國立臺灣科技大學

九十二學年度碩士班招生考試試題

系所組別：財務金融研究所碩士班

科　目：統計學

總分 100 分

1. (25 分) A college professor gives a test that has 5 true-false questions. Two students take the test. Student A, who does not know anything about the subject, answers the questions by tossing a coin. The college professor sets up the following hypothesis:

   Ho: The students do not know anything (p=0.5)

   Ha: The students know the subject (p>0.5)

   where p represents the probability that a student gets an answer right.

   (1)What is the chance of student A getting exactly 3 correct answers when the null hypothesis is true?

   (2)If the professor decides to reject the null hypothesis (that means passing the student) when the students get 4 or more correct answers, what is the probability of a Type I error?

   (3)Student B studies one night before the test, so he knows about 60 percent of the material. What is the probability that this student can pass the test when the standard for passing is 4 correct answers?

   (4)Plot the power curve, assuming p = 0.5, 0.6, 0.7, 0.8, 0.9, 1.0.

2. (25 分)

   (1) What is sampling error? Could the value of the sampling error be zero? If it were zero, what would this mean?

   (2)Company A's accountant decides that the best way to determine the company's mean accounts receivable is to take a simple random sample of the 1,000 accounts. Assume that the population variance is $3,740. What size sample should the accountant take if she would like to have a level of precision, as measured by $\sigma_{\bar{x}}^2$, of $106?

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3.(25 分)

令 Y 表示辦公大樓的租金(單位：千元)，X_1 表示辦公大樓的坪數(單位：10 坪)，X_2 表示辦公大樓的屋齡(單位：年)，X_3 表示辦公大樓所在地與捷運站的距離(單位：公里)，X_4 表示辦公大樓所在地居民的年平均收入(單位：十萬元)，X_5 表示辦公大樓所在的樓層數。今由 2500 間辦公大樓的資料計算出 Y 對 X_1，X_2，X_3，X_4，X_5 的迴歸估計式為：$\hat{Y} = 403 + 15.46X_1 - 20.37X_2 - 4.86X_3 + 85.47X_4 - 22.17X_5$

其中各項係數之樣本標準差依次如下：22.9、2.35、1.61、1.33、24.42、10.8。請回答下列問題：

(1) 其他自變數不變，若辦公大樓的坪數由 300 坪減少到 250 坪，試求辦公大樓的租金的變化。

(2)若 Y 與 X_1，X_2，X_3，X_4，X_5 之樣本標準差依次變動如下：120、4.8、2、8、0.64、1.5。試求在此假設之下 Y 對 X_1，X_2，X_3，X_4，X_5 的迴歸估計式。

4.(25 分)

設 $Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \varepsilon_i$，$i = 1,2,.....,n$，倘若 X_1 與 X_2 的相關係數 $r_{12} = 0$，則下列兩個新迴歸模型 $Y_i = \eta_0 + \eta_1 X_{i1} + \xi_i$，$Y_i = \lambda_0 + \lambda_1 X_{i2} + \zeta_i$，$i = 1,2,.....,n$，若 $\bar{Y} = \frac{1}{n}\sum Y_i$，$\hat{\beta}_0$、$\hat{\eta}_0$、$\hat{\lambda}_0$ 分別為最小平方法下的估計量，請列出一式表達出 $\hat{\beta}_0$、$\hat{\eta}_0$、$\hat{\lambda}_0$ 之關係。