

國立臺北科技大學 102 學年度碩士班招生考試

系所組別：4400 服務與科技管理研究所

第一節 統計學 試題

第一頁 共二頁

注意事項：

1. 本試題共 9 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Please explain, in each of the following questions, the terms and their differences: (15%)
 - (a) Type I error, Type II error (5%)
 - (b) Right-skewed frequency distribution, left-skewed frequency distribution (5%)
 - (c) Hypergeometric distribution, binomial distribution (5%)
2. Please explain the central limit theorem. (5%)
3. A simple regression model can be written as $Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$, $i=1, 2, \dots, n$ when we consider only one explanatory variable, x , and assume that the statistical relationship between the response variable Y and this explanatory variable is linear. Please explain the usual assumptions about parameters and variables in this model. (10%)
4. The grades of a class of nine students on a midterm report (x) and on the final examination (y) are as follows: (20%)

x	78	60	72	73	81	93	97	99	67
y	80	66	78	34	47	85	99	98	69

 - (a) Estimate the linear regression line. (10%)
 - (b) Estimate the final examination grade of a student who received a grade of 83 on the midterm report. (10%)
5. The nicotine content of a certain brand of cigarettes is known to be normally distributed with a variance of 1.4 milligrams. Test the hypothesis that $\sigma^2 = 1.4$ against the alternative that $\sigma^2 \neq 1.4$ if a random sample of eight of these cigarettes has a standard deviation $s = 1.7$. Use a 0.05 level of significance. (10%)

6. Assume that the prior distribution for the proportion p of the defectives produced by an equipment is

p	0.2	0.3
$f(p)$	0.7	0.4

Please find the Bayes estimate for the proportion of defectives being produced by this equipment if a random sample of size 2 yield 1 defective. (10%)

7. Please prove that the covariance of two random variables X and Y with means μ_X and μ_Y , respectively, is given by $\sigma_{XY} = E(XY) - \mu_X \mu_Y$. (10%)
8. The probability that a student fails the screening test for scoliosis at a local high school is known to be 0.002. Of the next 4000 students who are screened for scoliosis, please find the probability that: (10%)
 - (a) fewer than 5 fail the test; (5%)
 - (b) 11, 12, or 13 fail the test. (5%)
9. Three sections of the same calculus course are taught by three teachers. The final grades were recorded as follows:

A	80	76	76	43	89	73	71	60	45	93	36	74			
Teacher B	89	76	48	91	53	85	74	77	29	78	62	76	96	81	57
C	67	80	56	91	71	71	83	41	59	68	53	79	19		

Is there a significant difference in the average grades given by the three teachers? Use a 0.05 level of significance. (10%)

注意：背面尚有參考資料

