國立臺北科技大學 100 學年度碩士班招生考試

系所組別：4110、4120、4130 工業工程與管理系碩士班
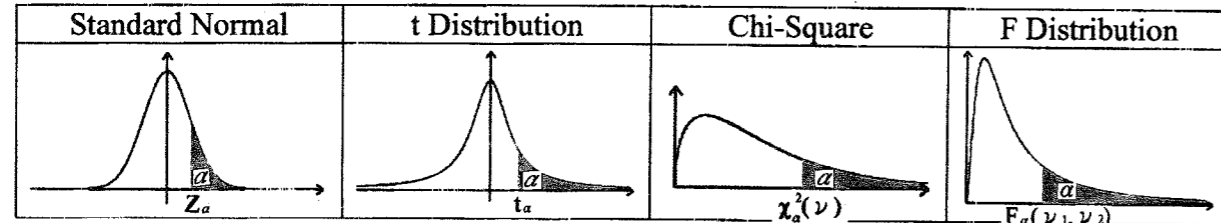
甲、乙、丙組　第一節　統計學　試題

注意事項：

1. 本試題共 7 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。

Note:

Standard Normal	t Distribution	Chi-Square	F Distribution
Z_α	t_α	$\chi^2_\alpha(\nu)$	$F_\alpha(\nu_1,\nu_2)$

$Z_{0.025} = 1.960$

$Z_{0.05} = 1.645$

$P(Z > 1.373) = 0.0849$

$P(Z > 1.687) = 0.0458$

$P(Z > 5.293) = 0$

$P(Z > 4.980) = 0$

$t_{0.025}(8) = 2.306$

$t_{0.05}(8) = 1.86$

$t_{0.1}(8) = 1.397$

$t_{0.025}(9) = 2.262$

$t_{0.05}(9) = 1.833$

$t_{0.1}(9) = 1.383$

$t_{0.025}(39) = 2.023$

$t_{0.05}(39) = 1.685$

$\chi^2_{0.025}(2) = 7.378$

$\chi^2_{0.025}(5) = 12.833$

$\chi^2_{0.025}(6) = 14.449$

$\chi^2_{0.05}(2) = 5.991$

$\chi^2_{0.05}(5) = 11.071$

$\chi^2_{0.05}(6) = 12.592$

$F_{0.05}(15, 24) = 2.11$

$F_{0.05}(24, 15) = 2.29$

$F_{0.025}(15, 24) = 2.44$

$F_{0.025}(24, 15) = 2.70$

1. A suppliers' lot size (N) of component is 1000, the defective rate (P) of the lot is 2%, the sampling plan of a toy company is taken 100 components to inspect the quality, if the defective number of 100 samples are not great than 1, that the toy company accept the lot. To find the probability of accept the lot. **15%**

   (1) Using binomial distribution (List the formula only, needed not accuracy answer) **5%**

   (2) Using hypergeometric distribution (List the formula only, needed not accuracy answer) **5%**

   (3) Using Poisson distribution (List the formula only, needed not accuracy answer) **5%**

2. In a random sample of 800 customers selected for a short phone interview, 96 have stated that they have received their shipments late. Compute the confidence interval of the population proportion about shipments late, at the 0.1 level of significance. **10%**

3. Consider the 3x2 contingency table below. At significance level of 0.05, test H_0: the factors A and B are independent. **10%**

Factor A	Factor B	
	B_1	B_2
A_1	16	14
A_2	15	25
A_3	9	21

4. Nine distance runners were selected to determine the effectiveness of a specific new training program. First each of the nine runners ran a half marathon before they used the new training program. The same 9 runners also ran a half marathon after they went through the new training program. The following data represents the completion time of a half marathon in minutes for each of the 9 runners before and after training with the new training program. Does the new training program appear to be effective in decreasing the completion time of a half marathon? At significance level of 0.05. **10%**

Runner	1	2	3	4	5	6	7	8	9
Before	110	88	84	94	108	82	96	97	134
After	94	81	82	88	97	85	77	89	110

5. A local charity believes they receive money from people in the group A and from people in the group B. They conducted a survey of 25 and 16 peoples randomly selected from group A and group B, the sample mean and sample standard deviation as shown in below. At the 0.01 level of significance. **20%**

Group A	Group B
$\bar{X}_1 = \$34/\text{person}$	$\bar{X}_2 = \$30/\text{person}$
$s_1 = \$8/\text{person}$	$s_2 = \$6/\text{person}$
$n_1 = 25$	$n_2 = 16$

   (1) Is the variance of receive money from group A different from group B? **10%**

   (2) Is the mean of receive money from group A different from group B? **10%**

6. A production line operation is tested for filling-weight accuracy with the following hypotheses.

$H_0: \mu = 16$ (Ounces)　Filling okay; keep running

$H_1: \mu \neq 16$ (Ounces)　Filling off standard; stop and adjust machine

The sample size is 36 and the population standard deviation is $\sigma = 0.9$, if filling-weight is normal distribution. To find the type II error, when true mean of population is 16.5, at the 0.05 level of significance.　10%

7. An experiment was performed on a certain metal to determine if the strength (Y) is a function of heating time (X). Results based on 10 metal sheets are given below. Use the simple linear regression model.　25%

$\sum X = 30$,　$\sum X^2 = 104$,　$\sum Y = 40$,　$\sum Y^2 = 178$,　$\sum XY = 134$

(1) Find the estimated Y intercept and slope and write the equation of the least squares regression line.　5%

(2) Complete the ANOVA table and determine the value of the F statistic.　5%

(3) Find the t statistic and test $H_0: B_1 \quad 0$ vs. $H_a: B_1 > 0$, at　=0.05.　5%

(4) Calculate the 95% confidence interval for the slope.　5%

(5) Calculate the correlation coefficient.　5%