3-1-5

國立聯合大學 100 學年度碩士班考試招生

資訊管理學系碩士班 入學考試試題

科 目：統 計 學 第 1 頁共 2 頁

1. Please define and give an example of each of the following statistical terms to explain it: **(20%)**
   (1)Bayes' theorem
   (2)coefficient of determination
   (3)requirements of probabilities
   (4) chi-squared test of normality
   (5) test statistic

2. Discuss the differences between parameter and statistic? Explain the differences with an example. **(8%)**

3. Let $X_1, X_2,....,X_n$ denote the outcomes of n independent Bernoulli trials, each with the same parameter p. Please find the mean and variance of $Y=X_1+X_2+....+X_n$. **(6%)**

4. Let random variable X denote an exponential distribution given by **(8%)**

$$f(x)=\lambda e^{-\lambda x}, \quad x > 0;$$
$$= 0, \quad x \leq 0$$

(1) Find the cumulative distribution function F(x) of X. (4%)
(2) Use the results of (1) to show that $P(X > x + x_n \mid X > x)$ for any positive x and x_n. (4%)

5. Describe any four probability distributions with their characteristics and applications. **(8%)**

6. A construction company has submitted bids on two separate state contracts, *A* and *B*. The company feels that it has a 60% chance of winning contract *A*, and a 50% chance of winning contract *B*. Furthermore, the company believes that it has an 80% chance of winning contract *A* given that it wins contract *B*. **(12%)**
(1) What is the probability that the company will win both contracts? (3%)
(2) What is the probability that the company will win at least one of the two contracts? (3%)
(3) If the company wins contract *B*, what is the probability that it will not win contract *A*? (3%)
(4) What is the probability that the company will win at most one of the two contracts? (3%)

7. The marketing manager of a pharmaceutical company believes that more girls than boys use its acne medicine. In a recent survey, 2500 teenagers are asked whether or not they use that particular product. The responses, categorized by sex, are summarized below. **(10%)**

Sex	Use acne medicine	Do not use acne medicine
Female	540	810
Male	391	759

(1) Do these data provide enough evidence at the 10% significance level to support the manager's claim? (5%)
(2) Estimate with 90% confidence the difference in the proportion of male and female users of the acne medicine. (5%)

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8. Assume we have the random samples $\{X_1, X_2,....,X_n\}$ coming from a normal distribution population $N(\mu, \sigma^2)$. Please answer the following questions. **(20%)**

(1) Assume σ is unknown. Construct a (1-α)*100% confidence interval for μ. (4%)

(2) State how to test H_0: $\mu=\mu_0$ versus H_1: $\mu \neq \mu_0$ at level α. (4%)

(3) Find an unbiased estimator of σ^2. (4%)

(4) Construct a $(1-\alpha)*100\%$ confidence interval for σ^2. (4%)

(5) Give a test for testing H_0 : $\sigma^2=1$ versus H_1 : $\sigma^2 \neq 1$ at level α. (4%)

9. Consider inferences about the difference $P_1 - P_2$ between two population proportions for large samples. **(8%)**

(1) Construct a $(1-\alpha)*100\%$ confidence interval for $P_1 - P_2$. (4%)

(2) Give a test for testing H_0: $P_1 = P_2$ versus H_1: $P_1 \neq P_2$ at level α. (4%)