar{X} = 54$ is observed, what is the p -value and your conclusion? Construct a 95% confidence interval for μ . ($P\{Z > 2\} \cong 0.025, P\{Z > 1\} \cong 0.16$, where Z stands for the standard normal random variable.)(20%)



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4. 台科大技教中心為瞭解本校大學部畢業生在就業工作五年後認為自己本身在工作職場上所擁有的優勢與所欠缺的能力，委託您進行此項研究工作。請您就下列各點做說明：
- (1) 在資料收集上常用的抽樣方法有哪些？概要說明這些方法的適用環境、優缺點與使用上所應注意的事項？（9%）
 - (2) 說明您將如何進行抽樣工作（抽樣方法）以使得抽出的樣本能充分地代表母體？（6%）
5. 如果您有一項研究工作需要使用迴歸分析方法，請您以流程圖方式來說明一般建構迴歸模式的工作步驟，並概要說明其工作內容？（8%）
6. The label on a medium-size package of King-Ping Best OOLONG tea states that the package contains at least 2 kilograms of tea. A random sample of 49 packages of tea is selected and the average weight of this sample is 1.94 kilogram. Suppose we know that the population standard deviation is 0.21. $[\Pr(Z \leq 1.65) = 0.95, \Pr(-2 \leq Z \leq 2) = 0.9544]$
- (1) At $\alpha = 0.05$, compute the test statistic for the hypothesis $H_0: \mu \geq 2$ vs. $H_1: \mu < 2$ and make you conclusion. (5%)
 - (2) If the rejection region is $\{\bar{X} < 3.06\}$ and the true mean $\mu = 3$, compute the type II error. (5%)
 - (3) If we want to estimate the mean μ within ± 0.05 with 95% confidence, what sample size will be needed? (5%)
7. Suppose you have known that the average yearly income per family last year in Taiwan was NT 850 thousand dollars. If you want to know whether the yearly income between those native families and the families in Taiwan is consistent (equal), you have conducted a survey. Due to the difficulty of obtaining the data, you have just 8 data of native families at hand as followed.
- 843, 856, 870, 858, 823, 836, 880, 861 (yearly income per native family in NT\$ thousand)
- (1) Use Sign Test method to write down your model and make the conclusion. (6%)
 - (2) Use the Sign Rank Test (Wilcoxon Test) to write down your model and make the conclusion at $\alpha = 0.05$. $[W_{8, 0.05} = 4]$ (6%)



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