

# 國立中央大學八十七學年度碩士班研究生入學試題卷

所別： 企業管理研究所    甲組    科目： 甲統計學    共 / 頁 第 / 頁

1. Consider a 2 x 2 contingency table as follow:

Populations	1	2	Totals
Success	X1	X2	X
Failures	n1-X1	n2-X2	n-X
Totals	n1	n2	n

where  $n = n1+n2$  and  $X = X1+X2$ .

- (a) Based on independent sample, what is the Z-test statistic for differences in two proportions, i.e.,  $H_0: p_1 = p_2$ ? (5%)
- (b) Show that the Chi-square test statistics for homogeneity of proportions is equal to  $Z^2$ . (15%)

2. Given the data of two independent samples,

$$\bar{X}_1 = 3.27, S_1^2 = 1.698, n_1 = 21 \text{ and } \bar{X}_2 = 2.53, S_2^2 = 1.353, n_2 = 25$$

- (a) In what kind situations, the F statistic of ANOVA can be used to test the null hypotheses that  $\mu_1 = \mu_2$ . (5%)
- (b) Using the data sets, compute the ANOVA table. (10%)
- (c) Show that the formula of F statistic used in (a) is equal to  $t^2$ , where

$$t = (\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2) / \sqrt{S_p^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}, S_p^2 \text{ is a pooled variance. (15\%)}$$

3. A quality control plan for an assembly line involves sampling  $n=10$  finished items per day and counting Y, the number of defectives. If  $p$  denotes the probability of observing a defective, then Y has a binominal distribution, assuming the number of items produced by the line is large. But  $p$  varies from day to day and is assumed to have a uniform distribution on the intervals from 0 to 1/4. Find the expected value of Y for any given day. (10%)

4. By examining the scatter plot of following data, address a suitable regression model and derive the slope of piecewise linear function. (15%)

X	1	2	3	4	5	6	7	8	9
Y	2.3	3.8	6.5	7.4	10.2	10.5	12.1	13.2	13.6

- 5. (a) The data consists of n independently selected pairs  $(X_i, Y_i), i=1, 2, \dots, n$ . Let  $D_i = X_i - Y_i$ , the  $D_i$ 's are assumed to be normally distributed with variance  $\sigma_D^2$ . Find the variance for  $\bar{D}$  in terms of the correlation between X and Y. (10%)
- (b) If the two-sample t test is used (incorrectly) to analyze paired data, what will happen? (5%)
- 6. The superintendent of a large school district believes that the number of students absent on any given day has a poisson distribution with parameter  $\lambda$ . Use the accompanying data on absences for 50 days to derive a large-sample 95% confidence interval for  $\lambda$ . (10%)

Number of absences	0	1	2	3	4	5	6	7	8	9	10
Frequency	1	4	8	10	8	7	5	3	2	1	1

參考