國立臺北科技大學

九十四學年度工業工程與管理系碩士班入學考試

統計學試題

填 准 考 證 號 碼 　　　　　　　　　　第一頁　共二頁

注意事項：

1. 本試題共 14 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

Part I. There are ten questions in this part. Choose the best answer for each question. There are five points for each question totally 50 points.

Note: Normal Distribution $Z_{.1} = 1.282$, $Z_{.05} = 1.645$, $Z_{.025} = 1.96$, $Z_{.01} = 2.326$, $Z_{.005} = 2.576$, $Z_{.0005} = 3.291$, $\Phi(Z>0.5) = 0.3085$, $\Phi(Z>1) = 0.1587$, $\Phi(Z>1.3) = 0.0968$, $\Phi(Z>1.4) = 0.0808$, $\Phi(Z>1.5) = 0.0668$, $\Phi(Z>2) = 0.0228$

1. Which of the following tests may be used to determine whether a sample comes from a population with an exponential distribution?

a. t

b. F

c. ANOVA

d. Chi-square

2. The correlation coefficient for the length and weight of units made by a process is determined to be 0.27. If the process were adjusted to reduce the weight of each unit by 0.5 ounce, the correlation coefficient of the length and weight of the units made by the new process would be equal to

a. 0.50

b. 0.27

c. 0.23

d. –0.23

3. What is the required discrimination of a comparator given a tolerance of 0.005 and an accuracy ratio of 10:1?

a. 0.0005

b. 0.005

c. 0.05

d. 0.5

4. A manufacturer of air conditioners wants to estimate the mean life (years from installation to replacement) of its units. The error level is set at 0.5 year, a desired probability $(1 - \alpha)$ of 95% is selected, and the standard deviation of unit life is given as 6.0 years. If unit life is normally distributed, then the required sample size for the desired estimate is equal to

a. 283

b. 291

c. 554

d. 585

5. It is most appropriate to use a t-test for a hypothesis test to compare the

a. variances of two distributions.

b. means of two distributions.

c. standard deviations of two distributions.

d. medians of two distributions.

6. The correct value for the expected frequency of cell I in the contingency table is

Alternative			
Result	A	B	Total
X	I	II	80
Y	III	IV	120
Total	130	70	200

a. 28

b. 42

c. 52

d. 78

7. A computer, in adding numbers, rounds each number off to the nearest integer. Suppose that all rounding errors are independent and uniformly distributed over (-0.5, 0.5). If 1500 numbers are added, what is the probability that the magnitude of the total error exceeds 15?

a. 0.1802

b. 0.3132

c. 0.0451

d. 0.2842

8. Same as question 7, Xi are independent random variables each having a uniformly distributed over (-0.5, 0.5). How many numbers may be added together in order that the magnitude of the total error is less than 10, with probability 0.9?

a. 187

b. 94

c. 374

d. 444

9. A factory produces 10 glass containers daily. It may be assumed that there is a constant probability p = 0.1 of producing a defective container. Before these containers are stored they are inspected and the defective ones are set aside. Suppose that there is a constant probability r = 0.1 that a defective container is misclassified. Let X equal the number of containers classified as defective at the end of a production day. (Suppose that all containers which are manufactured on a particular day are also inspected on that day.) Compute P(X=2) =?

a. 0.1937

b. 0.1714

c. 0.2541

d. None of above.

10. In a study of television viewing habits among married couples, a researcher found that for a popular Saturday night program 25% of the husbands viewed the program regularly and 30% of the wives viewed the program regularly. The study found that for couples where the husband watches the program regularly 80% of the wives also watch regularly. What is the probability that at least one --husband or wife--watches the program regularly?

a. 0.35

b. 0.2

c. 0.65

d. 0.4

Part II. Questions 11 through 14 are calculations. There are 50 points in this part. Write down the calculation process as detailed as you can.

11. A market survey was conducted to estimate the proportion of homemakers who could recognize the brand name of a cleanser based on the shape and color of the container. Of the 1,400 homemakers, 420 were able identify the brand name. Using the .99 degree of confidence, the population proportion lies within what interval? (10%)

12. It is known that a large shipment of volt meters contains a certain proportion of defectives, say p. To test Ho: p=0.2 versus H1: p>0.2, the following procedure is used. A

sample of size 5 is obtained and X, the number of defective voltmeters, is counted. If X<=1, accept Ho; if X>4, reject Ho; and if X = 2, 3, 4 take a second sample of size 5. Let Y be the number of defective meters in the second sample. Reject Ho if X+Y > 4 and accept otherwise. (Assume that the lot being sampled is sufficiently large so that X and Y may be supposed to be independent binomially distributed random variables.)

a. What is the probability of type-2 error if $p = 0.5$? (10%)

b. Obtain an expression for L(p), the OC function of the above test. (10%)

13. A manufacturer produces both a deluxe and standard model automatic designed for home use. Selling prices obtained from a sample of retail outlets are as follows:

Retail Outlet	Price, Deluxe Model	Price, Standard Model
1	$39	$27
2	39	28
3	45	35
4	38	30
5	40	30
6	39	34
7	35	29

The manufacture's suggested retail prices for the two models show a $10 differential in prices. Use a 0.05 level of significance and test to see if the mean difference between prices of the two models is $10. (10%) $t_{.025,6} = 2.447$, $t_{.05,6} = 1.943$, $t_{.025,7} = 2.365$, $t_{.05,7} = 1.895$.

14. The following is a two-way ANOVA table. (10%)

Source	Sum of squares	Degrees of freedom	Mean square
Treatment	50	2	25
Blocks	24	3	8
Error	48	6	8
Total	122	11	

a. How many treatments are there? (2%)

b. How many locks are there? (2%)

c. How many samples are there in the problem? (2%)

d. Conduct a test for treatments. Is there a significant difference among the treatment means? Use the 0.05 significance level. (4%)

$F_{.05,2,6} = 5.14$, $F_{.05,3,6} = 4.76$, $F_{.05,2,11} = 3.98$, $F_{.05,3,11} = 3.59$