

國立臺北科技大學九十八學年度碩士班招生考試

系所組別：4111 4112 4120 工業工程與管理系碩士班甲乙組

第一節 統計學 試題

第一頁 共二頁

注意事項：

1. 本試題共 8 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:

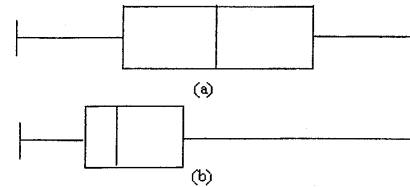
Standard Normal	t Distribution	Chi-Square	F Distribution
$z_{0.025} = 1.960$ $z_{0.05} = 1.645$ $P(Z > 0.2) = 0.4207$ $P(Z > 0.5) = 0.3085$ $P(Z > 1.0) = 0.1587$ $P(Z > 1.414) = 0.0787$ $P(Z > 1.5) = 0.0668$	$t_{0.05}(5) = 2.015$ $t_{0.05}(4) = 2.132$ $t_{0.025}(5) = 2.571$ $t_{0.025}(4) = 2.776$ $t_{0.05}(9) = 1.833$ $t_{0.05}(8) = 1.860$ $t_{0.025}(9) = 2.262$ $t_{0.025}(8) = 2.306$	$\chi^2_{0.025}(3) = 9.343$ $\chi^2_{0.025}(4) = 11.143$ $\chi^2_{0.025}(5) = 12.833$ $\chi^2_{0.05}(3) = 7.815$ $\chi^2_{0.05}(4) = 9.488$ $\chi^2_{0.05}(5) = 11.070$	$F_{0.05}(3,14) = 3.335$ $F_{0.05}(3,12) = 3.490$ $F_{0.05}(2,14) = 3.739$ $F_{0.05}(2,12) = 3.885$

1. Consider the following four data sets.

Data Set I	Data Set II	Data Set III	Data Set IV
1 1 2 2 5	1 1 1 1 1	5 5 5 5 5	2 4 4 4 4
5 8 8 9 9	9 9 9 9 9	5 5 5 5 5	4 4 4 10 10

- (a) Although the four data sets have the same means, in what respect are they quite different? (2%)
 - (b) Which data set appears to have the least variation? (2%)
 - (c) Which data set appears to have the greatest variation? (2%)
2. A box-plot was obtained from a very large data set. What is the approximate shape of the

distribution of this data set (Uniform, Bell shaped, Right skewed or Left skewed)? (4%)



3. In a gambling game a woman is paid \$30 if she draws a jack or a queen and \$50 if she draws a king or an ace from an ordinary deck of 52 playing cards. If she draws any other card, she loses. How much should she pay to play if the game is fair?(10%)
4. The average life of a certain type of small motor is 10 years with a standard deviation of 2 years. The manufacturer replaces free all motors that fail while under guarantee. If he is willing to replace only 5% of the motors that fail, how long a guarantee should he offer? Assume that the lives of the motors follow a normal distribution. (10%)
5. If the standard error of the mean for the sampling distribution of random samples of size 36 from a larger of infinite population is 2, how large must the size of the sample become if the standard error is to be reduced to 1.2? (10%)
6. A manufacturer has developed a new fishing line, which he claims has a mean breaking strength of 15 kilograms with a standard deviation of 0.5 kilogram. To test the hypothesis that $\mu = 15$ kilograms against the alternative that $\mu < 15$ kilograms, a random sample of 50 lines will be tested based on the population normality assumption. The critical region is defined to be sample mean $\bar{x} < 14.9$.
 - (a) Find the probability of committing a type I error when H_0 is true. (10%)
 - (b) Evaluate the type II error β for the alternatives $\mu = 14.8$ kilograms. (10%)
7. Three brands of batteries are under study. It is suspected that the lives (in weeks) of the three brands are different. Five batteries of each brand are tested with the following results:

Weeks of Life		
Brand 1	Brand 2	Brand 3
100	76	108
96	80	100
92	75	96
96	84	98
92	82	100
$\bar{x}=95.2$	$\bar{x}=79.4$	$\bar{x}=100.4$
$S=3.347$	$S=3.847$	$S=4.561$

- (a) Are the mean lives of these brands of batteries different under the same population variance assumption? Significant level $\alpha = 0.05$ (Need to show ANOVA table) (10%)

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- (b) Construct a 95% confidence interval estimated on the mean life of battery brand 2. (10%)
- (c) What is the minimum absolute difference of sample mean life of batteries between brand 2 and 3 if the same population variance estimation is MSE of question (a), we will conclude that the means are different under the significant level $\alpha=0.05$? (10%)

8. Three marbles are selected from an urn containing 5 red marbles and 3 green marbles. After recording the number x of red marbles, the marbles are replaced in the urn and experiment repeated 112 times. The results obtained are as follows:

x	0	1	2	3
f	1	31	55	25

Test the hypothesis at the 0.05 level of significance that the recorded data may be fitted by the hyper-geometric distribution $h(x;8,5,3)$, $x=0, 1,2,3$. (10%)